

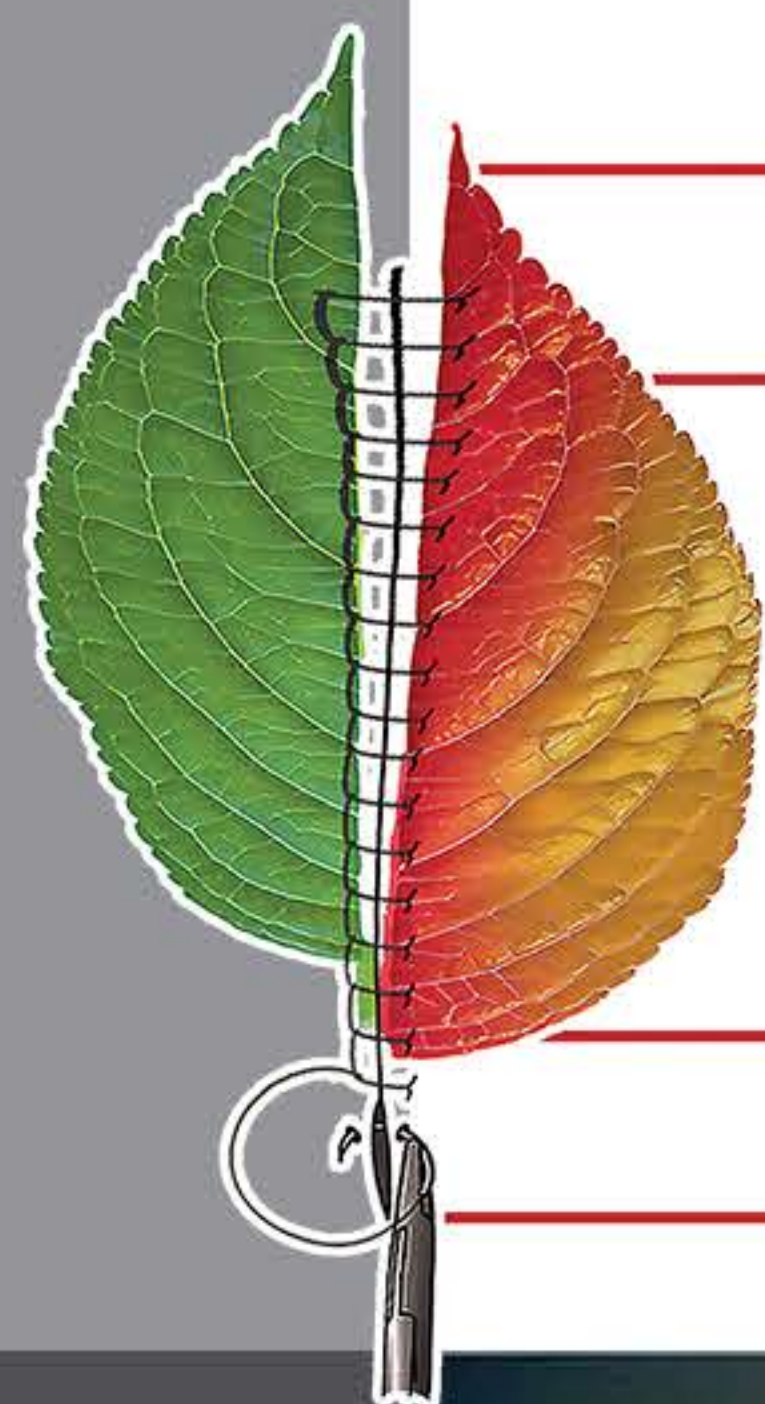
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هشتم تا دهم آذرماه
Nov. 29 - Dec. 1

2023

10th WTR

دهمین کنگره بین‌المللی زخم و ترمیم بافت

Tenth International Congress of Wound and Tissue Repair

Wound and World,
Return to



Abstract Book

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Academic Center for Education, Culture and Research (ACECR)

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mtaba@jdtums.ir

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mansori_p@sina.tums.ac.ir

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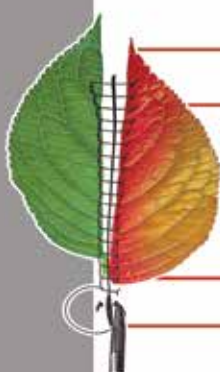
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Room No, 101 Tehran University of Medical Sciences, Tehran, Iran

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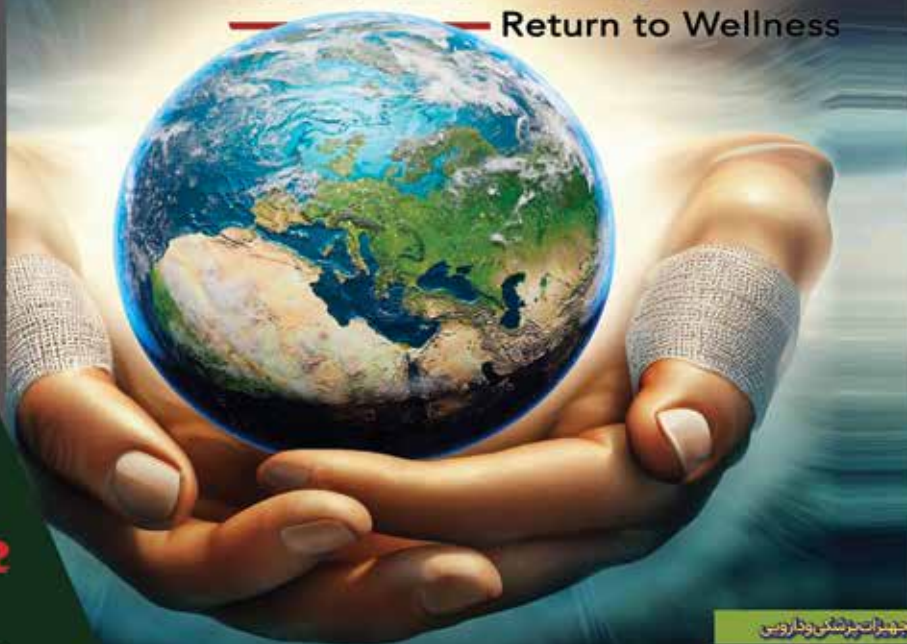
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Tenth International Congress of Wound and Tissue Repair

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Wednesday, November 29th 2023

Panel 1	Update in Wounds	
Chairpersons	Dr. Ali Montazeri, Dr. Bagher Larijani Dr. Hesamuddin Allameh , Dr. Seyed Saeed Hashemi	
Bagher Larijani	Innovations in Medicine: Omics in diseases	8:00 - 8:20
Ali Montazeri	Translation and validation of the Persian version of diabetic foot ulcer scale-short form (DFS-SF)	8:20 - 8:40
Mehrangiz Toutouchi	The effectiveness of Hyporesponsive dressing on debridement and the presence of granulation tissue in diabetic ulcers (Report of treated cases of Yara Clinic)	8:40 - 8:50
Masood Fallahi	Investigating the incidence of pressure ulcers and affecting factors in patients admitted to Imam Reza Hospital	8:50 - 9:00

Discussion I	Management of Diabetic foot ulcers	
Moderator: Dr. Mohammadreza Mohajery Tehrani Members: Dr. Neda Mehrdad, Dr. Mohammad Reza Amini		9:00 - 9:45

Panel 2	Nursing Wound Management	
Chairpersons	Dr Abbas Ebadi, Mahdi Akbarzade Amirdehi, Dr.Mahdieh Arian, Dr. Mehrangiz Toutouchi	
Abbas Ebadi	A report of achievements & activities of the deputy of nursing in the specialized field of Wound & Ostomy Care	9:45 - 10:00
Mahdi Akbarzadeh Amirdehi	Novel technologies in Chronic Nursing Care	10:00 - 10:10
Mahdieh Arian	Nursing Care in Pressure Ulcer	10:10 - 10:20
Saeed Pasban Noghabi	Effect of Oxytetracycline Spray on Diabetic Foot Ulcer (DFU)	10:20 - 10:30
Hamed Savadkoobi	Infected Wounds Wound Care	10:30 - 10:40
Tannaz Faregh	World & Nursing Wound Care	10:40 - 10:50
Firuzeh Hatamirad	Evaluating the level of adherence to ethical principles when changing dressings by nurses in special, surgical and emergency departments	10:50 - 11:00
Donya Safari	Discovering the most suitable type of bandage for each phase of a bedsore	11:00 - 11:10
Zahra Goudarzi	Investigating and comparing the effectiveness of atmospheric plasma therapy with vacuum therapy (NPWT) compared to vacuum therapy (NPWT) alone on pressure ulcer patients: a randomized, controlled, double-blind clinical trial study	11:10 - 11:20

Ahmad Reza Farmani	Theranostics Wound Dressings; Promising Strategy for Future Wound Care	11:20 - 11:30
Questions and Answers		11:30 - 11:40

Opening Ceremony	11:40 - 13:00
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Pray and Lunch	13:00 - 14:00
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Discussion II	Mental Health in Wound Healing	
Moderator: Dr. Maryam Sedaghat Members: Dr. Robabe Nouri, Dr. Biouk Tajeri		14:00 - 14:45

Panel 3	Innovative Technology	
Chairpersons	Dr. Jafar Ai, Dr. Kavosh Zand Salimi, Dr. Hoda Keshmiri Neghab, Dr. Reza Faridi Majidi	

Naghmeh Bahrami	In vivo bioreactor for skin tissue engineering	14:45 - 15:00
Nasrin Lotfibakhshaiesh	Skin regeneration using three-dimensional printer	15:00 - 15:15
Seyed Ahmad Vaez	Skin-on-a-Chip: an efficient powerful tool to simulate physiological and pathological skin conditions	15:15 - 15:30
Shahin Homaeigohar	Electrospun nanofibrous wound dressings; a new generation of wound healing materials	15:30 - 15:45
Reza Faridi Majidi	Application of nanofibers in wound healing and repair	15:45 - 16:00
Fariba Dashtestani	Regenerative wound dressing for cancerous wound	16:00 - 16:15
Hadi Sadeghzadeh	Fabrication and evaluation of 3D nanofibrous scaffolds using mold-assisted electrospinning for tissue engineering	16:15-16:25
Benyamin Mashhadi	Resveratrol-Grafted Cellulose Scaffolds: A Novel Approach for Enhancing Tissue Repair	16:25 - 16:35
Arian Karimi Rouzbahani	Investigating the therapeutic effect of ozone therapy combined with alginate compared to alginate alone on the wounds of patients with diabetes: a three-blind, randomized, multicenter clinical trial with a control group	16:35 - 16:45
Mahdijeh Bakhtiyari-Ramezani	The effect of nonthermal-atmospheric pressure plasma jet (NTP) and plasma-activated water (PAW) on skin wound healing: An animal study	16:45 - 16:55
Questions and Answers		16:55 - 17:10

Thursday, November 30th 2023

Panel 1	Nanotechnology	
Chairpersons	Dr. Seyed Mahdi Rezayat, Dr. Farshad Hashemian, Dr. Mohammad Hassan Soheilifar, Dr. Fatemeh Ashrafi	
Mohsen Shahrousvand	Nanotechnology approaches in polymeric transdermal drug delivery systems	8:00 - 8:15
Ali PorMohammad	Innovative strategies for Managing Persistent Non-Healing Wound infections	8:15 - 8:30
Kavoos Razmjooee	Foam nanocomposite based on alginate/gelatin/zeolite for wound dressing: In vitro study	8:30 - 8:40
Fatemeh Ashrafi	Synthesis of polymer nanofibers containing mountain cypress extract with antibacterial properties to cover wounds and produce chitosan/polyethylene oxide scaffolds containing henna extract in the industrial sector to produce dressings to treat skin infections	8:40 - 8:50
Zahraa Neamah Abbas	Study the effect of chitosan nanoparticles that synthesize from oyster shells in Iran and Iraq on methicillin-resistant Staphylococcus aureus isolated from burn wound infection	8:50 - 9:05
Milad Ghasemi	Evaluation of clinoptilolite nanocomplex effects in combination with honey on wound healing considering coagulation time, vascular endothelial growth factor (VEGF) expression, and clinical outcomes	9:05 - 9:15
Questions and Answers		9:15 - 9:25

Panel 2	Cell & Cell Free Based Therapy	
Chairpersons	Dr. Naser Aghdami, Dr. Atefeh Shahbazi, Dr. Mohammad Javad Fatemi, Dr. Azadeh Goodarzi, Dr. Mohammad Moradi	
Naser Aghdami	Mesenchymal Stem Cell in Diabetic Foot Ulcer	9:25 - 9:40
Mohammad Javad Fatemi	The role and mechanisms of stem cells in wound healing	9:40 - 9:55
Amir Bajuri	Application of Stem Cells' Exosomes in Wound and Scar Regeneration	9:55 - 10:10
Armin Nazemi Zadeh	Lab scale production of recombinant platelet-derived growth factor-BB homodimer (PDGF-BB) in microbial expression system for wound healing applications	10:10 - 10:20
Azadeh Goodarzi	A Systematic Review of the Efficacy, Safety, and Satisfaction of Regenerative Medicine Treatments for Hypertrophic Scars and Keloids	10:20 - 10:35
Questions and Answers		10:35 - 10:45

Panel 3	laser / Light and tissue repair	
Chairpersons	Dr. Reza Fekrazad, Dr. Leila Ataie Fahshtami, Dr. Afshan Shirkavand, Dr. Mohammad Pooya	
Reza Fekrazad	The Role of Biophotonics in Nerve Damage	10:45 - 11:00
Shirin Farivar	Epigenetic in photobiomodulation of wound healing	11:00 - 11:15
Mohammad Pooya	PUVA treatment in wound infection	11:15 - 11:30
Leila Ataie Fahshtami	Photodynamic therapy in wound repair	11:30 - 11:45
Questions and Answers		11:45 - 11:50

Panel 4	Herbal Drug and Pharmaceuticals	
Chairpersons	Dr. Shamsali Rezazadeh, Dr. Mohsen Fateh, Dr. Farahnaz Khalighi Sigaroodi	
Shamsali Rezazadeh	Medicinal Plants in Wound Healing	11:50 - 12:05
Amir Mahdi Zehi	Investigating the Synergistic Effect of turmeric and Ferula gummosa in the healing of surgically induced gastric ulcer in Rat	12:05 - 12:15
Arefeh Shams	Fabrication and characterization of microparticles loaded with bromelain for wound healing	12:15 - 12:25
Mohsen Adib	Wound healing effect of a topical product from <i>Ajuga chamaecistus</i> ssp. <i>tomentella</i> Ging. ex Benth in pressure ulcer: a randomized double-blind placebo-controlled clinical trial	12:25 - 12:35
Student Scientists: Kimia Bahadori Zahra Amiri Setila SeyedneZhad Fatemeh Nozad Reyhaneh Valian	Proof of the effect of marshmallow plant extract on <i>Lactobacillus plantrum</i> bacteria in the presence of haram brain Treatment of pilonidal sinus and skin ulcer in Wistar rats	12:35 - 12:45
Questions and Answers		12:45 - 13:00

Pray and Lunch	13:00 - 14:00
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Panel 5	Acute Wound Management	
Chairpersons	Dr. Mostafa Dahmardehei, Dr. Mohhamad Reza Mobayen, Dr. Mina Sadat Naderi	
Mostafa Dahmardehei	Cell Therapy in acute burn	14:00 - 14:15
Mohhamad Reza Mobayen	The role of modern and knowledge-based therapies in acute burn	14:15 - 14:30

Seyedeh-Sara Hashemi	Tracking of Human Wharton Jelly Stem Cells Labeled with Superparamagnetic Iron Oxide Nanoparticles and Seeded on Polyurethane/Chitosan/Hyaluronic acid in Burn Wounds	14:30 -14:40
Arian Karimi Rouzbahani	The Effectiveness of Nanocomposite Powder from Aerosil, Hydroxyapatite and Timolol in Wound Healing after Pilonidal Sinus Surgery: A Randomized, Controlled, Double-blind Clinical Trial Study	14:40 - 14:50
Questions and Answers		14:50 - 15:00

Panel 6	Tissue Engineering	
Chairpersons	Dr. Hamid Mirzadeh, Dr. Nahid Nasiri, Dr. Shadab Bagheri	
Simin Nazarnezhad	Decellularized extracellular matrix scaffolds for skin tissue engineering	15:00 - 15:15
Mohd Fauzi MH Busra	Multifunctional Natural-based Biomaterials Strategies for Cutaneous Tissue Engineering: Conventional Approach Towards Advance Technology 3D-Bioprinting	15:15 - 15:30
Nahid Nasiri	Skin tissue engineering: wound healing based on stem cell-based therapeutic approaches	15:30 - 15:45
Shadab Bagheri	3D printing technology for skin regeneration and wound care applications	15:45 - 16:00
Mahshid Shabani Vishkaei	Assesing the restorative effect of Ozone and Chitosan-Hyaluronic acid with and without Mesenchymal stem cells on wound healing in rats	16:00 - 16:10
Questions and Answers		16:10 - 16:20

Friday, December 1st 2023

Panel 1	Rehabilitation in Wound Healing	
Chairpersons	Dr. Amir Masoud Arab, Dr. Manijeh Soleimanifar, Dr. Siamak Bashardoust Tajali	
Manijeh Soleimanifar	The Effect of Laser Therapy in Chronic Wound Healing	8:00 - 8:15
Amir Massoud Arab	Physiotherapy effect on remodeling phase of chronic wound healing	8:15 - 8:30
Seyed Masoud Jarchian	Physiotherapy approach in wound healing	8:30 - 8:45
Mohammad Reza Asadi	Influence of current stimulation in growth factor and wound healing	8:45 - 9:00
Questions and Answers		9:00 - 9:10

Discussion III	How to Manage Multiple Skin Cancer?	
Majid Pornour	Cellular and molecular basis of cancerous wound	9:10 -9:25
Moderator: Dr. Mohammad Shirkhoda Members: Dr. Parvin Mansouri, Dr. Farid Azmoudeh Ardalan, Dr. Ali Kazemian Dr. Ali Arab Kheradmand, Dr. Seyed Mehdi Tabaie		9:25 - 11:00

Discussion IV	Dermatologic Wounds Management: Best Practices	
Moderator: Dr. Parvin Mansouri Members: Dr. Nasrin Zand, Dr. Maryam Daneshpajooh, Dr. Kamran Balighi		11:00 - 12:00

Discussion V	Iatrogenic Wound: What should we do?	
Moderator: Dr. Mansour Jamali Zavareh Members: Dr. Seyed Mehdi Tabaie, Dr. Babak Nikoumaram, Dr. Ghasem Rahmatpour Rokni, Dr. Maryam Iranzad Asl, Dr. Masoumeh Rohani Nasab		12:00 - 13:30

Oral Presentations

The Effectiveness of Hydro Responsive Dressing on Debridement and the Presence of Granulation Tissue in Diabetic Ulcers (Report of Treated Cases of Yara Clinic)

Mehrangiz Toutounchi^{1*}

Panthea Sokhanvar²

1. MD, Yara Wound and Tissue Repair Clinic, ACECR, Tehran, Iran

2. M.Sc in Health Education and Health Promotion

Background and Purpose: Diabetes is one of the most common diseases caused by metabolic disorders, which has become an important health problem. Among its various complications, diabetic foot ulcer is one of the most challenging consequences of this disease. In fact, the negative impact of diabetic ulcer on the physical and mental health of the patients is thought-provoking and always lead researchers to find efficient treatments. Using Hydroresponsive dressing is a method for chronic wound management, which is used in line with the TIME principle to obviate chronic wound challenges. With its special functional mechanism, this dressing is effective on facilitating autolytic debridement and reducing the microbial burden of the wound and improving the granulation tissue. The study cited is retrospective case reports of wound healing with this dressing, which supports this concept that Hydroresponsive dressing may be an worthwhile option alongside other therapies.

Method and review: It is a retrospective interventional study that was conducted at the ACECR Wound Clinic, in 1400-1402. 70 diabetic patients with necrotic and slough were investigated that part of their treatment was done by Hydroresponsive dressings. Review of patient's files led to select 30 patients according to the study entry criteria. In this study the average of applying Hydroresponsive dressing is four sessions, and clinical observations indicate the effectiveness of this method.

Findings: The conclusion is based on the results of SPSS statistical program version 25. In this survey, there were 19 men and 11 women, the highest frequently distribution was 70-74. It was also shown that the longest duration of diabetes is more than ten years. 53.3% afflicted with Wagner's the first and data analysis indicated that Wagner's grade has a statistically significant relationship with the level of HbA1c at the level of 95% of patients (P.003). Applying of Hydroclean dressing has finally led to the complete satisfaction of cleaning the wound and facilitating the debridement of dead tissue and eliminating the local infection.

Result: The result of this report shows the effect of Hydroresponsive dressing to help autolytic debridement and promoting the presence of granulation tissue.

Keywords: Hydroresponsive dressing, dead tissue debridement, diabetic wound healing, granulation tissue

Investigating the Incidence of Pressure Ulcers and Factors Affecting Them in Hospitalized Patients with a Braden Score Below 14

Masoud Fallahi¹

Kamran Vafaei¹

Somayeh Mahdavi Kian^{1*}

Feyzollah Mansouri²

1. Clinical Research Development Center, Imam Reza Hospital, Kermanshah University of Medical Sciences, Kermanshah, Iran

2. Clinical Research Development Center, Imam Reza Hospital, Kermanshah University of Medical

Introduction: Paying attention to the high prevalence and high financial and human costs of pressure ulcers, early treatment and prevention of its occurrence is one of the most important and necessary goals of the health care system. A standardized system of wound status registration program enables survival analysis and clinical care outcome assessment, etiology studies, generation of descriptive data (incidence, prevalence,

mortality), suitable resource for clinical trial, case control and cohort study. Therefore, the pressure ulcer registration program was created and launched in order to determine the exact incidence and prevalence of pressure ulcers, the factors affecting it and the reduction of its complications.

Method: The present registry was conducted in patients hospitalized in Imam Reza. Hospital Patients information has been collected using questionnaires and medical files and preclinical samples in the laboratory by three nurses, wound specialist nurse and an infectious disease specialist. 3378 patients older than 20 years with PU or Braden score less than 14 admitted to Imam Reza Hospital from 1399 to 1400 were included in the study. Odds Ratio (OR) was used to show the relationship between pressure ulcer prevalence rate and each of the independent variables. In the univariate regression model, cox regression was used to estimate the hazard ratio in order to investigate the relationship between independent variables and the incidence rate of pressure ulcers.

Results: 3378 men and women with an average age of 54 (SD=±9.08) years were included in the study. 1340 (39.67%) participants were male. 2646 (78.33%) study participants had pressure ulcers during the study period, of which 1380 cases of pressure ulcers had been created in (18.18%) 614 patients in the hospital. The highest prevalence of pressure ulcers with 1671 cases was seen in the sacrum in 1644 patients. The highest rate of prevalence in people over 80 years old with an incidence ratio of 90.65% Obtained. First-degree ulcer was the most common type of ulcer with 2907 cases of ulcer in 1584 patients. The rate of incidence and prevalence excluding first-degree ulcer was 460 (13.62%) and 1691(63.91%) respectively. The variables of age, Braden score, BMI, comorbidity, diabetes mellitus, fecal incontinence, duration of hospitalization, Glasgow Coma Scale, Vasopressor have a significant relationship with PU (P<0.05).)

Conclusion: The incidence and prevalence of PU in the patients of this study was high. Consciousness level, age, duration of hospitalization, Braden score and diabetes were the most important factors in the development of PU. Considering the high prevalence and high financial and human costs of pressure

ulcers, control, early treatment and prevention of its occurrence is one of the most important goals of the health care system.

Keywords: pressure ulcer, wound degree, Braden score

Role of Novel Technologies in Wound Care Management

Mahdi Akbarzadeh Amirdehi

International Certified in Taking Care of Chronic Wounds from Toronto University, Canada (IIWCC) & from European Wound Management Association (EWMA / EWICW), Certified in Taking Care of Wound, Ostomy & Continence from (LFSC / ASPOA / IOS / OWI / ET Nurse), Member of the World Scientific Association & International Wound, Ostomy & Continence Instructor (EWMA & WOCN), CEO of Sadra Wound, Ostomy & Osteomyelitis Specialized Center, Tehran, Iran

Wound care of chronic wounds incorporate, but are not constrained, to diabetic foot ulcers, venous leg ulcers, and weight ulcers. They are a challenge to wound care experts and devour an awesome reduced of healthcare assets around the globe. This review examines the complex challenges in chronic wounds and the implies and modalities as of now accessible to attain recovering in such patients. In spite of the fact that frequently troublesome to treat, an understanding of the fundamental pathophysiology and particular consideration toward overseeing these irritations can regularly lead to effective recuperating. Disabling the components that contribute to postponed mending are key component of a comprehensive approach to wound care and presents the essential challenges to the treatment of chronic wounds. An improved understanding of the contrasts between different sorts of everlasting wounds at the atomic and cellular levels ought to move forward our treatment approaches, driving to way better recuperating rates, and encouraging the advancement of unused more viable treatments. More prove for the viability of current and future progressed wound treatments is required for their fitting utilize. In this survey, current and future potential wound mending medicines for intense and chronic wounds are described. The current wound dressings for this issue have to improve by utilizing biocompatible and biodegradable biomaterials, cell

therapy techniques and other novel technologies.

Keywords: chronic wound care, developing methods, biocompatible biomaterials, cell therapy techniques, wound care approaches, novel technologies

Nursing Care in Atypical Ulcers

Saeid Pasban Noghabi^{1*}

Mohamad Mahdi Kamyar²

Shaghayegh Ameli³

Mohsen Rohani⁴

1. MSc in Nursing Education, Wound Nurse, Velayat and Sina Hospital, TOOS Clinic, Mashhad University of Medical Sciences, Mashhad, Iran

2. Vascular Surgeon, Velayat Hospital, Mashhad University of Medical Sciences, Mashhad, Iran

3. GP, TOOS Clinic, Mashhad University of Medical Sciences, Mashhad, Iran

4. Bsc in Operation Room, Wound Nurse, Taleghani Hospital, TOOS Clinic, Mashhad University of Medical Sciences, Mashhad, Iran

Incidence rate of Atypical ulcers approximately 5% to 20% of chronic ulcerations. Atypical wounds may be categorized into different groups, including inflammatory ulcers, vasculopathies, neoplastic ulcers, hematologic ulcers, infectious ulcers, hydroxyurea-induced ulcers, and heroin-induced ulcers. In this review study we described the Atypical ulcers and nursing care. The most nursing care includes the wound management priority is to protect the patient from wound infection by using antimicrobial wound dressings that also provide a moist environment to prevent adherence, control of pain and hemorrhage. In these patients we use dressing to manage exudate of ulcer. The nursing care with physician's intervention assistance the ulcer but the treatment of these ulcer are poor prognosis.

Key words: Nursing care, Atypical ulcers, wound dressing

Evaluating the Level of Adherence to Ethical Principles When Changing Dressings by Nurses in Special, Surgical and Emergency Departments

Firuzeh Hatamirad^{1*}

Hamzeh Hassani²

Mahtab Eskini¹

Parvin Idoon³

Manouchehr Nasiri³

1. MSc of Nursing, Lorestan University of Medical Sciences, Lorestan, Khorramabad, Iran

2. Anesthesiologist, Lorestan University of Medical Sciences, Lorestan, Khorramabad, Iran

3. Nursing Expert, Lorestan University of Medical Sciences, Lorestan, Khorramabad, Iran

Background & Goal: Dressing correctly is a nursing task that requires great skill and knowledge to avoid widespread complications such as infection and amputation or, in severe cases, even death. Compliance with ethical principles is considered essential in clinical care. The range of nursing ethics is the same as all the descriptions of nursing duties. Therefore, the above research was conducted with the aim of determining the level of compliance with ethical principles during dressing changes by nurses in special, surgical and emergency departments.

materials and methods: In this descriptive study, 150 nurses working in the surgical, special, and emergency departments of Shohada Ashayer - Khorramabad educational center were selected by census method in 2018. The data of this study was collected through a questionnaire, the first part of which included the demographic information of the nurses, and the second part of which included a checklist to assess the level of compliance with ethical principles during dressing changes by nurses. The results were analyzed using statistical software SPSS version 22 and using chi-square, one-sample chi-square, non-parametric Mann-Whitney and non-parametric Kruskal-Wallis tests. To test the hypotheses, a significance level of 0.05 was considered.

findings: The findings of the research showed that the average age of the nurses under the research was 30.42 ± 5.41 years, the average work experience was 6.52 ± 4.71 years, the average working hours per week was 56.03 ± 10.25 hours, the average work experience in Surgical departments aged 5.91 ± 4.29 years, also 57.7% of female nurses were single and 65.2% of male nurses were married. According to the obtained

results, the performance of 82% of nurses in observing ethical principles while changing the patient's dressing was good. According to the results of the one-sample chi-square test, the frequency of nurses with poor and average performance was lower than expected and the frequency of nurses with good performance was higher than expected. Also, the performance of nurses in ICU 1 and ICU 4 was better than other departments. The results obtained from the non-parametric Mann-Whitney test to compare the performance of nurses based on their gender showed that there was no significant difference between the performance of male and female nurses at the five percent error level ($p>0.05$).

Discussion and conclusion: Since one of the most important tasks of nurses, as the ma

Key words: compliance with ethical principles, dressing change, nurses

Discovering the Most Suitable Type of Bandage for Each Phase of a Bedsore

Donya Safari*

Reihaneh Seyedebrahimi

Fatemeh Hayeri Mehrizi

Ali Torkamandi

Mohaddeseh Zeinali Ali Abadi

Medical Student, Student Research Committee, Qom University of Medical Sciences, Qom, Iran

Background: When capillaries in the skin and subcutaneous tissues are compressed, it can lead to bedsores, resulting in tissue necrosis. Treating bedsores at the right time and in the right way is crucial to prevent systemic infection and increase the risk of death. Wound dressings play a significant role in the healing process, protecting the wound from further damage and infection, and aiding in the remodeling process for optimal wound healing. Several types of wound dressings are available, such as hydrocolloid, alginate, silicone foam, and transparent film dressings. Due to the importance and sensitivity of bedsores, we are trying to use the best dressings in different stages.

Method: This research was conducted on articles published in English between 2019 and 2023 using the

search terms "bedsore," "non-adhesive silicone foam dressing," and "collagen dressing" from PubMed, Scopus, Google Scholar, etc.

Result: During the proliferative and inflammatory phase of bed sores, it's important to use a dressing that can absorb excess fluid, maintain moisture, and promote airflow to prevent infection. Non-adhesive silicone foam dressing is ideal for this purpose because it not only provides these benefits but also creates gentle and safe adhesion to the surrounding skin, making it easy to remove without causing pain or injury. Additionally, the cushion it creates in the wound area can reduce pressure, friction, and shearing forces that exacerbate the wound, leading to faster healing.

If the wound is chronic or infection-free, collagen dressing can be used during the remodeling phase. This type of dressing helps to strengthen the newly formed tissue by stimulating the stabilization of directed collagen fibers. It also promotes the removal of dead tissue, the growth of new blood vessels, and the healing of wound edges.

Conclusion: Based on research, it is recommended to use non-adhesive silicone foam dressings throughout the Inflammatory and Proliferative phases due to their soft and flexible design, gentle adhesion, great absorption capabilities, and efficient moisture control and wound protection. During the remodeling phase, collagen dressings are suggested for repairing damaged tissue.

Keywords: Bedsore, Non-adhesive silicone foam dressing, Collagen dressing

Investigating and Comparing the Effectiveness of Atmospheric Plasma Therapy with Vacuum Therapy (NPWT) compared to Vacuum Therapy (NPWT) Alone on Pressure Ulcer Patients: A Randomized, Controlled, Double-blind Clinical Trial Study

Zahra Goudarzi¹

Arian Karimi Rouzbahani²

Nahid Madhani³**Abdolrazagh Marzban^{4*}***1. Students' Scientific Research Center, Tehran University of Medical Sciences, Tehran, Iran**2. Student Research Committee, Lorestan University of Medical Sciences, Khorramabad, Iran 2. USERN Office, Lorestan University of Medical Sciences, Khorramabad, Iran**3. Department of Nursing and Wifery, Lorestan University of Medical Sciences, Khorramabad, Iran**4. Razi Herbal Medicines Research Center, Lorestan University of Medical Sciences, Khorramabad, Irandiabetes*

Introduction: A pressure ulcer is a type of injury that occurs when an area of the skin is subjected to constant pressure for a certain period of time. It decomposes the skin and the underlying tissue and causes tissue ischemia, interruption of nutrition and oxygen supply to the tissues, and ultimately tissue necrosis. Pressure ulcers are one of the most important and preventable problems and a defined indicator of the quality of care for health service providers. There are different methods for treating pressure ulcers. One of these methods is plasma therapy, which has antibacterial properties. It confirms the increase in epidermis formation, neovascularization, cell proliferation, and growth factor release. Vacuum therapy (NPWT) is another method that works based on the laws of physics, and by creating a uniform negative pressure on the surface of the wound, the dead space in the wound decreases and tissue perfusion increases, which provides tissue oxygen in addition to accelerating wound healing. It reduces the levels of bacteria in the wound. Considering the importance of early treatment of bedsores and taking into account the properties mentioned in plasma therapy and vacuum therapy, this study was conducted with the aim of investigating the effectiveness of plasma therapy together with vacuum therapy in comparison to vacuum therapy alone.

Methods: In this study, 150 patients with 2nd, 3rd, and 4th degree pressure ulcers who were between the ages of 18 and 75 participated. After the initial screening and evaluation, the participants were randomly and blindly divided into two groups, A and B. The duration of the treatment is 10 sessions, which were done twice a week. In both groups, patients

underwent vacuum therapy in the first 3 sessions, but in group A, plasma therapy was used during 7 sessions after the treatment. Participants in group B during the next 7 days and participants whose wound did not heal during the ten-day period used standard interventions, including dressings, to maintain wound moisture and, if necessary, clean the wound of infection. To evaluate the healing process of the wound in each visit session, after wound debridement, the healing rate of the wound was evaluated, the wound was photographed to record the healing process, and the wound was examined in terms of secretions, infection, and other desired factors.

Results: In this study, 150 patients with pressure ulcers in stages 2 and 3 were recruited. Patients were divided into

Keywords: atmospheric plasma therapy , vacuum therapy ,pressure ulcer

Theranostics Wound Dressings; Promising Strategy for Future Wound Care

Ahmad Reza Farmani¹**Fatemeh Moradbeygi^{2*}***1. Tissue Engineering Department, School of Advanced Technologies in Medicine, Fasa University of Medical Sciences, Fasa, Iran**2. Department of Pharmaceutical Biotechnology, School of Pharmacy, Shiraz University of Medical Sciences, Shiraz, Iran*

Background: There is a significant financial burden due to the need for continuous monitoring of chronic wounds due to various factors such as diabetes and burns, as well as the lack of real-time monitoring in traditional wound care strategies. Because they are based on passive bandages, whereas smart bandages are capable of tracking biomarkers for diagnostics, treatment monitoring, and regeneration induction (theranostics scaffolds). Hence, they have attracted much research interest.

Materials and Methods: In this review, PubMed, ISI Web of Science, Google scholar and SCOPUS databases were searched for studies published up to October of 2023 related to "Theranostics Wound

Dressings; Promising Strategy for Future Wound Care" were addressed.

Results: Chronic wounds are often associated with infection, so a promising strategy to minimize the severity of infection is continuous wound monitoring with the aim of informing rapid changes in care after a rapid diagnosis of infection. The use of modern, smart, and user-friendly wound dressing has significantly reduced hospital costs by reducing the patient's hospitalization time. These smart wound dressings have been developed with sensing capabilities to detect various physiological and biochemical changes such as glucose, lactate, oxygen, hydrogen peroxide, temperature, and pH in real-time at trace levels in the wound site. monitor wound status and diagnose infection. In particular, because of the significant change in alkalinity that occurs after the onset of infection, wound pH has been widely reported as a promising biomarker of infection. In addition, smart wound dressings capable of measuring glucose are of great interest in diabetic wound monitoring.

Conclusion: Subsequently, given the diagnostic and therapeutic capabilities of smart wound dressings and their various capabilities to reduce hospitalization time, it can be expected that the next generation of wound dressings may enable the management of healing wounds at the moment without the need for hospitalization and significantly reduce treatment time and hospital expenses.

Keywords: Theranostics, Smart Medicine, Wound Healing, Regenerative Medicine, Nanomedicine

Psychological Interventions in Diabetic Foot Ulcers

Maryam Sedaghat

Department of Lifestyle Medicine, Medical Laser Research Center, ACECR, Tehran, Iran

Diabetes is a growing public health concern with a growing global incidence during the last three decades due to lifestyle changes. Diabetic foot is one of the most serious and destructive complications of diabetes mellitus (DM) with a significant impact on patients, families, and society. Around 11–14% of worldwide

patients diagnosed with diabetes will develop DFUs, which is the leading cause of lower-limb amputations in approximately 80% of these patients. Even in a patient with healed ulceration, there is a tendency to suffer from recurring ulcerations (up to 50% within one year). DFU management requires a multidisciplinary approach. it has been proven that physically restrictive regimes can lead to an increase in psychological stress which in turn contributes to the wound healing impairment. Stress-induced cortisol and adrenaline release has long been known as responsible to impair wound healing. On the other hand, living with diabetes and managing this condition is associated with high levels of anxiety, depression, and distress even more so when complications such as DFU develop. This condition contributes to prolonged infections, delayed wound healing, and poor quality of life (QoL), which is associated with low treatment responses and low remission rates, a major health concern. Diabetes-related distress (DRD) is a term used to characterize the emotional and behavioral changes caused by DM and its demanded lifestyle changes. Furthermore, DFUs negatively affect health-related quality of life (HRQL). Some studies have shown that patients with healed ulcers reported higher HRQL compared with patients with ongoing DFU. Since there is evidence that psychological distress affects negatively wound healing, it is expected that reducing-stress interventions have positive implications on DFU recovery. Psychological stress-reducing interventions, such as relaxation with guided imagery (visualizing positive, peaceful settings like a beautiful beach or a peaceful meadow), biofeedback-assisted relaxation (receiving information about the body, and using this information to change body functions), mindfulness-based strategies (focusing on the present moment), and hypnosis (a changed state of awareness and increased relaxation that allows for improved focus and concentration), can lead to a reduction in perceived stress and improve wound healing by reducing wound inflammation and pain while improving glycemic control. All stress reduction interventions also lead to pain relief and improved patient's quality of life.

Keywords: Diabetes mellitus, diabetic wound healing, diabetic foot ulcer, psychological stress, psychological stress-reducing interventions, hypnosis, muscle relaxation

In Vivo Bioreactor Fur Skin Tissue Engineering

Naghmeh Bahrami^{1,2,*}

Fatemeh Ghorbani¹

Abdolreza Mohamadnia^{3,4}

1. Department of Tissue Engineering and Applied Cell Sciences, School of Advanced Technologies in Medicine, Tehran University of Medical Sciences, Tehran, Iran

2. Craniomaxillofacial Research Center, Shariati Hospital, Tehran University of Medical Sciences, Tehran, Iran

3. Chronic Respiratory Diseases Research Center, NRITLD, Shahid Beheshti University of Medical Sciences, Tehran, Iran

4. School of Advanced Technologies in Medicine, Department of Biotechnology, Shahid Bheshti University of Medical Sciences, Tehran, Iran

For many years, bioreactors have been the focus of attention in the field of biological production due to the ability to provide a controlled environment and the possibility to monitor and even intervene in the required parameters. An ideal bioreactor for tissue engineering, in addition to the ability to effectively regulate various environmental factors (pH, oxygen level, temperature), transport nutrients and remove waste materials, should also provide the ability of sterilization procedures and the possibility of sampling, so that the appropriate cells of the target tissue. It is thought that they can be stabilized in porous, biodegradable and biocompatible scaffolds similar to the body environment in a dynamic environment in laboratory conditions for tissue growth. Full-thickness skin grafts by replacing both the dermis and epidermis layers are suitable as an immediate cover for the injury site and can prevent delays in the repair of the injury, and despite the success of these skin grafts, its commercial use in the clinic is limited for various reasons. The main limitation of the available tissue-engineered dermal substitutes is vascularization. One way to overcome this problem is to use a compatible bioreactor. In studies, bioreactors were used to maintain human skin explants under fluid dynamic conditions in vitro, which had previously been used to successfully maintain skeletal muscle grown in vitro. The result of one of these studies was compared with skin samples kept in static conditions in terms of tissue changes and

it was found that the samples kept in the bioreactor still show structural integrity after 72 hours. Despite the advantages of using conventional tissue engineering bioreactors for the growth of whole tissue grafts, one of their main limitations is the absence of healthy blood vessels and as a result the disruption of cell and tissue viability. In order to overcome these problems, alternatives called in vivo bioreactors were used, which do not require strong equipment and hardware design.

Skin-on-a-chip: An Efficient Powerful Tool to Simulate Physiological and Pathological Skin Conditions

Seyed Ahmad Vaez

Department of Tissue Engineering and Applied Cell Sciences, School of Advanced Medical Sciences and Technologies, Shiraz University of Medical Sciences, Shiraz, Iran

Skin engineering has advanced significantly as a result of the growing need for physiologically accurate in vitro human skin models for drug testing. Using in vitro microfluidic systems, sometimes referred to as skin-on-a-chip (SoC) devices, to create sophisticated skin models is one of the most promising methods. By simulating important mechanical, functional, and structural aspects of human skin, these devices can more closely resemble the skin's natural microenvironment. Crucially, SoC devices can perfuse skin tissue in contrast to traditional cell culture methods. This is achieved by the use of microfluidic channels that function as designed vasculature or by including perfusable lumens. Furthermore, the SoC device's sensor integration enables non-destructive, real-time monitoring of skin function and the results of systemic and topical medicine application. The main obstacles and necessary conditions for developing physiologically appropriate SoC devices for drug testing are discussed in this topic. Here, recent developments in SoC devices are showcased, with a comparison and discussion of their primary benefits and shortcomings. Lastly, this topic emphasizes the present obstacles that must be removed in order to translate SoC devices for clinical use.

Electrospun Nanofibrous Wound Dressings; A New Generation of Wound Healing Materials

Shahin Homaeigohar

School of Science and Engineering, University of Dundee

Biomimicry is a state-of-the-art nature-inspired technological perspective to develop new artificial systems. Such a goal is predominantly realized through imitating the microstructure-derived macrofunction of the biomaterials available in nature. This strategy has been largely adopted by biomedical engineers for the development of biomimetic wound dressings, e.g., those made to simulate extracellular matrix (ECM) of skin. ECM is the acellular constituent of tissues that acts as a scaffold holding the cells physically and allowing them to dynamically proliferate, migrate, and differentiate. ECM includes an amorphous assembly of proteins (collagen, mainly) and polysaccharides, forming an interconnected nano/micro-fibrous network. The protein nanofiber mesh exposes a large number of cell adhesive peptides that facilitates cell anchorage. Mimicking this biological nanostructure, biohybrid nanofibers made of a combination of synthetic and nature-derived (e.g., protein) materials are appealing for a range of biomedical applications from tissue regenerating scaffolds to wound dressings.

Fabrication and Evaluation of 3D Nanofibrous Scaffolds Using Mold-assisted Electrospinning for Tissue Engineering

Hadi Sadeghzadeh*

Ahmad Mehdipour

Department of Tissue Engineering, Faculty of Advanced Medical Sciences, Tabriz University of Medical Sciences, Tabriz, Iran

The main limitation of currently available electrospinning methods is the fabrication of three-dimensional (3D) nanofibrous scaffolds. Two-

dimensional (2D)-fabricated nanofibrous scaffolds failed to recapitulate the in vivo 3D cellular microenvironment which is vital for the repair and regeneration of damaged tissues. In this study, we designed mold-assisted electrospinning as a new method for the fabrication of 3D nanofibrous scaffolds consisting of polycaprolactone (PCL) and type I collagen (Col I) with controllable and desirable shapes for future utilize in tissue engineering and regenerative medicine (TERM). For this purpose, we prepared a 3D mold of an aluminum sheet to build up the 3D nanofibrous scaffolds by electrospinning without using any pre/post-processing steps or instruments alongside this method. Next, we evaluated the physicochemical property, biocompatibility, and other requisites for employing fabricated 3D scaffolds in TERM. The results indicated that the prepared 3D nanofibrous scaffolds presented biocompatibility, high porosity, high surface-to-volume area, and good tensile strength. In addition, these 3D nanofibrous scaffolds can mimic the natural 3D cellular microenvironment and provide the mechanical and biochemical signaling for osteogenic differentiation of adipose-derived stem cells.

Keywords: 3D nanofibrous scaffolds, mold-assisted electrospinning, tissue engineering, regenerative medicine, osteogenic differentiation

Resveratrol - Grafted Cellulose Scaffolds: A Novel Approach for Enhancing Tissue Repair

Benyamin Mashhadi¹

Bahareh Sedighi^{1,2}

Hosein Shahsavarani^{2*}

1. Institute of Biochemistry and Biophysics, University of Tehran, Tehran, Iran

2. Department of Cell and Molecular Biology, Faculty of Life Sciences and Biotechnology, Shahid Beheshti University, Tehran, Iran

Introduction: Nanobiotechnology has developed as a promising field for the development of novel therapeutic strategies to address the challenges associated with tissue repair and regeneration. Over the past few decades, tissue engineering has garnered significant interest because of its capacity to innovate

advanced biomaterials, replicate healthy tissue settings, and contribute to the creation of cutting-edge delivery systems for tissue construction, repair, and regeneration. Its pivotal role in restoring or establishing normal function in human cells, tissues, and organs is paramount in the field of regenerative medicine. In recent years, the combination of natural compounds and nano-materials has emerged as a novel approach to enhance tissue repair strategies. Resveratrol, a small molecule renowned for its regenerative properties, has shown great potential in various tissue repair applications.

Purpose: The aim of our study is to investigate the potential of resveratrol-grafted cellulose scaffolds as a novel strategy for enhancing dermal tissue repair. By grafting resveratrol onto cellulose scaffolds, we aim to synergistically harness the benefits of both the natural compound and the biomaterial. The specific purposes of this study are to evaluate the grafting technique, assess the controlled release profile of resveratrol from the scaffold, and investigate the biological responses and potential implications for tissue regeneration.

Materials and methods: For preparation of scaffold, we utilized the endocarp of Phoenix dactylifera fruit, SDS employed in endocarp decellularization, MTT assay employed to determine resveratrol's cytotoxicity concentration; to achieve optimal stability, the coated small molecule underwent Freeze-drying, preserving its integrity on the scaffold, to investigate cellular treatment, we utilized the NIH 3T3 fibroblast cell line and employed Flow-cytometry for quantitative assessment of cell growth and proliferation.

Results: The release profile of resveratrol from the scaffold manifested sustained release over a specific time period, indicating its potential for localized delivery. In vitro studies using the NIH 3T3 fibroblast cell line showed enhanced cell growth and proliferation on the resveratrol-grafted scaffolds compared to control one. Flow-cytometry analysis revealed a significant increase in cell viability and proliferation rates. These findings indicate the potential of resveratrol-grafted cellulose scaffolds as a promising strategy for enhancing dermal tissue repair and regeneration.

Keywords: Nano-material, Dermal tissue repair, Natural scaffold, Tissue engineering

Investigating the Therapeutic Effect of Ozone Therapy Combined with Alginate Compared to Alginate Alone on the Wounds of Patients with Diabetes: A Three-blind, Randomized, Multicenter Clinical Trial with a Control Group

Arian Karimi Rouzbahani¹

Zahra Goudarzi²

Nahid Madhani³

Abdolrazagh Marzban^{4*}

1. Student Research Committee, Lorestan University of Medical Sciences, Khorramabad, Iran 2. USERN Office, Lorestan University of Medical Sciences, Khorramabad, Iran

2. Students' Scientific Research Center, Tehran University of Medical Sciences, Tehran, Iran

3. Department of Nursing and Wifery, Lorestan University of Medical Sciences, Khorramabad, Iran

4. Razi Herbal Medicines Research Center, Lorestan University of Medical Sciences, Khorramabad, Iran

Introduction: Diabetes is one of the most common non-infectious diseases, and diabetic foot ulcers are one of the most common and debilitating complications, so that every 30 seconds, a person in the world loses their lower limb due to diabetic foot ulcers. Today, there are various methods for treating diabetic foot ulcers, one of which is ozone therapy. Ozone has antibacterial and antioxidant properties and can prevent free radical damage and cause healing effects in wound healing. Ozone can create antibacterial properties by destroying the bacterial cell membrane. In addition, ozone has anti-inflammatory properties and inhibits the migration of mast cells. For the treatment of diabetic wounds, an effective method is needed that shortens the treatment period and, at the same time, has an acceptable cost. Due to the antioxidant, anti-inflammatory, and antibacterial properties mentioned in the studies for the ozone therapy method and the lack of toxicity and side effects for patients, This study was conducted with the aim of investigating the therapeutic effect of ozone therapy combined with alginate compared to alginate alone on the wounds of

patients with diabetes.

Methods: In this randomized clinical trial, 200 people aged 18 to 80 who were suffering from diabetes and whose wounds were in the 2nd or 3rd grade of the Wagner scale participated. Also, their ankle-brachial scale was between 0.7 and 1.2, the wound was not contaminated or infected, the debridement wound was free of necrosis and sinus tracts, and its area was between 1 and 25 square centimeters. Also, the hemoglobin A1C level of the participants was less than 12%. After the initial screening, the participants were randomized into two groups, A and B, in a three-way blind manner. The duration of this course was 10 sessions, which were conducted twice a week (Sundays and Wednesdays). In group A, in addition to alginate dressing, the participants were subjected to ozone therapy (Device of Sefidjamgan Technologies Company) in the first 3 sessions with 101 settings for 20 minutes, and if the wound did not heal, alginate dressing was used until granulation tissue formation. After that, foam dressing is used until complete epithelialization. In patient B, alginate dressing in the form of Tabagran Trita powder has been used for 10 sessions. Standard interventions for diabetic foot ulcers include periodic visits and taking digital photos of the wound, which were done to monitor the basic evaluations

Keywords: ozone therapy, alginate, wound

Nanotechnology Approaches in Polymeric Transdermal Drug Delivery Systems

Mohsen Shahrousvand

Caspian Faculty of Engineering, College of Engineering, University of Tehran

Transdermal drug delivery systems (TDDS) are capable of injecting drugs at specific sites without damaging the skin membrane. Although the skin is the most attractive and accessible route of drug administration, it constitutes an excellent barrier due to the presence of the stratum corneum (SC) for the penetration of most therapeutic agents, especially hydrophilic drugs. The drug is transported through the skin portal to the blood circulation system with

a controlled release rate and for a longer period of time. Nanotechnology has made significant progress in all sciences, including transdermal systems. Nanotechnology represents the design, synthesis, characterization, and application of materials and devices (at an atomic or molecular level), in order to produce new nano-sized materials, preferably 1–100 nm. The development of a nanotechnological product for percutaneous application is challenging. So, in this research, primarily skin anatomy is discussed for general understanding; then an overview of absorption through the skin, advantages of nanotechnology-based polymeric TDDS over conventional delivery systems, physicochemical properties of nanostructures required for transdermal drug delivery, and some of them being used in TDDS are presented. Polymeric transdermal nanosystems are divided into two categories, the first category is nanostructures that have the role of drug carriers and drug injectors. Lipid Nanoparticles, polymeric nanoparticles, and dendrimers are among this category. The second category is the structures in which nanomaterials are used to increase the efficiency of transdermal systems. The second category may not be nanometers, but they have used nanomaterials in their structure to improve efficiency.

Keywords: Transdermal carrier; nanotechnology; Skin penetration; nanostructures

Foam Nanocomposite Based on Alginate/Gelatin/Zeolite for Wound Dressing: In Vitro Study

kavoos Razmjooee¹

Fatemeh Haghdoost²

Saeed Saber-Samandari^{1*}

1. New Technologies Research Center (NTRC), Amirkabir University of Technology, Tehran, Iran

2. Department of Photo Healing and Regeneration, Yara Institute, ACECR, Tehran, Iran

Simultaneous biocompatibility and healthy cellular activity enable proper tissue regeneration. This can be resulted by the smart selection of platforms among bewildering arrays of structural possibilities with various porosity properties (ie, pore size, pore

connectivity, etc). Zeolite is a type of microporous tectosilicate known among other porous structures that may be able to offer a biological microenvironment in tissue engineering applications. Zeolite has also shown special promise as a wound dressing and in scaffolds targeted toward bone and teeth. Alginate, a type of polysaccharide that is naturally generated, is frequently used in medication administration, regenerative medicine, tissue engineering, and wound care. It is frequently utilized in contemporary wound dressings because to its great biological compatibility, low toxicity, and capacity to absorb a significant amount of exudate. Numerous studies suggest that the use of nanoparticles can improve alginate used for wound care by showing additional qualities helpful in the healing process. Composite dressings made of alginate and antibacterial inorganic nanoparticles are among the materials that have been researched the most. In this article, alginate/gelatin/zeolite (AGZ) composite foams were fabricated by lyophilisation technique for promoting partial thickness wound healing. The optimized foam with 10% (w/w) of zeolite demonstrated pore size in the range of 10–350 μ m. Cell viability of the MTT assay for the optimal zeolite, it was 97.04%. which shows the non-toxicity of the foam sample containing zeolite.

The results showed that the hydrodynamic diameter of zeolites was 367 ± 0.2 nm. The hydrogel nanocomposite containing zeolite had adequate swelling as well as hem compatibility, and no cytotoxicity was noticed. Zeolites demonstrate any substantial antibacterial action. These findings revealed that the incorporation of zeolites induce a significant beneficial effect in comparison with Alg/Gel foam, using zeolite capacity in foam for loading the antibiotics or other effective compounds can be considered a promising wound dressing. Agar disc diffusion tests verified the antibacterial role and further supported that bacterial lysis was due to zeolite released from the core of foam embedded in the alginate/gelatin matrix. We can conclude that the materials chosen for the manufactured foam dressings actively promoted healing.

Keywords: Foam, Alginate Sodium, Zeolite, Antibacterial wound dressing

Synthesis of Polymer Nanofibers Containing Mountain Cypress Extract with Antibacterial Properties to Cover Wounds and Produce Chitosan / Polyethylene Oxide Scaffolds Containing Henna Extract in the Industrial Sector to Produce Dressings to Treat Skin Infections

Fatemeh Ashrafi^{1*}

Roghayeh Roshani²

1. Assistant Professor, Department of Microbiology, Faculty of sciences, Islamic Azad University, North Tehran branch, Tehran, Iran

2. PhD student, Department of genetic, Faculty of sciences, Islamic Azad University, North Tehran branch, Tehran, Iran

Introduction: Today, finding new antibiotic compounds with minimal side effects is needed. On the other hand, the resistance of bacteria to antibiotics has become a serious problem in the medical world. The aim of this research is the synthesis of polymer nanofibers containing 1% mountain cypress extract, with antibacterial properties to cover wounds and the production of chitosan/polyethylene oxide scaffolds containing 1% henna extract in the industrial sector for the production of dressings for the treatment of skin infections.

Methods: In this study, in order to investigate the antimicrobial effects of the methanolic extract of mountain cypress plant on standard microbial strains common in skin infection, using MIC, MBC, disk diffusion and welling methods, the antibacterial properties of the herbal extract were proved.

Results: The results showed that the diameter of the halo of non-growth in the polymer nanofibers containing the synthesized extract on the round coverslip was similar to the polymer solution containing the extract before electrospinning in the bacterial culture medium. Also, the diameter of the halo of non-growth in the disk diffusion method for *Staphylococcus aureus* and *Pseudomonas aeruginosa*, containing 300 micrograms/ml of mountain cypress extract, shows the most accurate value of the

control. In *Proteus mirabilis* bacteria, the welling method with a concentration of 300 mg/ml extract was closer to the control. In *Escherichia coli* and *Proteus vulgaris* bacteria, the behavior of 48% polymeric nanofiber round lamellar extract was closer to the control (gentamicin disk). In *Staphylococcus epidermidis* bacteria, the blank disk method of polymer nanofiber 48% extract shows the most accurate value compared to other methods compared to gentamicin. Discussion: According to the results, it seems that the chitosan/polyethylene oxide scaffold containing 1% henna extract is suitable as a wound cover and facilitates the wound healing process.

Keywords: mountain cypress, PVA/PEO polymer nanofibers containing mountain cypress extract, skin infection

Evaluation of Clinoptilolite Nanocomplex Effects in Combination with Honey on Wound Healing Considering Coagulation Time, Vascular Endothelial Growth Factor (VEGF) Expression, and Clinical Outcomes

Milad Ghasemi^{1*}

Nasrin Takzare²

1. Tehran University of Medical Sciences, Tehran, Iran

2. Tehran University of Medical Sciences / TUMS, Department of Anatomy PhD of Histology - Biomedical Sciences & MPhil - Tehran university of medical sciences Faculty of medicine, Dept. Histology & Anatomical sciences

Background & Aims: Despite the emergence of new wound healing technologies, developments of novel strategies should be put in place to address the remaining challenges. In this study, we aimed to indicate the influences of clinoptilolite nanocomplex, particularly in coordination with honey, on tissue-repairing processes through various microscopic and macroscopic aspects of wound healing.

Methods: In this experimental study, 60 Wistar rats were divided into five groups of control, phenytoin ointment,

clinoptilolite nanocomplex, honey, and clinoptilolite nanocomplex + honey. Macroscopic assessments were done on days 1, 4, 7, 10, and 14. Histopathological analysis was also performed on days 4, 7, and 14 following receiving treatments (except the control group). The blood coagulation time and vascular endothelial growth factor (VEGF) gene expression were also evaluated. SPSS software version 22 was used for data analysis and the P -value < 0.05 was considered statistically significant.

Results: The histopathologic analysis showed that all groups were significantly associated with lower wound bed's inflammatory cells and higher fibroblasts and blood vessels compared to the control group which were more significant in the clinoptilolite nanocomplex + honey group ($p < 0.05$). Collagen deposition score (on the 14th day) was significantly higher in the clinoptilolite nanocomplex + honey group and polymerase chain reaction (PCR) data showed a higher VEGF expression for the clinoptilolite nanocomplex + honey group than others, especially on day 7 ($p < 0.05$). Clinoptilolite nanocomplex was shown to have a significant effect on shortening the blood coagulation time compared to the control group. All interventions were associated with a significant acceleration of wound healing and wound surface reduction, and among them, clinoptilolite nanocomplex + honey was more effective than others ($p < 0.05$).

Conclusions: Topical application of clinoptilolite nanocomplex, particularly in association with honey, can significantly affect morphometric and histopathological factors associated with wound healing, improve coagulation function, and increase VEGF expression

Keywords: Clinoptilolite, Honey, Vascular Endothelial Growth Factors, Wound Healing, Wounds and Injuries, Zeolites

Effects of Stem Cell Exosomes on Wound Healing and Scar Regeneration

Amir Bajouri

MD, Hair and Stem Cells Department Director, Skin and Stem Cells Research Center, TUMS, Tehran, Iran

Exosomes are small extracellular vesicles that are released by various cells, including stem cells, and they contain a variety of bioactive molecules such as proteins, lipids, and nucleic acids. These exosomes have been found to play a crucial role in intercellular communication and tissue repair. Mesenchymal stem cells (MSCs) are a type of multipotent stem cells with the potential to differentiate into a variety of cell types. They have gained attention for their regenerative properties and ability to modulate the immune system. MSCs release exosomes, small membrane-bound vesicles containing proteins, lipids, and nucleic acids, which play a role in cell-to-cell communication. Studies have shown that MSC-derived exosomes can significantly accelerate the healing process of various types of wounds, including diabetic ulcers, burns, and surgical incisions through enhancing collagen deposition, promoting the migration and proliferation of keratinocytes and fibroblasts, and improve the quality of healed tissue. Exosomes promote cell proliferation and migration by delivering growth factors, cytokines, and microRNAs to the target cells. They also stimulate angiogenesis by transferring pro-angiogenic factors to endothelial cells, leading to the formation of new blood vessels. Furthermore, exosomes modulate the extracellular matrix by regulating the expression of matrix metalloproteinases and tissue inhibitors of metalloproteinases, facilitating tissue remodeling and wound closure. Additionally, exosomes exhibit anti-inflammatory effects by suppressing pro-inflammatory cytokines and promoting the secretion of anti-inflammatory cytokines, thereby controlling the inflammatory response at the wound site. This intricate molecular interplay orchestrated by exosomes ultimately accelerates wound healing and mitigates scar formation.

Lab Scale Production of Recombinant Platelet-derived Growth Factor-BB Homodimer (PDGF-BB) in Microbial Expression System for Wound Healing Applications

Armin Nazemi Zadeh¹
Fereshteh Sarafrazi¹

Masoud Habibi¹

Mohsen Fateh²

Hassan Rassouli^{1*}

1. Department of Photo Healing and Regeneration, Medical Laser Research Center, Yara Institute Academic Center for Education, Culture and Research (ACECR), Tehran, Iran

2. Lifestyle Medicine Department, Medical Laser Research Center, Academic Center for Education, Culture and Research (ACECR), Tehran, Iran

Skin wound healing depends on different and overlapping phases including hemostasis, inflammation, proliferation, and dissolution/remodeling. Wound healing will be delayed by any blockage period, which often enters the wound into a state of pathological inflammation. Recombinant proteins are proteins encoded by recombinant DNA technology. In recent years, the number of recombinant proteins used for therapeutic applications has increased dramatically. Among the growth factors, platelet-derived growth factors (PDGFs) are effective in the management of injury and involve many cellular events in the healing process, including inflammatory cell recruitment, fibroblast proliferation and migration, intraepithelial collagen deposition, and granulation tissue formation. During the process of natural wound healing, platelets are one of the first cells that respond at the wound site or around it and play an essential role in wound healing. Platelets are a rich source of growth factors, including PDGF. PDGF is the first and only recombinant growth factor approved by the US Food and Drug Administration (FDA) for topical administration to treat diabetic foot ulcers.

Methods: In this study, we've built a microbial expression vector containing the coding sequence for optimized PDGF-BB and transformed it into an E. coli Strain. Then We developed a complete production process that includes, expression, purification, and biological activity assay.

Results: The purified PDGF-BB (500 µg/L of culture) was well-folded and biologically active. The whole procedure is fast and scalable.

Conclusions: Chosen E. coli Strain can produce and fold recombinant PDGF-BB. The produced PDGF-BB has biologically active, cost benefits and could be considered for further investment and investigation.

Keywords: Recombinant PDGF-BB, Recombinant DNA Technology, Microbial Expression System, Wound Healing

A Systematic Review of the Efficacy, Safety, and Satisfaction of Regenerative Medicine Treatments for Hypertrophic Scars and Keloids

Azadeh Goodarzi

Associate Professor of Dermatology, Department of Dermatology, Rasool Akram Medical Complex Clinical Research Development Center (RCRDC), School of Medicine, Iran University of Medical Sciences (IUMS), Tehran, Iran

What is already known about this topic?

- Hypertrophic and keloid scars are unpleasant consequences of skin injuries that pose challenges for doctors and patients when it comes to treatment.
- Several treatments, including lasers, intralesional injections of corticosteroids, surgery, intralesional injections of 5-FU, cryosurgery, and radiotherapy, have been proposed for the treatment of these lesions. Different treatment responses have been observed.

• Regenerative medicine plays a pivotal role in treating various skin diseases and post-injury conditions. Examples of these treatment methods include stromal vascular fraction (SVF), stem cell-conditioned medium, cell therapy, platelet-rich plasma (PRP), and exosomes.

What does this study add?

• In all eight reviewed studies (100%), the effectiveness of regenerative medicine in treating hypertrophic and keloid scars has been proven. Out of these eight studies, five (62.5%) are related to the effectiveness of PRP, two studies (25%) is related to the effectiveness of SVF, and one study (12.5%) is related to stem cell-conditioned medium.

• The use of this treatment method, either as monotherapy (50% of studies) or as an addition to standard treatments (50% of studies), leads to a significant difference in recovery.

• In all eight studies (100%), the recovery rate in the group treated with regenerative medicine was significantly higher than the group receiving standard treatments such as intralesional injection of triamcinolone acetonide or laser ablation. In one study (16.6%), regenerative medicine, specifically intralesional injection of PRP, demonstrated superiority over intralesional verapamil injection and intralesional 5-FU in terms of recovery rate, side effects, and recurrence of lesions.

• Regenerative medicine is an effective and safe method for treating hypertrophic scars and keloids. Numerous studies have demonstrated its significant superiority over other treatment methods. Additionally, this treatment method can be combined with conventional therapies, such as laser therapy and intralesional injections

Epigenetic Aspects of Photobiomodulation in Wound Repair

Afshan Shirkavand¹

Mohammad Amin Fereidounian²

Shahriyar Bourbour³

Shirin Farivar^{4*}

1. PhD, Assistant Prof of Biophotonics, Photodynamic therapy department, Medical Laser Research Center, Yara Institute, ACECR, Tehran, Iran

2. Ph.D. Candidate, Department of Cell and Molecular Biology, Faculty of Life Sciences and Biotechnology, Shahid Beheshti University, Tehran, Iran

3. MSc, Department of Cell and Molecular Biology, Faculty of Life Sciences and Biotechnology, Shahid Beheshti University, Tehran, Iran

4. Ph.D., Associate Professor of Genetics, Stem Cells, Department of Cell and Molecular Biology, Faculty of Life Sciences and Biotechnology, Shahid Beheshti University, Tehran, Iran

Proliferation forms a vital facet of wound repair, as keratinocytes adjacent to the wound margin divide to provide a sufficient number for the processes of migration and epiboly. Highlights the concept of wound healing, an intricate biological process that involves multiple cellular and molecular interactions to restore tissue integrity. Wound healing is of utmost importance for tissue restoration and is critical to the recovery process

following an injury. Any disruption in this process can lead to the development of chronic wounds, which can lead to significant health complications. Emerging evidence indicates the clinical benefits of photobiomodulation therapy (PBMT) in the management of skin and mucosal wounds. Epigenetic Regulators modulate keratinocyte proliferation, migration, and differentiation during skin healing. Epigenetic mechanisms are also vital for keratinocyte differentiation and stratification of the epidermis, differentiation, and migration, while also influencing skin regeneration and new vessel formation. This is achieved through a complex series of regulatory mechanisms that have the ability to both stimulate and inhibit gene activation to transiently alter cell phenotype and behavior as well as interact with factor activity. Understanding the molecular basis of this regulation is a priority as it represents potential therapeutic targets in the treatment of acute and chronic skin conditions. Here, we aim to present aspects of Photobiomodulation therapy drives massive epigenetic histone modifications, stem cells mobilization and accelerated epithelial healing.

Investigating the Synergistic Effect of Turmeric and Ferula Gummosa in the Healing of Surgically Induced Gastric Ulcer in Rat

Amir Mahdi Zehi¹

Amir Reza Karami Bonari^{2*}

Samaneh Ghasemi³

1. Faculty of Veterinary Medicine, Shabestar Branch, Islamic Azad University, Shabestar, Iran

2. Department of Pharmacology, Faculty of Veterinary Medicine, Shabestar Branch, Islamic Azad University, Shabestar, Iran

3. Assistant Professor of Surgery, Department of Veterinary Clinic, Faculty of Veterinary Medicine, Ferdowsi University of Mashhad, Iran

Gastric ulcer is one of the most common digestive problems. The purpose of this study is to investigate the histopathology and serology effect of turmeric and Ferula gummosa extracts in accelerating the healing of gastrotomy wounds in Rats. In this study, 40 adult male Wistar rats were divided into 5 control groups, omeprazole, turmeric, Ferula gummosa and the

combination of turmeric and Ferula gummosa. A 1cm gastrotomy incision was made between the greater and lesser bends of the stomach and then sutured in 2 layers in a Cushing pattern. After 14-day gavage period, blood samples were taken to check TNF- α and IL-6 factors. Also, tissue samples were taken from the gastrotomy sites and after preparing tissue sections, they were stained with hematoxylin-eosin method. The results showed that the combination of turmeric and Ferula gummosa increased the rate of wound healing and compared to the separate use of turmeric and Ferula gummosa extracts, it reduced inflammatory factors to a greater extent and also improved the healing rate of gastrotomy wounds.

Keywords: Turmeric, Ferula gummosa, Surgery, Gastric Ulcer, Rat, Healing

Fabrication and Characterization of Microparticles Loaded with Bromelain for Wound Healing

Arefeh Shams¹

Iman Shabani^{2*}

1. Master of Science student, Tissue Engineering, Department of Biomedical Engineering, Amirkabir University of Technology (Tehran Polytechnic), Tehran, Iran

2. Assistant Professor, Biomaterial, Department of Biomedical Engineering, Amirkabir University of Technology (Tehran Polytechnic), Tehran, Iran

Background and Objective: The skin is the body's largest organ. One of its primary functions is to protect the body against external factors such as bacteria, chemicals, and temperature. Extensive skin damage that threatens the entire organism requires immediate and effective treatment. Natural wound healing is a complex and dynamic multi-stage process involving coordinated interactions between growth factors, cytokines, chemokines, and various cells. Any failure in these stages can result in abnormal wound healing. Therefore, efforts have been made to develop new therapeutic approaches for treatment. Early scar removal within 48 hours is considered a key step in the treatment of partial and full-thickness burns. However, there is an unmet need for an effective and non-surgical debridement agent. Bromelain, a mixture

of proteolytic enzymes from pineapple (*Ananas comosus*), is known as a potential debriding agent in the treatment of burns. In this study, the debridement efficiency of poly (lactic acid) (PLA) microparticles containing bromelain was evaluated.

Materials and Methods: Bromelain - loaded microparticles were prepared using a double emulsion method, and their structure was examined by SEM. The mechanism of interaction between PLA and bromelain was studied using Fourier-transform infrared spectroscopy (FTIR). The successful encapsulation of bromelain in PLA microparticles was measured. Subsequently, the release of bromelain by the microparticles in the medium was monitored for 7 days through the measurement of the concentration of bromelain in the solution.

Results: The prepared microparticles were perfectly spherical with a diameter of $1.31 \pm 0.92 \mu\text{m}$. Chemical bonds between bromelain and PLA were identified. The encapsulation efficiency of bromelain in PLA microparticles was approximately 51%. The in vitro release testing showed that the maximum bromelain release from the microparticles occurred within the first 5 days (95%).

Conclusion: The results of this study indicate that the chemical and physical properties of the bromelain-loaded microparticles could be considered as a potential factor in wound debridement.

Keywords: Bromelain, Debridement, PLA microparticles

Wound Healing Effect of a Topical Product from *Ajuga Chamaecistus* ssp. *Tomentella* Ging. Ex Benth in Pressure Ulcer: a Randomized Double-blind Placebo-controlled Clinical Trial

Mohsen Adib¹

Mohammad Hossein Jarrahzadeh²

Tayebeh Toliyat³

Laila Shirbeigi¹

Seyede Nargess Sadati Lamardi^{1*}

1. Department of Traditional Pharmacy, School of Persian Medicine, Tehran University of Medical Sciences, Tehran, Iran

2. Department of Anesthesia and Intensive Care Medicine, Faculty of Medicine, Shahid Sadoughi University of Medical Sciences, Yazd, Iran

3. Department of Pharmaceutics, Faculty of Pharmacy, Tehran University of Medical Sciences, Tehran

Introduction: This study aimed to evaluate the effectiveness of *Ajuga chamaecistus* ssp. *tomentella* ointment on healing pressure ulcers (PU) in patients admitted to the intensive care unit (ICU).

Method: In this randomized, double-blind, placebo-controlled clinical trial, 131 patients with grade 1 or 2 PU were randomly assigned into one of two groups through simple randomization. The study group received 3% *Ajuga* ointment (AO), while the control group received placebo twice a day for 14 days in addition to the standard care for PU. Changes in the degree and size of wounds were considered as the primary outcomes of the study based on the 2-digit Stirling scale.

Results: 40 patients in each group completed the research. Mean (95% confidence interval) difference values, for wound degree, between placebo and *Ajuga* groups on day 7 vs. day 0 was -0.88 (-1.01 to -0.76), on day 14 vs. day 7 was -0.69 (-0.85 to -0.53), and on day 14 vs. day 0 was -1.57 (-1.78 to -1.36). Mean (95% confidence interval) difference values, for wound area, between placebo and *Ajuga* groups on day 7 vs. day 0 was -1.730 (-1.979 to -1.48), on day 14 vs. day 7 was -1.411 (-1.654 to -1.168), and on day 14 vs. day 0 was -3.142 (-3.563 to -2.72).

Conclusion: Topical application of AO significantly improved PU on days 7 and 14 compared to placebo. Evaluation of the effects of this plant on a larger sample size, for a longer period of time and in different medical centers is recommended.

This clinical trial was registered in the Iranian Registry of Clinical Trials (No.: IRCT20191110045389N1).

Keywords: *Ajuga*, pressure ulcers, wound healing, 20-hydroxyecdysone, randomized controlled trial

Skin Burns and Tissue Engineering

Mohammad Reza Mobayen

*Associate Prof. of Guilan University of Medical Sciences-
Burn and Regenerative Medicine Research Center,
Guilan University of Medical Sciences, Rasht, Iran*

Skin burns are a global public health problem, accounting for an estimated 180,000 deaths annually worldwide. The process of repairing and regenerating damaged tissue is slow and time-consuming, so external therapeutic agents can be used to speed up this vital process. The most practical method to repair burn lesions is skin grafting, but it can be limited by donor site availability and cause additional pain for the patient. Tissue engineering is a promising approach for developing new solutions for burn repair. Cells are a crucial part of the tissue engineering triangle, and there are two main types of cells used in burn repair: somatic cells and stem cells. Somatic cells are further divided into three groups: autograph, allograft, and xenograft. Autologous cells are preferred in clinical trials because they have a low risk of transplant rejection and tumorigenesis. Stem cells are undifferentiated cells that have the potential to develop into different types of cells. They are particularly important in wound healing because of their ability to self-renew and differentiate. One promising approach to tissue engineering for burn repair is the use of split-thickness skin grafts (STSG). STSG technology allows skin grafts to be expanded to much larger sizes, which can overcome the limitation of donor site availability. Another promising approach is the use of tissue to cell suspension. This technique involves mechanical methods to create a suspension of keratinocytes, melanocytes, fibroblasts, and Langerhans cells, which are then sprayed onto the desired site. This technique helps to speed up the healing of the wound, prevent the creation of excess wound, and disturbance in the pigmentation of the donor area. The use of stem cells is also of particular importance in wound healing. Fat tissue contains cells called Stromal vascular fraction (SVF), which contains heterogeneous stem cells. These cells can be extracted using mechanical and enzymatic techniques and contain mesenchymal stem cells, hematopoietic stem cells, fat and preadipocyte cells, fibroblast cells and immune cells such as macrophages.

SVFs cells can secrete pro-angiogenic factors, which induce proliferation of endothelial cells and improve angiogenesis. They also secrete transforming growth factor-1 (TGF-1), hepatocyte growth factors (HGF) and interferon- γ (INF- γ), which exert immunomodulatory effects. Another important issue in the topic of burn is mitochondria. Mitochondrial function is impaired in burns. These organelles are involved in many important cellular activities, including energy production, heat regulation, calcium homeostasis, biogenesis and assembly of iron-sulfur proteins, apoptosis control, production of reactive oxygen species (ROS), and cell survival, proliferation, production of metabolites, coordination of metabolic pathways as well as cell signaling. Thermal traumas such as burns can disturb the components of the mitochondrial enzyme machinery as well as the related regulatory factors that play a role in cell metabolism. This disruption in cell metabolism can activate the metabolic pathology associated with burns.

Conclusion: Tissue engineering is a promising approach for developing new solutions for burn repair. Cells and stem cells play a crucial role in this process. Researchers are developing new techniques to improve the delivery and viability of these cells, as well as to enhance their regenerative potential. Further research is needed to optimize these techniques and translate them into clinical practice. In addition to tissue engineering, other promising approaches to burn repair include the development of new biomaterials, such as hydrogels and scaffolds, that can promote wound healing and reduce scarring. Researchers are also exploring the use of gene therapy and other advanced technologies to accelerate tissue regeneration and improve the outcome of burn patients.

Tracking of Human Wharton Jelly Stem Cells Labeled with Superparamagnetic Iron Oxide Nanoparticles and Seeded on Polyurethane/Chitosan/Hyaluronic Acid in Burn Wounds

Seyedeh-Sara Hashemi¹

Davood Mehrabani²

Bahareh Borzou^{3*}

Reza Jalli⁴

1. Burn and Wound Healing Research Center, Shiraz University of Medical Sciences, Shiraz, Iran

2. Comparative and Experimental Medicine Center, Shiraz University of Medical Sciences, Shiraz, Iran

3. Department of Biochemistry, Science and Research Branch, Islamic Azad University, Shiraz, Iran

4. Medical Imaging Research Center, Department of Radiology, Shiraz University of Medical Sciences, Shiraz, Iran

Background: Burn is still a global public health problem and In-vivo cell tracking after transplantation in regenerative medicine remains an unmet challenge and limits current understanding of the wound healing mechanism through cell-based therapies. This study investigated the tracking of human Wharton's jelly stem cells (hWJSCs) seeded onto nanofibers electrospun with hyaluronic acid and labeled with superparamagnetic iron oxide nanoparticles (SPIONs) by magnetic resonance imaging (MRI) in burn injury.

Method: The hWJSCs were characterized and assessed for growth kinetics. A total of 30 rats were enrolled in three equal groups. Group 1 underwent a scald burn injury without treatment, group 2 was treated by a nanofiber electrospun with hyaluronic acid and group 3 received hWJSCs labeled with SPIONs seeded onto a nanofiber electrospun with hyaluronic acid. Tensile strength was evaluated before and after interventions, real-time PCR assessed apoptosis, and Prussian blue staining, scanning electron microscopy (SEM), and MRI were used for the tracking of labeled cells.

Results: The hWJSCs exhibited mesenchymal stem cell properties. Population doubling time was 40.1 hours. SPIONs did not show any toxic effects. The hWJSCs seeded onto a nanofiber electrospun with hyaluronic acid decreased Bax and increased Bcl-2 gene expression. Internalization of SPIONs within hWJSCs was confirmed by

Prussian blue staining, SEM, and MRI until day 21. There was a significant difference between Young's moduli of normal skin and the group receiving hWJSCs seeded onto nanofibers electrospun with

hyaluronic acid. Histological observations and SEM imaging confirmed that MRI is an accurate method to track SPION-labeled hWJSCs in vivo.

Conclusions: This study showed that SPION labeling coupled with MRI can be used to further understand the fate of stem cells after transplantation in a burn model.

Keywords: Wharton Jelly stem cell, hyaluronic acid, scaffold, Magnetic resonance imaging, burn healing

Investigating the Effectiveness of Making Nanocomposite Powder from Aerosil, Hydroxyapatite, and Timolol Loading in Wound Healing Caused by Pilonidal Sinus Surgery: A Randomized, Controlled, Double-blind Clinical Trial Study

Arian Karimi Rouzbahani¹

Zahra Goudarzi²

Nahid Madhani³

Abdolrazagh Marzban^{4*}

1. Student Research Committee, Lorestan University of Medical Sciences, Khorramabad, Iran 2. USERN Office, Lorestan University of Medical Sciences, Khorramabad, Iran

2. Students' Scientific Research Center, Tehran University of Medical Sciences, Tehran, Iran

3. Department of Nursing and Wifery, Lorestan University of Medical Sciences, Khorramabad, Iran

4. Razi Herbal Medicines Research Center, Lorestan University of Medical Sciences, Khorramabad, Iran

Introduction: Pilonidal sinus disease is an inflammatory skin disease that is associated with a lot of pain. This inflammatory disease occurs mostly in the sacrum and involves the skin and subcutaneous tissue. One of the effective treatments for this disease is surgery, and one of the most important measures after surgery in these patients is the selection and tips related to proper dressing and wound care. Proper dressings should be able to absorb secretions and keep the

temperature and humidity at a balanced level and have antibacterial properties to prevent wound infection. Hydroxyapatite is a bioceramic based on calcium and phosphate. This material has biocompatible properties, local concentration of calcium and effect on the wound healing process, and it is used as an accelerator of cell proliferation and can increase water absorption by more than 2.5 times. Timolol belongs to the group of non-selective β_2 -adrenergic receptor antagonists and can improve the wound healing process by improving the migration of keratinocytes and increasing the settling time of neutrophils and increasing inflammatory cytokines. This study was conducted with the aim of investigating the effectiveness of making nanocomposite powder from aerosil and hydroxyapatite and loading timolol in wound healing caused by pilonidal sinus surgery in Lorestan city.

Methods: In this randomized clinical trial, 120 patients over 18 years of age who underwent pilonidal sinus surgery were included. Then, in screening 48 hours after surgery, they were subjected to basic clinical and laboratory evaluation. After the basic evaluation, the participants were randomized into 2 control and intervention groups. All participants in the intervention and control groups benefited from standard care, but the intervention group also received powder nanocomposite of aerosil and hydroxyapatite and timolol loading on a daily basis. Standard care of the pilonidal sinus surgical site is traditional dressing using sterile gauze on a daily basis. The duration of the intervention and control period was 12 weeks (84 days). During this study, the wound healing was evaluated every week by taking a digital photo of the patients by a blinded evaluator compared to randomization, and to check the bacterial status of the wound, culture was done on day zero.

Results: The average wound volume was calculated 41.9 ± 8.01 cc in the controls and 42.35 ± 10.81 in the treatment arm group. The mean of healing time was 8.7 ± 1.18 ,

Keywords: Pilonidal sinus, Hydroxyapatite, timolol

Decellularized Extracellular Matrix Scaffolds for Skin Tissue Engineering

Simin Nazarnejad

Tissue Engineering Research Group, Department of Anatomy and Cell Biology, School of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran

Decellularized extracellular matrix (dECM) is considered as a biological scaffold derived from whole tissues and/or organs, in which the cellular components have been removed by means of physical, chemical, and/or biological methods, while micro- and macro-scale structural components and functional ECM proteins and polysaccharides are left. In addition to preserve the compositional integrity similar to the native ECM, a major superiority of decellularized ECM can be noted as preservation of similar tensile strength to native tissues as well as retaining most of the inherent native vasculature, to about the third or fourth level of branching. During recent decades, various forms and formulations of dECM have been designed and engineered for tissue engineering and regenerative medicine applications including sheets, hydrogels, composites, cell-laden dECM, and other dECM-based bioconstructs. Although conventional approaches have revealed promising outcomes in tissue engineering, they mostly require blending with other biomaterials or post-treatments (e.g., secondary cell seeding) in order to improve their biochemical and biomechanical performance. Highlighting the emergence of 3D bioprinting technology, numerous studies have been attempted to fabricate a rich source of bioink that possesses intrinsic cues for cell communication and other aspects of tissue-specific reconstruction. Despite significant progress in developing dECM bioinks for regenerating various tissues such as skin, there are still some considerations regarding dECM bioinks including (I) their printability, (II) preserving cell viability and behavior, (III) mechanical and structural integrity, (IV) biomimicry, and (V) degradation profile, which should be addressed in research studies. Finally, it should be mentioned that dECM-based products have recently emerged as an attractive substrate for clinical application. For example, AlloDerm® (BioHorizons) was applied to skin regeneration.

Multifunctional Natural-based Biomaterials Strategies for Cutaneous Tissue Engineering: Conventional Approach Towards Advance Technology 3D-Bioprinting

Mh Busra Fauzi

Centre for Tissue Engineering and Regenerative Medicine (CTERM), Faculty of Medicine, Universiti Kebangsaan Malaysia, Kuala Lumpur, Malaysia

Background: The irregular deep chronic wound is a grand challenge to be healed due to multiple factors, including slow angiogenesis that causes regenerated tissue failure. It presented an epidemic in millions of patients and resulted in amputations. The narrow gap of deep wounds could hinder and slow down normal wound healing. In order to overcome this, immediate treatment is a realistic strategy to minimize the risk of complications and aid in the healing rate of the cutaneous wound. Functionalized engineered biomaterials are proven to be a potential approach to embarking on skin wound management.

Methods: In this research, several injectable formulations have been developed to explore further, starting from selecting fundamental biomaterials and combinations with various potential active compounds. The base technology used in these studies depends on the thermoresponsive approach. In addition, the injectable hydrogel formulations were printed using three-dimensional (3D) bioprinting technology via the extrusion method. All hydrogel-base formulations were tested for their physico-chemical, cell-biomaterial interactions and efficiency in preclinical models.

Results: The physicochemical and biocompatibility of all injectable hydrogels were respectively evaluated. They displayed the highest injectability degraded over two weeks with optimum swelling capacity and higher mechanical strength. Furthermore, the hydrogels offered higher porosity and lower wettability than the control. Surface and cross-section SEM photographs displayed an interconnected porous structure for tested groups. The chemical analysis represented no

significant changes after GNP modification. Moreover, no toxicity effect of fabricated hydrogels against dermal fibroblasts was shown during the biocompatibility test. The hydrogels provided an excellent interconnected channel for cells migrating inside the microstructure in various directions. The healing capacity was evaluated using mice model and demonstrated faster wound closure and matured bilayer-skin formation.

Conclusion: The outcomes convey that all formulated functionalised hydrogels delivered the optimum features to be used as a provisional biotemplate for skin tissue engineering purposes. The findings above indicated that injectable functionalised-hydrogels have excellent physicochemical properties and acceptable biocompatibility as a rapid acellular treatment for future use in irregular deep cutaneous chronic wounds.

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Keywords: Biomaterials; Tissue Engineering; thermoresponsive; bioprinting

Skin Wound Tissue Engineering with the Focus on Stem Cell-based Therapeutic Approaches

Nahid Nasiri

Department of Photohealing and Regeneration, Medical Laser Research Center, Yara institute, ACECR, Tehran, Iran

Normal wound healing is a multiple phase process which requires complex interactions between various cells, cytokine, chemokines and growth factors. Chronic wounds occur as a result of failure in different healing phases as well as prolonged inflammation. The difficulty of treating these wounds, including high costs and frequent dressing changes, has made it necessary to design more effective therapeutic approaches to guide skin regeneration rather than wound healing.

Accordingly, wound tissue engineering has been provided promising therapeutic strategies using cell/stem cells and synthetic/natural polymers. It has shown a great potential for skin tissue regeneration and successful wound healing. Here we will discuss the efficacy of different stem cell types and sources in wound healing as well as various approaches whereby these cells can best demonstrate their unique properties in skin tissue repair. In addition, we will describe existing challenges for using stem cells in skin tissue regeneration.

Keywords: Wound healing, Mesenchymal stem cells, Cytokines, Chronic wounds, Skin tissue

3D-printing Technology for Skin Regeneration and Wound Care Applications

Shadab Bagheri Khoulenjani

*Polymer and Color Engineering Department,
Amirkabir University of Technology, Iran, Tehran*

In the ever-evolving landscape of medicine, 3D printing has emerged as a transformative force, offering a promising applications that has the potential for revolutionizing skin regeneration and wound care. This cutting-edge technology can be used to redefine healthcare practices, enabling personalized, effective, and cost-effective treatments for a wide range of skin injuries. Conventional skin grafts, while often effective, can face challenges that can compromising treatment outcomes. 3D printing addresses these limitations by enabling the fabrication of skin grafts that are meticulously tailored to the size and shape of the wound, ensuring optimal integration with the surrounding tissue. This precise alignment minimizes the risk of graft rejection and promotes the wound healing process. Besides, 3D printing plays a pivotal role in developing advanced scaffolds that support and promote tissue regeneration. These scaffolds provide a structured environment for cell growth and differentiation, accelerating the healing process and enhancing the quality of newly formed tissue. 3D printing allows for the creation of scaffolds with customized pore sizes and geometries, tailoring them

to the specific requirements of different wound types. 3D-printing itself is a diverse array of technologies, including fiber filament fusion (FFF), 3D-bioprinting, direct ink writing (DIW) and immersion-precipitation 3D-printing (IP-3DP) each with its unique strengths and applications in skin regeneration and wound care. In this talk, application of these technologies for improving the skin care and skin regeneration processes will be discussed.

Assesing the Restorative Effect of Ozone and Chitosan - Hyaluronic Acid with and without Mesenchymal Stem Cells on Wound Healing in Rats

Mahshid Shabani Vishkaei^{1*}

Siavash Sharifi²

1. Doctor of veterinary medicine, veterinary medicine, department of clinical sciences, shahrekord university, Shahrekord, Iran

2. Assistant professor, Doctor of veterinary surgery, Department of clinical sciences, Faculty of Veterinary Medicine, University of Shahrekord, Shahrekord, Iran

The aim of this study was to evaluate the effect of ozone and chitosan-hyaluronic (Cs-HA) acid with and without mesenchymal stem cells (MSCs) on wound healing in rats. For this study, 64 rats were randomly divided into four groups of sixteen. A skin punch 5 mm in diameter was created as a round full-thickness wound on the back of the rat. The first group was the control group, the second group received ozone, the third group received chitosan-hyaluronic acid with ozone, and the fourth group received chitosan-hyaluronic acid with ozone and mesenchymal stem cells. Then, on days 3, 5, 9, and 14 after surgery, the wound area was studied macroscopically. For histopathological evaluation, tissue sections were prepared from the lesion sites and the healing process was evaluated in terms of inflammation, collagen arrangement, neovascularization and rearrangement of epithelial tissue. Macroscopic assessment results showed differences in wound area on days 5, 9, and 14.

The results of the histopathological examination

showed that the Cs - HA + ozone + MSCs and Cs - HA + ozone groups had significantly higher vascularization on day 3 compared with the ozone-treated and control animals. In addition, in terms of collagen arrangement, all treatment groups were significantly better than the control group. On day 5, no significant difference was observed between different groups. On day 9, the inflammation level in the group treated with Cs-HA+ozone+MSCs was significantly lower than the other groups. Significantly better vascularization compared to controls was observed in all treatment groups. In the treatment groups, the rate of inflammation was significantly lower than the control group on day 14. Significantly higher collagen arrangement levels were observed in the Cs-HA+ozone and the Cs-HA+ozone+MSC groups compared with the control and ozone groups. Regarding epithelial tissue rearrangement, the treatment groups were significantly better than the control group. Overall, the results of this study indicated that treatment with ozone, chitosan-hyaluronic acid, and Cs-HA along with mesenchymal stem cells accelerated wound healing in rats. The effect of using chitosan-hyaluronic acid with mesenchymal cells was better than the other types of treatment. It seems that due to the effect of the above substances alone and in combination to accelerate wound healing, larger clinical trials suitably designed to assess these factors are necessary for improving chronic wound treatment.

Keywords: wound healing, ozone, hyaluronic acid, chitosan, mesenchymal stem cells, scaffold

The Effect of Laser Therapy on Chronic Wound Healing

Manijeh Soleimanifar

*PhD of Physiotherapy, Lifestyle medicine department,
Medical Laser Research Center, ACECR, Tehran, Iran*

Introduction: A wound is considered chronic when it does not heal, either because of a slow healing process, or because of its recurrence after a certain time period.

Most diabetic wounds are categorized as chronic since take more than 3 months to heal. The loss of mobility and the high cost of treatment makes the demand for

an efficient and faster wound-healing process more desirable. The “TIME” principle is used as a general approach in the management of chronic wounds, involving tissue debridement, infection control, moisture balance, and edges of the wound. Following this assessment, other therapeutic modalities can be used to ensure effective healing.

Methods of treatment: The principal objective in the treatment of chronic Diabetic Foot Ulcer (DFUs) is to achieve quick wound resolution and closure, and focus on preventing lower limb amputation. Photo biomodulation (PBM) as a knowledge in the science of photonics and bio photonics have led to the effective use of light in the treatment of DFUs. Numerous studies have demonstrated the therapeutic benefits low-level laser (light) therapy (LLLT), on diabetic wound healing which is considered as an effective therapeutic method in wound healing when used with the correct treatment parameters. Low-level laser therapy, when applied to skin wounds, is able to promote major physiological effects, such as anti-inflammatory resolution, neo angiogenesis, epithelial and fibroblasts proliferation, collagen synthesis and deposition, revascularization and wound contraction and alleviates the inflammatory phase in chronic wounds. In addition, high-intensity laser produces photochemical, photothermal, and photomechanical actions with a sufficient dose to reach the deep target tissue, which has a positive effect on reducing pain by penetrating deep tissues and providing functional improvement. High-intensity laser therapy is better than low-level laser therapy which takes much longer to deliver the same amount of energy to the tissues. High-intensity lasers, which are more potent, can penetrate more deeply than low level lasers.

Conclusion: According to the literature review, doses of 3- 6 J/cm² appear to be more effective and doses above 10 J/cm² are associated with deleterious effects. The wavelengths between 632.8 and 1000 nm remain as those having more satisfactory results in the wound healing process. Additionally, high-intensity lasers can treat a larger area than low-level lasers. This enables the healing light's energy through the application of laser therapy at the plaque level.

Effects of Electrical Stimulation on the Expression of Angiogenic Growth Factor and Wound Healing

Mohammad Reza Asadi

*Assistant Professor, Department of Physical Therapy,
School of Rehabilitation Sciences, Hamadan
University of Medical Sciences, Hamadan, Iran*

The use of electrical stimulation for the treatment of chronic wounds is not a new issue, and its history dates back to 300 years ago, when gold leaves were used to prevent smallpox wounds. During the last few decades, the beneficial and positive effects of electrical stimulation have been reported in human and animal models, so that there are many evidences in support of the use of electrical stimulation for wound healing. In general, three types of electric current have been proposed with therapeutic application for wound healing; direct current, pulsed current and alternating current. In most studies, only DC and PC currents have been used for wound healing. Recently, it has been reported that it has profound and extensive effects on the angiogenesis process. One of the proposed mechanisms for electrical stimulation in connection with wound healing is the angiogenic effects of electrical stimulation in the wound healing process. The increase of angiogenesis by electrical stimulation, both with an intensity at the limit of skeletal muscle contraction or an intensity below the threshold of contraction in ischemic and non-ischemic muscles, through the increase of angiogenic factors such as VEGF. In the studies conducted on animal and human wounds, it has been observed by performing a biopsy of the wound tissue that electrical stimulation increases the expression of angiogenic factors (VEGF, FGF), the density of capillary vessels and angiogenesis in the wound tissue. The results of our previous study on diabetic foot ulcers showed that electrical stimulation can increase the release of VEGF in diabetic foot ulcers. The pattern of VEGF release in diabetic wounds in the stimulation group was different from the placebo. In the first session, immediately after applying electrical stimulation, the amount of VEGF increased significantly compared to the baseline value before

stimulation. In the twelfth (last) session, similar to the first session, immediately after applying electrical stimulation, the amount of VEGF in the wound fluid compared to before Stimulation also showed a significant increase compared to the baseline value in the first session. based on the available evidence, It can be concluded that application of ES can increase the release of angiogenic factors such as VEGF in wound site, which may lead to improved angiogenesis and accelerate wound closing in chronic wound such as diabetic foot ulcers.

Oral Chronic Graft-versus-host Disease

Nasrin Zand

*Assistant Professor of Dermatology, Department of
Medical Laser, Medical Laser Research Center, Yara
institute, ACECR, Tehran, Iran*

Oral chronic graft-versus-host disease (cGVHD) is a frequent and principal adverse effect of allogeneic hematopoietic cell transplantation (alloHCT). It is an important factor of morbidity in long-term alloHCT survivors. Oral manifestations of GVHD include inflammation, thinning of oral tissue, and ulceration (similar to lichen planus), lymphocyte-mediated salivary gland dysfunction (similar to Sjögren syndrome), sclerosis of oral and perioral tissues which leads to limitation in oral opening (trismus) (equivalent to decreased oral opening in scleroderma). These pathological events can lead to severe mucosal pain, malnutrition, weight loss, trismus, and in some cases irreversible salivary glands fibrosis. Pain is the most prominent symptom of oral cGVHD which can severely affect the patient's quality of life. The pain may strongly impair basic physiological oral functions such as eating, drinking, and speech. The severe pain may lead to nutritional compromise, weight loss, dehydration, enteral or parenteral nutrition, opioid consumption and hospitalization

Medication selection; including selection of topical or systemic treatment or both, is based on the severity of oral lesions, degree of functional impairment, patient specific factors, medication potency, availability, cost and patient preference. While some mild cases can

be managed with topical therapies, management may also require long-term targeted immunosuppressive and/or corticosteroid therapy with associated risks. Topical treatment is an essential part of oral cGVHD management. In more severe cases systemic treatment is recommended. Even when systemic treatment is needed, topical therapies are valuable as combination therapy. Currently no FDA-approved topical therapies exist for oral cGVHD. Topical steroids, topical non-steroidal agents (e.g., tacrolimus, cyclosporine, thalidomide, azathioprine, some traditional agents, etc), topical anesthetics, PUVA and UVB have been used in clinical practice. Due to the anti-inflammatory and analgesic properties of photobiomodulation therapy (low level laser therapy), PBMT can be used as an adjunctive option for management of oral cGVHD. In this panel we will discuss about the different aspects of PBM application in oral cGVHD. The beneficial effects of photobiomodulation therapy (low level laser therapy) has been investigated for pain relief and inflammation reduction of oral GVHD.

Poster Presentations

A Report of Bullous Pemphigoid in a 10-month-old Scottish Cat, for the First Time in Iran

Alaleh Rakhshanpour^{1*}

Sayyed Jafar Hasani²

Ali-Asghar Tehrani³

1. Assistant Professor, Small Animal Internal Medicine, Department of Internal Medicine and Clinical Pathology, Faculty of Veterinary Medicine, Urmia University, Urmia, Iran

2. DVM student, Faculty of Veterinary Medicine, Urmia University, Urmia, Iran

3. Associate professor, Veterinary Pathology, Department of Pathobiology, Faculty of Veterinary Medicine, Urmia University, Urmia, Iran

Pemphigus and pemphigoid, both deriving their names from the Greek word for "blister," have been recognized for many years in both humans and animals like horses, dogs, cats, and goats. These conditions are believed to have an autoimmune basis and are exceptionally uncommon, yet their precise underlying mechanisms remain uncertain. A 10-month-old unsprayed Scottish cat weighing 2.8 kg presented at the clinic with symptoms including deep skin ulceration on the scalp, hair loss, and excessive itching leading to heightened anxiety. The cat exhibited normal appetite, food and water consumption, breathing rate, heart rate, capillary refill time (CRT), and body temperature. This cat was housed in a confined urban environment, and the owner confirmed that the cat had not undergone prior surgeries or experienced prior illnesses or allergies related to specific foods or medications since birth. Another kitten housed alongside this cat did not exhibit any skin lesions. The blood examination revealed a minor increase in neutrophil count, while the rest of the complete blood count (CBC) results were within the normal range. Approximately five months prior, the cat had received the Tetrakt vaccine. However, previous treatment attempts by a veterinarian over the last two months, involving antiparasitic tablets, terbinafine, ketoconazole shampoo, and ivermectin, were unsuccessful in resolving the infection. The diagnosis is established by considering the patient's medical history,

observing clinical signs, and conducting histopathological and immunopathological evaluations. Following a biopsy of the skin lesions and subsequent examination using a light microscope, the presence of dermatophytes and bullous pemphigoid was confirmed. In order to achieve effectiveness, therapy needs to be immunosuppressive, serving as a palliative rather than a curative measure. To achieve this, a treatment regimen was initiated, which included the administration of prednisolone at a dosage of 2 mg/kg every 12 hours for one week. Additionally, topical hydrocortisone ointment was applied twice a day, while vitamin E tablets were given at a dosage of 100 units per day for up to one week. Omega 3 tablets were also prescribed at a dosage of 200 mg per day for one week. Finally, Ciplex drops were administered at a rate of one drop every six hours for a week. The combination of these treatments resulted in complete recovery for the animal, with visible regrowth of hair on the skin's surface.

Keywords: Scottish cat, Bullous pemphigoid, Autoimmune and skin

Preparation and Making of Topical Formulation of Honey, Fish Oil, Rosa Damascena Extract and Plantago Major L Extract Investigating its Effectiveness on Wound Healing from Burns on the Skin of Laboratory Mice

Amene Hardani

Student Research Committee, Jundishapur University of Medical Sciences, Ahvaz, Iran

Burns are one of the most common injuries to the skin. It has many different factors and it causes material costs and psychological damage. Controlling wound infection is one of the main problems in burns. In the event of a burn, the skin, which is the main protection of the body against the penetration of microbes, gets damaged and while causing pain, burning, inflammation and

discomfort, the beautiful and uniform appearance of the skin is lost. Whether the burn is minor or extensive, there is a desire to heal faster and repair the traces left by it. Studies have shown that honey, fish oil, , Rosa damascena, and Plantago major L, while having antimicrobial properties, help to heal the wound as quickly as possible and repair the traces left behind.

Objective: To prepare and make a topical formulation of honey, fish oil, Rosa damascena extract, and Plantago major L extract to evaluate its effectiveness on the healing of a burn wound on the skin of a large laboratory mouse. The prepared formulation was compared with zinc oxide ointment available in the market.

Methodology: First, the formulation was prepared and then the product was subjected to physicochemical control tests. Further, after inducing burns in 30 rats, the rats were randomly divided into 3 groups and treated with formulation ointment, normal saline and zinc oxide. The rate of wound healing was evaluated during the 15-day period. After 15 days of study, sampling of wound tissue was done for histopathological examination.

Results: The evaluations showed that the percentage of wound healing in mice treated with the formulation showed a significant difference with the control group and the group treated with zinc oxide at the end of the period. The histopathological evaluation of the wounds also showed the presence of healing indicators in the wound tissue of the groups treated with the formulation.

Discussion and conclusion: The prepared formulation can be used as a product in the pharmaceutical industry.

Keywords: formulation, honey, fish oil, Rosa damascena, Plantago major L, wound, burn, skin

Effects of Zno Nanoparticles Prepared by Extract of Rosa Damascena on Wound Healing in Rats

Amene Hardani

Student Research Committee, Jundishapur University of Medical Sciences, Ahvaz, Iran

Abstract Research Aim: Considering the positive effects

of medicinal plants on controlling and treating diseases as well as the advancement of new sciences such as nanotechnology, it is possible to combine traditional science with new effective ways to control and treat diseases. In this study, the goal of helping treatment The wound is made using zinc oxide nanoparticles prepared with an extract of the plant. Rosa Damascena is a plant that reduces inflammation and antioxidants. Zinc oxide nanoparticles have antibacterial, anti-inflammatory and antiseptic properties that are widely used in the production of skin creams. **Research method:** In this study, the aqueous extract of the plant (Rosa Damascena) was prepared. Zinc oxide nanoparticles were synthesized and prepared for use as an aqueous extract, and their effects on wound healing induced in mice were studied. Structural properties of nanoparticles were evaluated using XRD, TGA, UV-vis DRS, FT-IR, BET, and SEM analyzes. 4 Wistar rats group (n = 5 in each group) were treated. After wounding in the skin of mice, they were exposed to the extract and prepared nanoparticles for 18 days. Every three days the wound dressing was changed and imaged. Progressive changes in the wound area were recorded every six days and for 18 days .At the end of the 6th, 12th and 18th days, the wound specimen was sampled and subjected to Hematoxylin- Eosin and Mason staining **Findings:** was 19 nm, which showed a decrease in size relative to the oxidation nanoparticles synthesized by the chemical method (20.5 nm). Also, TGA, UV-vis DRS and FT-IR techniques confirmed the presence of plant extracts molecules with zinc oxide. The results showed a significant decrease in the size of the wound in the mice treated with the extract of the Rosa Damascena extract than the control group. **Conclusion:** According to the results, we can conclude that combination of traditional and new science meaningful impact seems to make a great difference in accelerating wound healing

Keywords: Zinc oxide nanoparticles - Rosa Damascena - Wound healing- Green synthesis

Effect of Hydroalcoholic Extract of Solanum Melongena on Mast Cell Numbers and Degranulation in Diabetic Rat Wound Healing

Amene Nikgoftar Fathi

Tehran, Iran

MSc of anatomical sciences, Department of Anatomical Sciences, Medical School, Arak University of Medical Sciences, Arak, Iran

Objective: Many studies have revealed the prominent effects of mast cells in wound healing. In the present study, we assessed the probable therapeutic features of *Solanum melongena* hydroalcoholic extract on mast cell degranulation in experimental diabetic rats. **Method:** Skin wounds were generated and treatments were applied with *Solanum melongena* hydroalcoholic extract intraperitoneally in the sham, control and experimental groups, respectively. Animals were euthanised on days 3, 5, 7 and 15. 16,800 microscopic images used to count the mast cells and degranulation level (stereology test, Image J software).

Results: Time-lapse photography revealed that *Solanum melongena* significantly ($p < 0.05$) increased the total number of mast cells in all experimental groups on days 5 and 7. The count of grade III (degranulated) mast cells was reduced significantly ($p < 0.05$) on days 5 and 7 in experimental groups.

Conclusion: The rate of wound healing was accelerated considerably following *Solanum melongena* hydroalcoholic extract administration.

Keywords: *Solanum melongena*, Wound Healing, Diabetes

Investigating the Relationship Between Effectiveness and Cost in Specialized Wound Care

Amir Reza Fallahi¹

Hanieh Shahdoost¹

Elahe Taghvaei¹

Maryam Katebi¹

Mohammad Hossein Taklif^{2*}

1. MSc student in Nursing, Student Research Committee, Hormozgan University of Medical Sciences, Bandar Abbas, Iran

2. Medical Surgical Nursing, Student Research Committee, Hormozgan University of Medical Sciences, Bandar Abbas, Iran

Background: Acute and chronic wounds present a substantial economic pressure on healthcare

systems. Chronic wounds cost the health system at least US\$2.85 billion per year in Australia. Treatment of wounds of different etiologies constitutes a major part of the total health care budget. It is estimated that 1.5–2 million people in Europe and approximately 2.4–4.5 million people in the USA suffer from acute or chronic wounds. This review aimed to analyze the concept of cost-effectiveness within the chronic wound care.

Method: Several databases including PubMed, Scopus, Medline and scholar were searched to retrieve studies on the cost-effectiveness of specialized wound care in adults treated for acute and chronic wounds.

Result: totally, 44 cost-effectiveness studies were considered. It was found that, 22 Interventions were more effective and less costly compared to the study comparators: 8 for diabetic ulcers, 9 for venous ulcers, 2 for pressure ulcers, 2 for venous/arterial ulcers, and 1 for mixed complex wound types.

Conclusion: The obtained results can identify efficient wound care interventions and introduce ineffective treatments to save resources. It could be used to clarify future policy and decision-making, reduce the health costs of governments and reduce wound care costs and improve patient health condition.

Keywords: Acute wound, Chronic wound, Cost, Effectiveness

Application of Artificial Intelligence in Wound Care and Tissue Damage: A Review

Nasim Aslani

Assistant Professor, Health Information Management, Department of Health Information Technology, School of Allied Medical Sciences, Lorestan University of Medical Sciences, Khorramabad, Iran

Wound care and tissue damage management present significant challenges for healthcare providers worldwide. The emerging field of artificial intelligence (AI) offers promising solutions to improve the accuracy, efficiency, and effectiveness of wound

assessment, diagnosis, and treatment strategies. This article provides a comprehensive review of the application of AI in wound care and tissue damage management. Drawing from an extensive literature search, we explore various AI techniques employed in wound care, including image analysis, machine learning, and natural language processing. AI algorithms have been successfully applied to assess wound severity, identify tissue types, and track wound healing progress. By integrating AI technologies with digital imaging devices, wound assessment can be automated and standardized, enabling rapid and objective wound measurement. Furthermore, AI-based predictive models have demonstrated the ability to anticipate wound healing trajectories and detect potential complications, such as infection or delayed healing. These models leverage data from electronic health records, patient demographics, and clinical variables to provide real-time feedback to healthcare practitioners. Such predictive capabilities can aid in personalized treatment planning and improve patient outcomes. Additionally, AI-driven decision support systems have shown promise in optimizing wound care practices. These systems generate evidence-based treatment recommendations, considering factors such as wound characteristics, patient comorbidities, and therapeutic options. By incorporating AI algorithms into clinical decision-making, healthcare providers can benefit from improved treatment accuracy, reduced costs, and increased patient satisfaction. Despite the significant potential of AI in wound care, several challenges need to be addressed. Ensuring data privacy and security, designing user-friendly interfaces, and validating the accuracy of AI algorithms are among the key considerations for the implementation and adoption of these technologies in clinical settings. In conclusion, the application of AI in wound care and tissue damage management holds great promise in revolutionizing the field. By leveraging advanced analytic techniques and machine learning algorithms, AI offers accurate wound assessment, predictive modeling, and decision support capabilities. Although further research and validation are required, this review high

Keywords: Artificial Intelligence, Wound Care, Tissue Damage

Transdermal Delivery System in Skin Wound Healing Using Silver Nanomaterials

Azam Moslehi^{1*}

Fatemeh Heidari¹

Ali Torkamandi²

1. Cellular and Molecular research center, Qom university of medical sciences, Qom, Iran

2. Medical student, student research committee, Qom University of medical sciences, Qom, Iran

Introduction: Wound healing is a complex process that involves the restoration of damaged tissue and the prevention of infection. Traditional wound healing methods, such as the use of topical ointments and dressings, have limitations in terms of their effectiveness and the potential for adverse reactions. As a result, there has been growing interest in the use of nanomaterials for wound healing applications. One promising approach is the use of transdermal delivery systems to apply nanomaterials directly to the wound site. So in this study we explore the advantages of this method using existing literature.

Search method: This study summarizes the results of scientific articles since 2000.

Result and conclusion: Nanomaterials have unique properties that make them well-suited for wound healing applications. For example, they can be designed to release drugs or other therapeutic agents in a controlled manner, which can help to promote healing and prevent infection. Additionally, their small size allows them to penetrate the skin more easily, which can improve their effectiveness. There are several different types of nanomaterials that have been investigated for wound healing applications, including nanoparticles, nanofibers, and nanocomposites. These materials can be made from a variety of substances, including metals, polymers, and ceramics. In addition to their potential therapeutic benefits, nanomaterials also have some unique challenges that must be addressed in order to ensure their safety and effectiveness. For example, there is concern about the potential for nanomaterials to accumulate in the body over time, which could lead to toxicity or other

adverse effects. One example of a safe nanomaterial that has shown promise for wound healing is silver nanoparticles. Silver has long been known for its antimicrobial properties, and silver nanoparticles have been shown to be effective at killing a wide range of bacteria and fungi. Additionally, silver nanoparticles can be incorporated into dressings or other wound care products to provide sustained release of the silver ions over time. As research in this area continues, it is likely that we will see the development of new and innovative nanomaterials made from silver which can further improve the outcomes of wound healing.

Keywords: Transdermal delivery system, skin, wound healing, silver nanomaterials

The Comprehensive Analysis of Fish Oil's Effect on Scar Color

Donya Safari*

Fatemeh Heidari

Ali Torkamandi

Mohaddeseh Zeinali Ali Abadi

Fatemeh Hayeri Mehrizi

Medical student, student research committee, Qom University of medical sciences, Qom, Iran

Background: When there is damage to the skin, the body's natural response is to produce collagen, which is a fibrous protein that helps to replace the damaged tissue. The alignment of collagen fibers during this process is different from that of the surrounding skin tissue, and this results in the formation of a scar. The appearance of a scar can vary depending on factors such as skin tone, genetics, and the depth of the injury. Over time, scars may fade, but many people seek ways to minimize their appearance. One potential solution that has gained popularity is fish oil, which is rich in omega-3 fatty acids and has numerous health benefits. In this article, we will examine the impact of fish oil on scar color and discuss the scientific evidence that supports its use.

Method: This meta-analysis provides a comprehensive overview of the findings from peer-reviewed scientific literature published from 2018 to the present.

Result: Fish oil is highly regarded for its high concentration of omega-3 fatty acids, particularly eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). These fatty acids are known to maintain skin's moisture, elasticity, and suppleness, while also exhibiting anti-inflammatory properties that have a positive impact on skin health. Inflammation is a key contributor to the appearance of scar discoloration, and reducing inflammation can help minimize the visibility of scars. Fish oil's anti-inflammatory properties can indirectly influence scar color by reducing redness and inflammation associated with fresh scars. Moreover, fish oil's ability to enhance overall skin health can contribute to a more uniform appearance of scars and facilitate their fading process.

Conclusion: While there is limited research on the direct impact of fish oil on scar color, its supplementation can aid in reducing inflammation and redness, promoting healthier skin and potentially leading to a more favorable scar color over time. However, it is important to note that the results may vary depending on the individual and the severity of the scarring. It is recommended to consult with a healthcare professional before incorporating fish oil into the scar care regimen as it may interact with certain medications or have contraindications for specific conditions.

Keywords: Fish oil, Omega-3, Scar color

Effect of Dry Heat Application and Far-infrared Radiation on Perineal Pain and Episiotomy Wound Healing Among Primipara Women

Elahe Taghvae

Student Research Committee, Faculty of Nursing and Midwifery, Hormozgan University of Medical Sciences, Bandar Abbas, Iran

Background: Episiotomy is an incision made in the tissue between the opening of the vagina and the anus area during childbirth. Although episiotomy is a part of normal childbirth, it is not performed in some cases. Since episiotomy has physiological, psychological and socio-economic effects on women, not only the

decision to perform it but also how to perform this technique and the quality of its subsequent care are important. Considering the high number of births, episiotomy is probably very common. Considering the advantages of episiotomy in some situations, its selective use is recommended to prevent severe vaginal rupture, pelvic floor damage, urinary and anal incontinence, and intracranial bleeding in the baby. But the side effects of episiotomy include perineal pain, dyspareunia, decreased libido, infection, and bleeding. In the above study, we aim to investigate the effect of auxiliary methods such as dry heat and far infrared radiation therapy on perineal pain and episiotomy wound healing, considering the advantages of selective episiotomy.

Methods: In this study, a systematic review of databases including PubMed, Web of Science, Scopus, EMBASE, ProQuest and EBSCO using keywords «wound», «laceration», «trauma», «post partum», «perineal pain», «primipara», «episiotomy», were searched with Boolean operators OR and AND, and all observational studies from 2010 to the end of October 2023 were included. There were no restrictions on the language of publication of articles.

Results: Finally, 8 articles that were the most suitable in terms of subject coverage were evaluated, 6 articles were about the effect of dry heat and 2 articles were about the effect of far infrared radiation on perineal pain and wound healing. The results of this study showed that in most of the present studies, a significant improvement has been achieved in the healing of the episiotomy wound in terms of perineal redness, perineal edema, ecchymosis, and wound discharge due to dry heat. On the contrary, infrared radiation does not show any advantage in the direction of recovery.

Conclusion: The use of dry heat increased episiotomy wound healing among primiparous women and reduced their perineal pain in the early days after delivery, but studies found no additional benefit of postpartum far infrared radiation on primiparous women who They underwent an episiotomy and a second-degree tear of the perineum, they do not show.

Keywords: wound, laceration, trauma, perineal pain, post partum, episiotomy

An Overview of the Challenges of Using Stem Cells in Wound Healing

Elnaz Hajian^{1*}

Mohammad Reza Asgari²

1. MSc student in Critical Care Nursing, Shiraz University of Medical Sciences, Shiraz, Iran

2. Nursing Care Research Center, Semnan University of Medical Sciences, Semnan, Iran

Introduction: Wound complaints are one of the major problems in patients, which can have adverse effects on the aesthetic, functional, psychological and social dimensions of patients. Stem cells with a high tendency to absorb damaged tissues and the proliferation and maturation of undifferentiated cells have led to the healing of burn wounds (peptic ulcer and subsequent cardiovascular disease, diabetic wounds, pressure ulcers and scars caused by wounds. However, this method is still not one of the main approaches in wound healing. This article was compiled with the aim of the challenges in wound healing by stem cells.

method: The current research was conducted using a systematic review method in seven steps. First, the topic was selected and 1069 articles were obtained from the databases using the keywords stem cells, wound, healing, challenges and the time limit of the last 5 years. Then, by determining the entry criteria (abstract and full-text articles, persian and English) and the exit criteria (unrelated and repetitive articles), 21 articles were obtained. After reading the articles, findings were extracted and conclusions were made.

Findings: The surveys showed that the existing challenges are in 6 general categories. On the one hand, the special characteristics of stem cells such as the tumorigenic power, difficult extraction, its sensitivity due to wounds, on the other hand, the individual characteristics of the patient, such as a history of cancer and a history of donation, are some of the limitations. The difficult conditions of cultivation and preparation of products containing stem cells, followed by factors related to transportation, unwanted consequences of adjuvant treatments (surgeries and immunosuppressive drugs), unknown long-term

biological, immunological, anatomical and genetic side effects, legal-ethical obstacles and irreversibility of treatment, is another disadvantage of this method.

Conclusion: In general, the novelty of the treatment method, the lack of extensive trials and the stated challenges have made the decision to use this method difficult. It is hoped that with more research by researchers, an effective step will be taken in promoting this method

Keywords: stem cells; wound; healing; challenges

Comparing the Effectiveness of Oral Versus Intravenous Antibiotics in the Prophylaxis of Wound Infection in Hand Laceration

Elnaz Vahidi*

Mahdi Momeni

Morteza Maeedi

Tehran university of medical sciences

Objective: Hand lacerations are among the most frequent causes of visiting emergency departments (EDs). Wound infection is one of its complications. There is still an ongoing disagreement on the administration of oral versus intravenous (IV) antibiotics (ABs). The objective of this study is to compare the effectiveness of oral versus IV ABs in preventing wound infection of hand lacerations.

Methods: In this double-blind, randomized clinical trial, we enrolled all patients with hand lacerations (based on the inclusion criteria) during 6 months in the EDs of 2 tertiary referral centers. Convenient sampling was done. Finally, in the first group, 382 patients received oral AB (two 500 mg cephalexin capsules) and the other 382 patients in the second group received IV AB (1 gr IV cefazolin) before wound management. Both groups were followed and received oral cephalexin during 48 hours after suturing. Rates of wound infection and different complications were compared between the two groups. T-test, Mann-Whitney U test, Chi square and Fisher analysis were used.

Results: Both groups had the same age and gender

distribution rate (79.8% of males with the mean age of 30.8 years in the first group, and 83.5% of males with the mean age of 32.6 years in the second group ($P = 0.19$ and 0.39 , respectively). In our study, wound infection developed in 2.6% and 1.8% of patients in the first and second groups, respectively ($P = 0.46$).

Conclusion: Based on the results of this study, oral and IV ABs were not significantly different in terms of preventing wound infection

Keywords: Hand laceration Oral antibiotic Intravenous antibiotic Wound infection

Validity of Ultrasound in Diagnosis of Tendon Injuries in Penetrating Extremity Trauma

Elnaz Vahidi*

Narges Mohammadrezaei

Javad Seyedhosseini

Tehran university of medical sciences

Tendon ruptures are common musculoskeletal injuries all around the world. Correct and timely diagnosis of tendon injuries is obviously important for improving the treatment and minimizing the community costs. Ultrasound is now being considered as one of useful modalities in this area.

Objective: The preset study is going to validate the diagnostic ability of ultrasound in tendon injuries induced by penetrating extremity trauma.

Methods: In this prospective, observational study, patients with penetrating extremity trauma and suspicion of tendon injuries were enrolled in our study. A team of emergency medicine (EM) residents performed ultrasound examination in these cases after attending the specific workshop and acquiring necessary skills in normal and abnormal tendon ultrasound examination. Then another team of either EM or orthopedic residents explored patients' wounds and determined intact or injured tendons under direct visual observation. The results were analyzed to validate sensitivity and specificity of ultrasound as an alternative diagnostic test.

Results: Seventy-one patients were enrolled in our

study and 11 patients were excluded during one year in 2014. Sixty patients, 11 with lower extremity and 49 with upper limb injuries were evaluated, among them 32 patients had extensor zone and 28 patients had flexure zone injuries. The overall sensitivity and specificity were calculated 94.4% (95% CI 72.7–99.8%) and 100% (95% 91.5–100.0%) respectively.

Conclusions: Our results were similar to previous findings. Ultrasound can effectively differentiate injured from intact tendons in penetrating extremity trauma.

Keywords: Intact tendons, Injured tendons, Penetrating extremity trauma, Ultrasound

Effect of Contractubex Phonophoresis for Post-surgery Carpal Tunnel Syndrome Scar: A Case Study

Fateme Bokae

Isfahan university of medical science

Introduction: scars after surgery of carpal tunnel syndrome is a chronic complication of this surgery. Scars can cause pain, paresthesia and discomfort. Various treatment is utilized to diminish this type of scar. The purpose of this case study was to determine the effect of Contractubex phonophoresis on post-surgery scar of carpal tunnel syndrome.

Method: MS was a 45 years old women. She had surgery for carpal tunnel syndrome 40 days ago. She referred to physiotherapy for controlling pain and paresthesia. In physiotherapy sessions focus was on mobilization of scar tissue to decrease adhesion and paresthesia. For better scar management phonophoresis of Contractubex ointment was applied 10 session on scar.

Result: After 10 session of phonophoresis, size of scar decreased and scar had better mobility. In addition, pain and paresthesia were decreased.

Conclusion: Contractubex phonophoresis can be used for controlling size and mobility of post-surgery carpal tunnel syndrome scar.

Keywords: Physiotherapy, Phonophoresis, scar, carpal tunnel syndrome,

Effect of Viola Odorata Plant Extract on Wound Healing

Fatemeh Hayeri Mehrizi*

Mohaddeseh Zeinali Ali Abadi

Donya Safari

Reihaneh Seyedebrahimi

Medical Student, Student Research Committee, Qom University of Medical Sciences, Qom, Iran

Introduction: Wound healing is a complex process that involves a series of interconnected cellular and biochemical events aimed at restoring damaged tissues. researchers and scientists are continually exploring new ways to enhance and accelerate this crucial process. In recent years, there has been growing interest in the potential therapeutic properties of plant extracts, including *Viola odorata*, also known as the sweet violet. This plant possesses a rich history in herbal medicine and studies have shown promising results regarding its ability to facilitate the different stages of wound repair and recovery.

Method: Data were obtained by searching keywords in PubMed and Google Scholar from 2017 to 2023.

Result: *Viola odorata* is a small perennial flower from the *Violaceae* family that contains bioactive compounds such as flavonoids, saponins, alkaloids, and essential oils, which contribute to its potential therapeutic benefits. This plant extract has anti-inflammatory properties that help reduce inflammation and create an optimal environment for healing. This effect can be attributed to its rich content of flavonoids and other bioactive compounds that have anti-inflammatory effects by inhibiting specific signaling pathways in the body. It contains strong antioxidants that fight the damaging effects of free radicals, protecting cells and promoting their regeneration. In addition, Studies have suggested that *Viola odorata* extract may stimulate collagen synthesis, so promoting wound closure and tissue regeneration. This action can contribute to faster healing and the formation of stronger scars. Also, it exhibits antimicrobial properties due to its bioactive compounds, which can help prevent microbial colonization of wounds and reduce the risk of infection. This natural defense mechanism allows

wounds to heal efficiently without complications.

Conclusion: *Viola odorata* has a long-standing reputation in traditional medicine and shows potential as an adjunctive therapy for wound healing. The plant extract's anti-inflammatory, antioxidant, collagen-stimulating, and antimicrobial properties contribute to its effectiveness in promoting wound closure and tissue regeneration. Further research, including clinical trials, is needed to determine the optimal formulation, dosage, and application methods for *Viola odorata* extract in wound healing treatments. Also, future studies can be performed to determine the molecular mechanisms of *Viola odorata* in wound healing.

Keywords: *Viola odorata*, wound healing, Medicinal plants

Wound Management at Home: A Crucial Part of Cancer Palliative Care

Fatemeh Kargar^{1*}

Negar Asad Sajjadi¹

Mahindokht Sayadinia¹

Ghasem Hajilou¹

Babak Arjmand²

1. Iranian Cancer Control Center (MACSA), Tehran, Iran

2. Cell Therapy and Regenerative Medicine Research Center, Endocrinology and Metabolism Molecular-Cellular Science Institute, Tehran University of Medical Sciences, Tehran, Iran/ Iranian Cancer Control Center (MACSA), Tehran, Iran

Introduction: In cancer patients, various types of wounds may be developed due to immobility, underlying diseases, malnutrition and treatment procedures. These include pressure ulcers, malignant ulcers, diabetic foot ulcers, and surgical wounds. Cancer patients can be involved with pressure sores, which can be associated with significant complications and mortality. The Iranian Cancer Control Center (MACSA) is a facility that provides palliative and supportive services, including wound prevention and treatment for hospitalized and inpatient cancer patients.

Materials and Methods: The main objective of

this research is to demonstrate the frequency and percentage of wound treatment services provided by MACSA in Tehran from May 2018 to September 2023. This study focuses on patients whose information has been extracted from the home care MACSA database.

Results: MACSA has successfully provided home care for 3,044 patients. Additionally, 189 out of 3,044 subjects, which accounts for 6.21 percent of all the patients in Tehran, have been receiving wound treatment services. 106 (56.10%) males and 83 (43.90%) females were included. The most common site of ulceration in patients was the buttock area, which occurred in 26 patients (13.8%). The lowest occurrence of wounds was also observed in the elbow, with four patients (2.1%).

Conclusion: Ulcers can occur in cancer patients, causing numerous problems for both the patient and their caregivers. Due to the limited mobility experienced by many cancer patients, it is necessary to provide wound care services to palliative care patients in their homes, as well as in clinics and hospitals. Preventing the formation or exacerbation of wounds is crucial, particularly in the fields of supportive and palliative care. This requires training for patients, caregivers, and healthcare staff.

Keywords: Pressure Ulcer, Bed Sore, Cancer, Palliative Care

Evaluation of Healing Effects of Poultice Containing 0.5% Fulvic Acid on Male White-Male Rats with Skin Ulcer

Fatemeh Samieerad^{1*}

Nematollah Gheibi²

Ensiyeh Bahadoran³

Seyede Fatemeh Hosseini Sedighi⁴

Arman Taherkhani⁴

1. Professor of Pathology Department of Pathobiology, School of Medicine Qazvin University of Medical Sciences

2. Professor of Biophysics Department of Medical Biotechnology, School of Allied Medical Sciences Cellular and Molecular Research Center Research

*Institute for Prevention Non-communicable Diseases
Qazvin University of Medical Sciences*

*3. General Practitioner, Student Research Committee,
Qazvin University of Medical Sciences, Qazvin, Iran*

4. Qazvin University of Medical Sciences, Qazvin, Iran

Background: Chronic and acute skin wounds are an important health concern because they are very frequent during human life and affect millions of people worldwide. Shortening the wound healing process reduces treatment costs and hospitalization. Therefore, researchers have been looking for new treatment approaches to shorten the wound healing process.

Aims and Objectives: The aim of this study was to evaluate the wound healing properties of poultice containing 0.5% fulvic acid.

Materials and Methods: In this experimental study, a full-thickness skin wound was created on the dorsal side of 24 male rats. The animals were then randomly assigned to control, sham, and experiment groups. The skin defects were daily bandaged by using sterile gauze dipped in normal saline, carboxymethylcellulose, and 0.5% fulvic acid for 21 days, respectively. The wound healing rate was evaluated grossly and histologically at various time intervals post injury. Both descriptive and statistical analysis methods were applied ($P < 0.05$).

Results: The wound healing percentage was significantly higher in the poultice treatment group at all time intervals ($P < 0.001$). The wound was completely closed in this group compared with other groups at the end of week 4 post treatment. The mean numbers of inflammatory cells were statistically lower, and fibroblasts and vessels were higher in the poultice group than in the other groups at various time intervals post injury ($P < 0.001$).

Conclusion: Fulvic acid (0.5%) could be used as an effective therapeutic approach to improve the wound healing process because of its unique anti-inflammatory and neovascularization properties at the skin wound site.

Keywords: Anti-inflammatory treatment, fulvic acid, humic substances, wound healing

Effects of Silybum Marianum Oil in Nanostructured Lipid Carrier (NLC) on Skin Wound Healing

Tayyebbeh Ghaffari

*PhD of Pharmaceutical Sciences, Azarbaijan Student
Research Center, Tabriz, Iran*

Silymarin, a flavonoid from *Silybum marianum*, has been reported to have anti-inflammatory and antioxidant properties. Thus, it may be useful to study the effect of *Silybum marianum* oil (SM) on wound healing. On the other hand, nanostructured lipid carrier (NLC) is a useful delivery system for essential oil loading and combination of NLC and SM could be a potential candidate for the treatment of skin wounds. Cytotoxicity effect of SM-NLC and SM on HFF-2 cell line was determined by MTT assay. Cell migration assay was determined by scratch test on HFF-2 cell line. Our results showed that SM-NLC and SM prompted cell proliferation and migration capability in 24 and 48 hours. The results suggest that SM-NLC could be a potential source for promoting skin wound healing.

Keywords: *Silybum marianum*, nanostructured lipid carrier, wound healing

A Clinical Study on a Novel Wound Dressing for Acute and Chronic Wounds

Ghazal Shariat Panahi¹

Mohammad Darvishi²

Mehdi Akbarzadeh³

Maryam Barkhordari⁴

Amir Ghasemi^{1*}

1. Nano Fanavaran Narin Teb Co., Tehran, Iran

2. Infectious Diseases and Tropical Medicine Research Center (IDTMRC), Aerospace and subaquatic Medicine Faculty, AJAUMS, Tehran, Iran

3. Sadra Wound, Ostomy and Osteomyelitis Specialist Center, Tehran, Iran

4. Wound clinic of Imam Hussein Hospital Medical Center, Shahid Beheshti University of Medical Sciences and Health Services, Tehran, Iran

Objective: This clinical study aimed to evaluate the performance and safety of NanoEx wound dressing (Nano Fanavaran Narin teb Co., Iran) in the management of acute and chronic wounds. **Methods:** Forty patients suffering from wounds with different etiologies were enrolled. The wounds were evaluated for healing rate, wound area, wound bed tissue, exudate, and pain levels. Weekly assessments were done using wound evaluation forms and via digital photography. **Results:** After 21.25 days, wound area decreased by 70.6%, respectively, with a healing rate of 5.46 %/day. After 9 weeks, 57.5% of wounds completely healed with a healing rate of 5.7 %/day. Wound-related pain and exudate met a significant ($p < .001$) decrease, reducing by two and four points, respectively. The percentage of epithelialized tissue increased by 57.2%. Also, the percentage of slough and necrotic tissue decreased by more than 90%, showing a significant decrease ($p < 0.05$). **Conclusions:** In general, NanoEx wound dressing was safe and efficient for the treatment of acute and chronic wounds.

Keywords: burn, exudate, infection, pain, wound dimension, wound healing

Anti-biofilm and Antibacterial Effect of Psoralen Plus Ultraviolet-A (PUVA) Treatment Against Staphylococcus Aureus Isolated from Patients Wounds

Hadis Sadri¹

Mahshid Akhoondian²

Parastoo Ehsani³

Mohammad Pooya^{4*}

1. PhD Student, Medical Bacteriology, Department of Molecular Biology, Pasteur Institute of Iran, Tehran, Iran

2. Bachelor of Biology, Department of Molecular Biology, Pasteur Institute of Iran, Tehran, Iran

3. PhD of Medical Biotechnology, Department of Molecular Biology, Pasteur Institute of Iran, Tehran, Iran

4. MD / PhD of Medical Biotechnology, Department of Molecular Biology, Pasteur Institute of Iran, Tehran, Iran

Background and Objective: Staphylococcus

aureus is a major pathogen associated with wound infections, and the formation of biofilms by this bacterium poses significant challenges to successful treatment. Biofilms not only protect bacteria from antibiotics but also contribute to chronicity and recurrence of infections. Therefore, novel strategies are urgently required to prevent biofilm formation. This study aimed to investigate the potential of phototherapy with psoralen-ultraviolet A (PUVA) as a new treatment method for preventing biofilm formation in S. aureus samples isolated from patients' wounds.

Material and Methods: A total of 30 wound specimens were collected from patients diagnosed with S.aureus infections. The isolates were phenotypically confirmed using standard microbiological techniques. Biofilm-forming ability was assessed using crystal violet staining and microtiter plate assays. PUVA treatment involved exposing the bacterial isolates to a combination of 8-methoxypsoralen(8-MOP) and ultraviolet A radiation at specific wavelengths and doses. Control groups consisting of untreated bacteria and bacteria treated with either psoralen or ultraviolet A alone were included for comparison.

Results and Discussion: PUVA treatment significantly inhibited biofilm formation and bacterial growth ability of S. aureus strain when the UVA dose was 1000 mj/cm² and the 8-MOP concentration was 50 µg/ml or more. However, when the UVA dose decreased to 500 mj/cm², inhibition of biofilm formation started from 8-MOP concentration of 75 µg/ml.

Conclusion: PUVA treatment has been found to significantly reduce biofilm formation in a dose-dependent manner in S. aureus. The optimal conditions for inhibiting biofilm formation were a 75 µg/ml concentration of 8-MOP and a 500 mj/cm² UVA dose. Further research is needed to explore the mechanisms underlying the inhibitory effects of PUVA treatment and to evaluate its potential clinical applications in preventing biofilm formation and improving the management of S. aureus infections.

Keywords: PUVA, biofilm, Staphylococcus aureus, 8-methoxypsoralen

Quality of Life Assessment Among Older Adults Patient with Chronic Wounds

Hamed Savadkoohi^{1*}

Mahdi Akbarzadeh Amirdehi²

Salman Barasteh³

1. Student Research Committee, School Of Nursing & Midwifery, Shahid Beheshti University Of Medical Sciences, WOC Specialist Nurse, Geriatric Nurse, Tehran, Iran

2. The Head of Wound and Ostomy Department, Baqiyatallah Hospital (IIWCC-EWMA-ICW-WOC-ET Nurse), Tehran, Iran

3. Health Management Research Center, Baqiyatallah University of Medical Sciences, Tehran, Iran

Background and Aim : Patients with chronic wounds experience various biopsychosocial problems which severely affects their quality of life (QoL). Thus, a Persian instrument to assess the QoL of these patients is required. This study aimed to determine the psychometric properties of the Persian version of the wound-QOL questionnaire.

Methods: This methodological study was performed on Iranian patients during 2021-2022. The translation was carried out via forward-backward method. Face validity was addressed with 10 patients and content validity with 12 wound specialists. Construct validity was also assessed by performing exploratory factor analysis (EFA) (n=100) and convergent validation with EQ-5D-3L plus Pain VAS Score and known-groups validity. The reliability was assessed by internal consistency using Cronbach's alpha coefficient and test-retest.

Results: A total of 100 patients with chronic wounds were included in the study. Two factors with cumulative variance of 65.39% were extracted during EFA. The results revealed a significant and high correlation between the total scores of wound-QOL questionnaire, the Persian version of EQ-5D-3L ($p = 0.000$, $r = 0.502$), and Pain score (0-10; $p = 0.000$, $r = 0.627$). The Cronbach's alpha was 0.743 and stability of the questionnaire ($\alpha = 0.872$) was confirmed. In confirming the known-groups validity, the results showed that this tool can differentiate the QOL of patients with different wounds.

Conclusion: The Persian version of the wound-QOL

questionnaire is a valid and reliable questionnaire which can measure the QoL of patients with chronic wounds. This instrument can be used in clinical evaluation as well as research purposes across the Iranian population.

Keywords: EQ-5D-3L; Iran; Persian; chronic wound; quality of life; reliability; validation; wound-QOL questionnaire.

Skin Ulcers Treatment of Breast Cancer with Collagen Superabsorbent Powder Containing Silver Nanoparticles

Hamidreza Zeynali

Nursing Expert, Isfahan, Iran

Background: Breast cancer (BC) with skin ulceration is one of the main causes of cancer-associated deaths in women worldwide that imposes substantial medical and economic burden because often unsuccessful therapeutic methods. At now, Nanotechnology offers potential solutions to selectively target BC cells without causing any impairments to the adjacent normal tissues or organs. Therefore, the aim of the present study was to assay the skin ulcers improvement of BC with nano silver particles.

Materials and Methods: In this study, we present the case of a tissue ulceration of left breast of a female patient with breast cancer that underwent nanotherapy (collagen superabsorbent powder containing 15 ppm nano silver particles) at the same time as chemotherapy (Hydrocortisone), and head and neck radiotherapy.

Results: Within two months, the wound was almost completely cured and any side effects was not observed during treatment and after 6 months of follow. At the same time as the wound healed, the supraclavicular and axillary mass gradually also became smaller and the sound in the left lung decreased. So that, after 8 month the sound of the lungs became normal.

Conclusion: We recommend collagen superabsorbent powder containing silver nanoparticles as adjunctive therapy or even alternative treatment in the skin ulcers treatment of Breast cancer. Further studies on greater

population are needed to confirm this finding.

Keywords: Breast cancer, Nanotechnology, Nano silver particles, Chemotherapy, Radiotherapy.

Simvastatin-releasing Self-assembled Peptide Hydrogels Improves Wound Healing in Diabetic Mice

Haniyeh Najafi¹

Zahra Janipour²

Samira Sadat Abolmaali³

Reza Heidari⁴

Negar Azarpira⁵

Ali Mohammad Tamaddon^{3*}

1. Pharm.D & Ph.D., Pharmacy & Pharmaceutical Nanotechnology, Pharmaceutical Nanotechnology Department, Shiraz University of Medical Sciences, Shiraz, , Iran

2. Pharm.D , Pharmacy , Center for Nanotechnology in Drug Delivery, Shiraz University of Medical Sciences, Shiraz, , Iran

3. Ph.D. , Pharmaceutics , Center for Nanotechnology in Drug Delivery, Shiraz University of Medical Sciences, Shiraz, , Iran

4. Ph.D. , Toxicology , Pharmaceutical Sciences Research Center, Shiraz University of Medical Sciences, Shiraz, , Iran

5. Ph.D. , Pathologist , Transplant Research Center, Shiraz University of Medical Sciences, Shiraz, , Iran

Wound healing is one of the major global health concerns in diabetic patients. Simvastatin (SMV) is a poorly soluble oral cholesterol-lowering drug that may help diabetic wound healing. In the current study, a thixotropic peptide hydrogel of Fmoc-dipeptide containing SMV was designed to accelerate skin wound healing effectively and safely in diabetic mice. Fmoc-dipeptide hydrogels were prepared at various concentrations using the solvent triggering technique and characterized by spectroscopic methods such as attenuated total reflection FT-IR and fluorimetry. Mechanical behaviors were explored by oscillatory rheology. In model mice, the regenerative potential of Fmoc-dipeptide-SMV hydrogel was evaluated in terms of wound contraction and closure, tissue

regeneration, acute and chronic inflammation, granulation, and re-epithelization. The results showed that Fmoc-dipeptide-SMV hydrogels had an entangled nanofibrous microstructure and shear-thinning characteristics. Fmoc-dipeptide-SMV demonstrated a sustained drug release over seven days. Compared to unloaded Fmoc-dipeptide hydrogel, treatment with Fmoc-dipeptide-SMV led to superior diabetic wound recovery and reduced inflammation. Therefore, the utilization of sustained-release Fmoc-dipeptide-SMV hydrogel formulation could become an attractive choice for topical wound therapy in diabetes patients.

Keywords: Diabetic wound, Fmoc-dipeptide, Hydrogel, Nanofiber, Simvastatin

Topical Administration of Teucrium Polium on Diabetic Foot Ulcers Accelerates Healing: A Placebo-Controlled Randomized Clinical Study

Hasan Fallah Huseini¹

Shapour Badiie Aval^{2*}

Yaghoobi Maryam³

Ziae Mojtaba⁴

1. Medicinal Plants Research Center, Institute of Medicinal Plants, ACECR, Karaj, Iran

2. Department of Complementary and Chinese Medicine, School of Persian and Complementary Medicine, Mashhad University of Medical Sciences, Mashhad, Iran

3. Department of Epidemiology, Iran University of Medical Sciences, Tehran, Iran

4. Medicinal Plants Research Center, Maragheh University of Medical Sciences, Maragheh, Iran

Diabetic foot ulcer is one of the most devastating complications of uncontrolled diabetes. Although there have been advances in the management of diabetic foot ulcers, still diabetic foot ulcers are a major cause of many amputations in diabetic patients. Teucrium polium (T. polium) is widely used by folk medicine practitioners in Iran for the treatment of diabetic ulcers. The present study was designed to evaluate the safety and efficacy of topical T. polium ointment

besides the standard treatment in diabetic foot ulcers. A total of 70 diabetic patients with foot ulcers grade 1 or 2 according to Wagner's scale were enrolled in this study. Patients were randomly divided into two groups. Patients in both groups received standard treatment for diabetic foot ulcers. In addition, group 1 received topical T. polium ointment, and group 2 received topical placebo ointment for 4 weeks. The T. polium and placebo ointments were rubbed twice daily two hours before the conventional dressing. The ulcer size, healing time, and laboratory tests were measured in both groups at baseline and end of the study after 4 weeks. Twenty-nine patients remained in the T. polium group and 26 in the placebo group until the end of the study. The mean surface area of ulcers was 3.52 ± 1.47 and 3.21 ± 1.67 cm² in T. polium group and placebo group respectively at baseline which decrease to $.717 \pm .19$ and $1.63 \pm .72$ cm² respectively at the endpoint. The mean ulcer surface area was significantly lower in T. polium compared with the placebo group ($p < .0001$) at end of the study. Also, the number of patients that completely recovered in the T. polium group was significantly higher than the placebo group ($p < .001$) at the end of the study. The addition of topical T. polium ointment to standard treatment significantly improves the healing time of diabetic non-infected foot ulcers.

Keywords: eucrium polium, diabetic foot ulcer, herbal medicine, randomized clinical trial, topical ointment.

Clinical Efficacy Assessment of Potential Biological Indicators Present in Diabetic Foot Ulcers (DFUs) Exudates in Predicting Wound Healing Progress: A Systematic Review

Hooman Taghavi

BSN, Yara Wound and Tissue Repair Clinic, ACECR, Tehran, Iran

Introduction: The aim of this research was to detect potential biological indicators that have been documented in the wound exudate of diabetic foot and assess their capacity to accurately manifest the present

and forthcoming process of healing in diabetic foot.

Method: A systematic inquiry was conducted in accordance with the PRISMA methodology across three designated databases: Scopus, Embase and MEDLINE. Employing carefully selected keywords and expressions, the search produced a total of 3254 outcomes.

Results: After applying predefined inclusion and exclusion criteria, a comprehensive analysis was conducted using a total of 17 selected papers. Out of these, five papers provided insights into the sequential temporal changes of biological indicators within wounds. Additionally, six papers investigated the baseline measures and their association with the rate of healing and/or final outcome of healing. Four papers presented data on both endpoints, while two papers specifically concentrated on the baseline levels of biological indicators in a generalized cohort of individuals with diabetic foot ulcers.

In the collective analysis of these papers, a total of 35 distinct biological indicators were detected in the diabetic foot exudate of 900 patients. These biological indicators encompassed a range of categories, such as cytokines, growth factors, proteases, chemokines and protease inhibitors. It is worth noting that proteases represented the largest subgroup, accounting for 16 markers (34.8%) of the investigated biological indicators across seven studies. Among the proteases, matrix metalloproteinase-9 (MMP-9) stood out as the most extensively studied enzyme, demonstrating significant potential as a biomarker in five of the studies.

Conclusion: The association between wound bacterial profiles and the outcome of wound healing showed variations across the five studies that examined this aspect. Furthermore, one study focused on biophysical markers, such as measuring the pH of wound exudate, instead of traditional biological indicators. In general, the quality of the studies included in the analysis was deemed to be high. However, conducting quantitative comparisons between the papers proved challenging because of the variations in experimental setup, including differences in sampling methods and evaluation techniques.

Keywords: Diabetes, Diabetic foot ulcer, Biological indicators, wound exudate, ulcer, wound healing

Efficacy Of Silicone Gel in Reducing Scar Formation After Hypospadias Repair: A Randomized Placebo-Controlled Trial

Iman Shamohammadi^{1*}

Mehdi Shirazi²

Ali Akbar Mohammadi²

Iman Shamohammadi¹

1. Assistant professor of Urology, Department of Urology, Shiraz University of Medical Science, Iran, Shiraz

2. Department of Urology, Shiraz University of Medical Science, Iran, Shiraz

Background: Hypospadias is one of the most common congenital disorders of the urogenital system that is repaired by surgical method. Literature review shows that silicone gel is effective in preventing and improving hypertrophic scars after surgery. Thus, we conducted this study to evaluate the effect of silicone gel on scar reduction after surgical repair of hypospadias.

Materials and methods: In this randomized double-blind clinical trial, 64 patients who had undergone surgical repair of hypospadias were divided into two groups: 32 patients in the intervention group (silicone gel) and 32 in the control group (placebo). Then, the patients in the silicone gel treatment group were treated twice per day for two months on the site of surgical wound, and the patients in the control group were treated with Vaseline twice per day for two months on the site of surgical wound, too. Scar characteristics (pigmentation, vascularity, pliability, and height) were recorded based on Vancouver's scars scale. Finally, the results of the two treatments on reduction of scars after surgical repair were compared between the two groups. Data were analyzed using SPSS-24.

Results: There were significant differences between the two groups in scar characteristics after surgical repair of hypospadias, such as vascularity, pliability, and height ($P < 0.05$); however, there was no significant difference in pigmentation ($P > 0.05$).

Conclusion: The results of this study showed that silicone gel had considerable effects on reduction

of scars after surgical repair of hypospadias. However, further studies with larger sample size are recommended to confirm our conclusion.

Keywords: hypospadias, silicone gel, scar

Comparison of Low Level Laser Therapy and High Intensity Photobiomodulation on Physiologic Parameters in Patients with Carpal Tunnel Syndrome

Kamran Ezzati^{1*}

E-Liisa laakso²

Alia Saberi³

Shahrokh Yousefzadeh Chabok³

Ebrahim Nasiri³

Babak Bakhshayesh Eghbali³

1. PT, PhD, Associate professor: Neuroscience Research Center, Poorsina Hospital, Faculty of Medicine, Guilan University of Medical Sciences, Rasht, Iran

2. School of Allied Health Science, Griffith University, Gold Coast, Australia

3. Neuroscience Research Center, Department of Neurology, Poursina Hospital, Guilan University of Medical Sciences, Rasht, Iran

Background: Carpal tunnel syndrome (CTS) is a common peripheral nerve disorder of the wrist. Nonsurgical treatments e.g. laser therapy may cause potential beneficial effects.

Aim: To compare the dose dependent effects of low level laser therapy (LLLT) and high intensity laser therapy (HILT) on pain and electrophysiology studies in patients with CTS.

Design: Double-blind randomized controlled trial.

Setting: Outpatient physiotherapy clinic.

Population: Ninety-eight participants with CTS, aged between 20 to 60 years, were randomly assigned to five groups.

Methods: All participants undertook four standard exercises, with one group serving as exercise-only controls. Patients were randomly allocated to either high or low fluence LLLT or high or low fluence HILT

received over 5 sessions. All patients were assessed by visual analogue scale, median compound muscle action potential (CMAP) and sensory nerve conduction studies before and 3 weeks after the interventions.

Results: VAS was significantly lower in all groups after 3 weeks ($P<0.05$). CMAP latency decreased in all groups. The interaction of group and time (5×2) was significant for pain ($P<0.001$), the latency of CMAP ($P=0.001$) and CMAP amplitude ($P=0.02$). The interaction of group and time was not significant for the CMAP conduction velocity, sensory nerve latency and amplitude ($P>0.05$).

Conclusions: HILT with a power of 1.6 W and low fluence of 8 J/cm² was superior in reduction of pain and improvement of the median motor nerve electrophysiological studies compared to LLLT and exercise-only control groups.

Clinical Rehabilitation Impact: LLLT and HILT in conjunction with exercise program are effective in reducing pain and improving median motor nerve conduction studies of the patients with CTS. It seems that high power and low fluence laser therapy is better than LLLT and exercise interventions to treat these patients.

Keywords: Carpal tunnel syndrome, low-level light therapy, photobiomodulation, physiologic studies

Effect of Aqueous Extract of Tribulus Terrestris on Pressure Ulcer: A Case Report

Arian Karimi Rouzbahani¹

Zahra Goudarzi²

Nahid Madhani³

Golnaz Mahmoudvand¹

Abdolrazagh Marzban^{4*}

1. Student Research Committee, Lorestan University of Medical Sciences, Khorramabad, Iran, USERN Office, Lorestan University of Medical Sciences, Khorramabad, Iran

2. Students' Scientific Research Center, Tehran University of Medical Sciences, Tehran, Iran

3. Department of Nursing and Wifery, Lorestan University of Medical Sciences, Khorramabad, Iran

4. Razi Herbal Medicines Research Center, Lorestan University of Medical Sciences, Khorramabad, Iran

Introduction: A pressure ulcer is a form of wound in which an area of skin is continuously compressed for a predetermined amount of time, leading to the decomposition of the skin and the underlying tissue, tissue ischemia, disruption of the delivery of nutrients and oxygen to the tissues, and finally tissue necrosis. The most appropriate way to describe a pressure ulcer is probably constant pressure that causes a distortion or deformity damage. Any tissue that is subjected to an external force (shear, compression, or a combination of the two) sustains a localized and acute ischemic damage. There are several ways to cure pressure ulcers, including the use of medicinal herbs, wound cleansing, debridement, appropriate dressing, etc. Tribulus terrestris is the name of a plant that is widely used in traditional medicine and contains compounds of flavonoids, alkaloids, saponins, lignin, amides, and glycosides, and for this reason, it has many anti-inflammatory, antimicrobial, and antioxidant properties. In traditional medicine, this plant is usually used to protect the liver, reduce blood fat and anti-cancer activities. The purpose of this study is to report a case related to the positive effect of Tribulus terrestris plant on accelerating the wound healing process.

Methods: The plant material was gathered in Tribulus terrestris (24° 18 'S and 49° 37' W), in September 2023. The leaves were dried and then stored, where they were protected from light and moisture. To prepare and use the aqueous infusion, the aqueous extract of the leaves was prepared with 1 liter of boiling water. During the boiling process (100 °C) 1.4 g of dried leaves (five leaves) of Tribulus terrestris were submerged and left for five min. Then the affected area of the sacrum was soaked in the solution for 20 minutes, when the temperature was around 40 degrees Celsius, and the leaves remained on the wound during this time, and it was covered with a bandage.

Results: The patient is a 75-year-old man who has been using a wheelchair for 5 years and is unable to move his lower limbs on his own, and he complained of pain in the Batex area. He notices a wound in this area and goes to the hospital in August 2023. First, the patient's wound is evaluated and a grade 2 wound is diagnosed, and routine wound care such as cleaning the wound and changing the dressing is performed for him. It also uses the aqueous extract of Tribulus terrestris

plant for 20 days, which accelerates the wound healing proc

Keywords: Tribulus terrestris, pressure ulcer

The Synergistic Effect of Achillea Millefolium L. and Matricaria Recutita L. Herbal Extracts on Healing of Stomach Surgical Wounds in Rat

Ehsan Khoshbaten¹

Amirreza Karami^{2*}

Seyedhossein Jarolmasjed³

Ali Rezapour⁴

1. Department of Veterinary Clinical Sciences, Faculty of Veterinary Medicine & Agriculture, Shabestar Branch, Islamic Azad University, Shabestar, Iran

2. Assistant Professor of Pharmacology, Department of Veterinary Medicine, Faculty of Veterinary Medicine & Agriculture, Shabestar Branch, Islamic Azad University, Shabestar, Iran

3. Associate Professor of Veterinary Surgery, Department of Clinical Sciences, Faculty of Veterinary Medicine, University of Tabriz, Iran

4. Assistant Professor of Clinical Pathology, Department of Veterinary Clinical Sciences, Faculty of Veterinary Medicine & Agriculture, Shabestar Branch, Islamic Azad University, Shabestar, Iran

Background: Since wound and its treatment, especially surgical wounds, are an important issue, we are trying to provide methods that have less side effects in addition to quick and effective treatment. From the past until now, herbal extracts have been used to heal wounds and they had effects on wound healing due to their properties. This has made researchers to have a special look at herbs and their effect on tissue and wound healing. Achillea Millefolium and Matricaria Recutita herbal extracts have anti-inflammatory and antioxidant effects and have been used as wound healers since ancient times. The purpose of this study is to investigate the histopathological effects of two herbal extracts, Achillea Millefolium L. and Matricaria Recutita L., and their synergistic effects on wound healing caused by gastrotomy surgery of female rat.

Materials and Methods: In this study, 55 adult albino Wistar female rats were randomly divided into 5

groups of 11. First, a sample of hydroalcoholic extract of the plant was prepared by maceration method. All rats were subjected to gastrotomy surgery. The first group or control group received irrigation with the same amount as other groups of normal saline. The second, third, fourth and fifth groups as treatment groups, respectively, received 500 mg/kg Achillea extract, 200 mg/kg Matricaria extract and combination of both extracts with the mentioned dose and 20 mg/kg of omeprazole. The extracts, omeprazole and normal saline was given orally by Gavage every 24 hours for 14 days. Thereafter, on days 3, 7 and 14 the extent of wound healing was evaluated.

Results: Amount of vascularization, fibroblast cell and the percentage of organization of collagen fibers in combination of Achillea Millefolium and Matricaria Recutita treatment group were significantly higher than control group in 7th and 14th day, and the size of the remaining gap in the wound opening was significantly lower than the control group.

Discussion: The combination of Achillea Millefolium L. and Matricaria Recutita L. extracts with a positive synergistic effects result in better wound healing of surgical wounds caused by gastrotomy surgery and it can be used as effective as Omeprazole. each of the two extracts had an inflammatory effect on gastric surgical wounds by their own but their combination and synergistic effect together had a better performance.

Keywords: Histopathological, Achillea Millefolium L., Matricaria Recutita L., Wound healing, Gastrotomy, Omeprazole.

The Therapeutic Potential of Human Umbilical Cord Mesenchymal Stromal Cells for Wound Healing: Harnessing Exosomes as a Cell-free Therapy

Leila Dehghani¹

Ali Shojaeian^{2*}

1. Isfahan University of Medical Sciences

2. Research Center for Molecular Medicine, Hamadan University of Medical Sciences, Hamadan, Iran.

Wound healing is a complicated process that involves many different types of cells and signaling pathways. Mesenchymal stromal cells (MSCs) have shown great potential as a treatment to improve wound healing because they can modulate inflammation, promote the growth of new blood vessels, and stimulate the regeneration of tissue. Recent evidence indicates MSC-derived extracellular vesicles known as exosomes may mediate many of the therapeutic effects of MSCs on wound healing. Exosomes contain bioactive molecules such as proteins, lipids, and RNAs that can be transferred to recipient cells to modulate cellular responses. This article reviews current evidence on the mechanisms and therapeutic effects of human umbilical cord MSC (hUCMSC)-derived exosomes on wound healing. In vitro and animal studies demonstrate hUCMSC-derived exosomes promote fibroblast proliferation/migration, angiogenesis, and re-epithelialization while reducing inflammation and scar formation. These effects are mediated by exosomal transfer of cytokines, growth factors, and regulatory microRNAs that modulate signaling pathways involved in wound healing. Challenges remain in exosome isolation methods, optimizing targeting/retention, and translation to human studies. Nevertheless, hUCMSC-derived exosomes show promise as a novel cell-free therapeutic approach to accelerate wound closure and improve healing outcomes. Further research is warranted to fully characterize hUCMSC-exosomal mechanisms and explore their clinical potential for wound management.

Keywords: Wound healing, hUCMSC, Exosomes, Tissue regeneration, Extracellular vesicles

Nursing Interventions to Prevent Pressure Ulcers in 2023

Maedeh Nasirifar

Bachelor of Nursing Student, Falavarjan Islamic Azad University, Isfahan, Iran

Problem Statement: Pressure ulcers (PUs) are a common concern in most healthcare settings. PUs lead to harm to the patient, including pain, complications, suffering, impact on quality of life, increased length

of stay in the hospital, significant financial burden, and premature death in some patients. When diagnosis is delayed, patients' health conditions deteriorate. To reduce the incidence of PU, efforts must first be focused on prevention. The first step in preventing PU is to identify patients who are at risk. The second step is to confidently implement prevention strategies for all at-risk patients. Most of the studies show the lack of awareness of the nursing team in some specific areas, including PU preventive measures. Providing regular and sustainable health education for nurses is considered as one of the determining components of prevention methods. The risk identification process uses a structured risk assessment, including a skin assessment, and is a well-established approach. It is clear that PU starts silently and is like an iceberg. It is very dangerous under the surface, but discreet on the surface. Therefore, a specific and accurate nursing diagnosis for this clinical condition, with a clear definition and well-defined risk factors for this health issue, helps the nurse in the clinical judgment process and also supports her in choosing preventive interventions. The cornerstones of evidence-based pressure ulcer prevention guidelines include risk assessment, supportive levels, regular repositioning, good skin care, and adequate nutrition. More research is needed to understand the relationship between preventive nursing care and PUs and to guide effective prevention and treatment approaches. In this review article, we examine preventive nursing care for pressure ulcers in 2023.

Materials and methods: This systematic review was conducted with the aim of summarizing the practice of nurses and factors related to PU. Towards the prevention of PU, an extensive search was systematically conducted in electronic databases such as Scopus, PubMed, Web of Science, Scientific, etc. from 2015 to 2023. The articles included in the study include English language articles.

Conclusion: Training of nurses is considered as an integral part of pressure ulcer prevention. Nurses' knowledge is increased by continuous education in the field of PU prevention. The results of this study can help to improve the performance of nurses in the prevention of PU.

Keywords: Pressure ulcer, nursing interventions, prevention, education, risk tool, dressing, nutrition, change of position

Fabrication of Electrospun Poly (Lactic Acid) - Amnion Nanofibrous Membrane for Wound Healing Application

Mahsa Delyanee¹

Saeed Javadi Anaghizi²

Mehdi Jahanfar³

Sara Tabatabaee⁴

Reza Samanipour⁵

Amirhossein Tavakoli^{6*}

1. Biomedical Engineering Department, Amirkabir University of Technology, Tehran, Iran

2. Laser and Plasma Research Institute, Shahid Beheshti University, Tehran, Iran

3. Faculty of Life Sciences and Biotechnology, Shahid Beheshti University, Tehran, Iran

4. Bio-Computing Department, Interdisciplinary Sciences and Technologies Faculty, Tarbiat Modares University, Tehran, Iran

5. Research and Development Department, Iranian Tissue Product Company, Tehran, Iran

6. Iranian Tissue Bank and Research Center, Tehran University of Medical Sciences, Tehran, Iran

The amnion constitutes the deepest layer of fetal membranes, shaping a sac that contains amniotic fluid, thereby surrounding and protecting the developing embryo. The human amniotic membrane (AM) is the innermost layer of the three layers that forms the membrane surrounding the fetus, which itself consists of five layers: Cuboidal epithelium layer, Thick basement membrane, Compact layer, Fibroblastic layer and Spongy layer. The amniotic epithelial cells produce numerous cytokines/factors known to promote cell proliferation and differentiation. As reported by several authors, even after deepithelialization and sterilization of the membrane, at least some of these biologically active factors may remain bound to components of the extracellular matrix (ECM). These components include glycoproteins; proteoglycans; collagen fibers, mainly types I, III and IV; and large amounts of polymeric hyaluronan.

AM has been widely used in the treatment of abdominal and pelvic adhesions, ophthalmic surgery, and chronic skin ulcers, due to their low immunogenicity. This tissue was first used in skin grafting in 1910. Since then, there

have been numerous reports of the outstanding impact of this membrane in different fields of tissue engineering. It is not fully understood how exactly AM accelerates the healing process of the damaged tissue, but what is certain is that the structural and biochemical effects of the membrane, due to the great similarity between natural skin and AM as well as the presence of numerous growth factors, cytokines, anti-inflammatory factors, angiogenic factors, anti-scar factors, antimicrobial peptides, etc., are the main reasons for its unique properties. Despite all the remarkable features of AM as a suitable skin substitute, its poor mechanical properties and high biodegradability have limited its application as a skin graft. Considering this issue, it is suggested that the AM can be used in combination with some materials that have stronger mechanical properties. Hence, its combination with biocompatible synthetic polymers can be one of the strategies. In this study, an electrospun poly(lactic acid) (PLA)- AM nanofibrous membrane was prepared and characterized as a wound dressing. The results indicated that fibrous membrane based on PLA- AM has great potential to be used in wound healing applications.

Amniotic membrane (AM), Composite membrane, Electrospinning, Nanofibers, Poly(lactic acid) (PLA), Wound healing

Burn Wound Healing Effect of Mesenchymal Stem Cells Seeded into Collagen-Chitosan

Mahsa Koukaeyan^{1*}

Rahim Ahmadi²

Abbas Vakilian³

1. MA in Animal Physiology, Faculty of Medical Sciences, Islamic Azad University, Hamadan Branch; Technician of the Specialized Center of Medical Diagnostic Laboratory of Academic Jihad, Hamedan Branch, Hamedan, Iran

2. PhD, Department of Biology, Hamedan Branch, Islamic Azad University, Prof. Mousivand Blvd, Hamedan, Iran; Avicenna International College, Budapest, Hungary

3. Master's Degree in Animal Physiology, Faculty of Medical Sciences, Islamic Azad University, Zanjan Research Sciences Branch; The Director of the Specialized Center of Medical Diagnosis Laboratory of Academic Jihad, Hamedan Branch, Hamedan, Iran

Skin burn healing is still a major issue and treatments aim to accelerate the burn healing process to minimize the associated complications. Despite the fact that a wide range of wound dressings have been designed, few of them act well and sufficiently in repairing and protecting the burn wounds. This study aimed to investigate the accelerating effect of mesenchymal stem cells (MSCs) seeded collagen-chitosan hydrogel on burn wound healing in rats. In this in vitro study, adipose tissue was obtained from 10 patients undergoing liposuction surgery and MSCs were isolated and identified. Cell viability was measured by MTT assay method. The cells were examined for apoptosis and expression of surface markers using flow cytometry. Burn wounds were created on the back of rats and the animals were divided into: control group (n=6), and groups treated with MSCs (n=6), treated with collagen-chitosan hydrogel (n=6), and treated with MSCs seeded collagen-chitosan hydrogel. The healing process of burn wounds was evaluated quantitatively and qualitatively on days 7, 14 and 21 after treatment. Data were analyzed using ANOVA. The wound closure, and skin re-epithelialization, vascularization, collagen synthesis, thickness, density and elasticity at the transplant site was highly promoted by MSCs seeded collagen-chitosan hydrogel than MSCs or collagen-chitosan hydrogel alone ($P < 0.001$). Dressing of burn wounds with MSCs seeded collagen-chitosan hydrogels has significant potential to accelerate the process of burn wound healing.

Keywords: Mesenchymal stem cells, Collagen - chitosan hydrogel, Burn wound healing, Elasticity, Rat

Fabrication and Evaluation of Properties of 3D Scaffolds Based on Polyethylene Oxide and Poly (Glycerol Sebacic Acid) for Use in Skin Tissue Engineering

Mahtab Tirgar¹

Arash Goodarzi^{2*}

Vahabodin Goodarzi³

Zahra Abpekar²

Ahmad Reza Farmani²

Mohsen Safayi²

Farnia Mohammadifar⁴

1. PhD Student, Department of Tissue engineering, School of Medicine, Fasa University of Medical Sciences (FUMS), Fasa, Iran

2. Assistant Professor, Department of Tissue Engineering, School of Medicine, Fasa University of Medical Sciences (FUMS), Fasa, Iran

3. Applied Biotechnology Research Center, Baqiyatallah University of Medical Sciences, P.O. Box 19945-546, Tehran, Iran

4. PhD Student, Department of Tissue engineering, School of Medicine, Fasa University of Medical Sciences (FUMS), Fasa, Iran

The skin of the largest organ is the first protective barrier and the most vulnerable organ to injury, which after injury can partially restore its integrity and function. However, in some cases, these defects are too severe for spontaneous repair. The skin tissue engineering approach creates practical alternatives to treat skin injuries and diseases. An approach to achieving this goal is to use 3D scaffolding that mimics the structure and function of native skin tissue. This scaffolding should support the growth of new tissue and provide suitable living space for Migration and cell growth for host cells. Poly (glycerol sebacate) (PGS) is one of several polymer biomaterials that have recently been used in various applications. PGS is made up of two natural components, both of which are found in the body. Glycerol is the primary building block for lipids and sebacic acid a metabolic intermediate in the oxidation of ω fatty acids. Hence PGS is a rigid, biodegradable, biocompatible elastomer, which through the poly-condensation process leads to the creation of a three-dimensional network of random coils with hydroxyl groups attached to the spine of PGS. The two precursors are also inexpensive and have FDA approval. The chemical and mechanical properties of PGS and degradation behavior are determined by synthesis parameters that enable the adjustable degree of Ester. PGS shows limited water absorption capacity. To address these limitations, PGS can be physically and chemically modified to improve its properties. PEO is a water-friendly and biocompatible polymer. Our aim in this study is to investigate porous PGs and PEO scaffolding to modify the properties of PGS water absorption capacity by changing the molar ratio of PGS to PEO. The results showed that with the addition of PEO, the number of hydroxyl groups in the polymer network and the transverse binding density decreased. The morphology

of the sample surface has also changed with the increase in the weight percentage of PEO, creating a porous and interconnected structure. The integration of hydrophilic PEO chains has led to increased water absorption by the polymer network and increased degradation rate with increased PEO concentration, indicating the PGS degradation rate regulation with this material. Scaffolding showed elastomeric properties. They also support cell proliferation and can therefore be used for a range of tissue engineering applications.

Keywords: Poly (glycerol sebacic acid), polyethylene oxide, biocompatibility, salt washing, skin tissue engineering

From Plants to Wound Healing: A Review of Herbal Medicine

Maryam Katebi¹

Elahe Taghvaei²

Amir Reza Fallahi¹

Hanieh Shahdoost¹

Mohammad Hossein Taklif^{3*}

1. MSc Student in Nursing, Student Research Committee, Hormozgan University of Medical Sciences, Bandar Abbas, Iran

2. Student Research Committee, Faculty of Nursing and Midwifery, Hormozgan University of Medical Sciences, Bandar Abbas, Iran

3. MSc Student in Medical Surgical Nursing, Student Research Committee, Hormozgan University of Medical Sciences, Bandar Abbas, Iran

Introduction: Since the skin is the first line of defense and the largest organ of the body, it is necessary to maintain its integrity. In recent decades, healing chronic wounds has emerged as a significant challenge. The use of medicinal plants has a rich historical background in disease treatment and enjoys widespread cultural acceptance in the world. However, the era of allopathic medicine has significantly curtailed their utilization. In East Asian countries, traditional herbal medicine (THM) has been used for centuries. However, recently it has gained attention in developed countries for treating various ailments, including wound healing. As a result, researchers have increasingly focused on evidence-based approaches within this domain.

But more information is required regarding certain aspects of them. Therefore, this study reviews the uses of medicinal plants in wound healing. **Method:** We systematically reviewed PubMed, Scholar, Medline, SID, CINAHL, Scopus, Elsevier, Iran Doc, and Magiran databases. Finally, 15 articles from 2015 to 2023 with an emphasis on the relevant articles of the last five years, were selected. **Findings:** New research indicates that numerous plants and their extracts possess significant potential in wound management. Phytomedicine also provides herbal medicines that have significant pharmacological effects and have been widely used for healing skin wounds. In studies, THM has been used with the goals of debridement, providing an optimal setting for wound healing and disinfection. Numerous studies have mentioned the potential benefits of medicinal plants, which include antioxidant and anti-inflammatory properties, immune system strengthening, accelerated epithelialization, collagen formation, and angiogenesis promotion. Nevertheless, there are still obstacles, such as inadequate solubility, unfavorable absorption, and low concentration of active components extracted from plants, as well as the presence of unwanted side effects. **Conclusion:** Currently, medicinal plants have become very popular in developed countries. Medicinal plants possess the potential to serve as a valuable addition or even substitute for modern wound healing treatments, because of their safety, minimal side effects, and ability to enhance wound-healing mechanisms. Nevertheless, there have been limited clinical studies conducted in the realm of various wound types and therapeutic interactions, with a majority of them being carried out on animals.

Keywords: Wound Healing, Herbal Medicine, Medicinal Plant, Phytotherapy

Mechanotransduction in Wound Healing

Maryam Zare¹

Fatemeh Moradbeygi²

Mehri Nazeri³

Alaa Moeinzadeh⁴

Ahmad Reza Farmani^{5*}

1. Department of Biology, Faculty of Convergent Sciences and Technologies, Science and Research Branch, Islamic Azad University, Tehran, Iran

2. Department of Pharmaceutical Biotechnology, School of Pharmacy, Shiraz University of Medical Sciences, Shiraz, Iran

3. Research Center for Molecular Medicine, Hamadan University of Medical Sciences, Hamadan, Iran

4. Department of Tissue Engineering and Regenerative Medicine, Faculty of Advanced Technologies in Medicine, Iran University of Medical Sciences, Tehran, Iran

5. Tissue Engineering Department, School of Advanced Technologies in Medicine, Fasa University of Medical Sciences, Fasa, Iran

Background: As the wound healing process begins, activated cell types produce a large number of molecules and initiate multiple signaling pathways. Disturbances in these pathways cause abnormal wound healing and skin disorders, including keloids, hypertrophic scars, and associated chronic wounds.

Materials and Methods: In this review, PubMed, ISI Web of Science, Google scholar and SCOPUS databases were searched for studies published up to October of 2023 related to "Mechanotransduction in Wound Healing" were addressed.

Results: Studies have shown that mechanical forces can cause changes in cell function, including migration and signaling, by changing the microenvironment of a healing wound. However, despite the important role of the physical environment in skin processes, the underlying molecular mechanisms responsible for how the skin responds to force remain unclear. In the process of mechanotransduction, intracellular pathways convert mechanical signals into biochemical responses and cause the distinction between physical and chemical signaling to fade. Therefore, a better understanding of the mechanobiology of skin cells is essential in developing effective treatments to reduce skin disorders, normalize abnormal wound healing, and minimize scar formation. In addition, multiple pathways of mechanotransduction in immune cells have been identified. The central role of the immune system in directing the wound healing process through such pathways affects vital cellular functions such as activation of proliferation, cytokine production, and cell trafficking, providing a new mechanism of dynamic immune regulation during healing.

Conclusion: Subsequently, considering the important effects of the mechanotransduction process on the function of immune cells present in the wound environment, especially immune cells, it is expected that understanding the mechanisms of mechanotransduction can eliminate part of the complexities of chronic wound healing and pathological complications of wounds.

Keywords: Wound Healing, Mechanotransduction, Signaling, Wound Microenvironment

All in One, Bioinspired Skin Adhesive, Incorporating Multi-Metal Bioactive Glass with Superior Wound Healing Ability

Melina Ghasemian¹

Peiman Brouki Milan^{2*}

1. Phd Student, Tissue Engineering, Iran University of Medical Science, Department of Tissue Engineering & Regenerative Medicine, Tehran, Iran

2. Associate Professor of Tissue Engineering, Iran University of Medical Sciences (IUMS), Department of Tissue Engineering and Regenerative Medicine, Tehran, Iran

To successfully manage extensive wounds or persistent ulcers, the development of multifunctional wound dressings with hemostatic, angiogenic, anti-inflammatory and antibacterial properties is crucial [1]. Despite the production of a plethora of biomaterials as wound dressings the full reconstruction of skin structure with its vasculature and hair follicles has not been achieved yet. This article aims to develop a bio-inspired, GelMA based, skin adhesives, integrating a novel three-element doped, mesoporous bioactive glass with the composition of $58\text{SiO}_2\text{-}27\text{CaO-}9\text{P}_2\text{O}_5\text{-}2\text{CuO-}2\text{SrO-}2\text{CoO}$, synthesized by sol-gel technique. The ultimate adhesive possesses appropriate gelation and adhesiveness. Scanning electron microscopy (SEM) and energy-dispersive X-ray (EDX) mapping analysis of dressings, disclosed the porous structure, and dispersion of dopants inside the composite hydrogels. Furthermore, the composite was discovered to be biocompatible, stimulated cell proliferation and migration, induce capillary-like tube formation, promote faster clot formation and demonstrated antimicrobial properties against *Staphylococcus aureus* and *Escherichia*

coli. In vivo investigations revealed a significant enhancement in re-epithelialization ($p < 0.01$), collagen formation, reduced inflammation, and rise the density of blood vessels displayed by CD-31 immunostaining compared to the untreated wounds.

Keywords: wound healing, mussel inspired adhesive, bioactive glass

A Composite Silk Fibroin Hydrogel for Localized and Sustained Simvastatin Delivery to Diabetic Wounds

Mina Maleki

Reza Karimi-Soflou

Akbar Karkhaneh*

Department of Biomedical Engineering, Amirkabir University of Technology (Tehran Polytechnic), Iran

Diabetic wounds represent a significant clinical challenge due to impaired wound healing. Decreased lymphangiogenesis and angiogenesis during wound healing is a well-established consequence of diabetes. Simvastatin promotes angiogenesis and has anti-inflammatory effects in both acute and chronic wounds, making it a promising candidate for overcoming current therapeutic limitations. Local delivery of simvastatin via a sustained-release topical biodegradable dressing could offer advantages in treating diabetic chronic wounds. This study developed a composite silk fibroin hydrogel incorporating simvastatin-loaded PLA microparticles. The simvastatin-loaded PLA microparticles were prepared by double emulsion solvent evaporation method and characterized by FTIR, SEM, and size analysis. Microparticles were spherical with a mean diameter of $9.2 \pm 3.3 \mu\text{m}$ and low polydispersity of 0.15. High encapsulation efficiency ($67.2 \pm 5.2\%$) and yield ($84 \pm 7.2\%$) were achieved. Afterward, the simvastatin-loaded microparticles were loaded into the silk hydrogel, and then the composite hydrogel was characterized by FTIR and SEM. Composite hydrogels were characterized by FTIR and SEM, which confirmed gel formation and uniform microparticles distribution within an interconnected porous network (mean pore size $203 \pm 24 \mu\text{m}$). The hydrogel exhibited a swelling

ratio of $18.2 \pm 2.5\%$ and water vapor transmission rate of $2950 \pm 183 \text{ g/m}^2/\text{day}$. In vitro, simvastatin release occurred over 7 days. MTT assays demonstrated excellent cytocompatibility and ability to support cell growth and proliferation. This novel composite silk hydrogel capable of sustained simvastatin release represents a promising platform for accelerating diabetic wound healing through angiogenic effects.

Keywords: Chronic wound, Hydrogel, Simvastatin, Microparticle, Silk fibroin

The Effects of Betulin on Wound Healing

Mohaddeseh Zeinali Ali Abadi^{1*}

Fatemeh Hayeri Mehrizi¹

Donya Safari¹

Fatemeh Heidari²

1. Medical Student, Student Research Committee, Qom University of Medical Sciences, Qom, Iran

2. Cellular and Molecular Research Center, Qom University of Medical Sciences, Qom, Iran

Introduction: Wound healing is a complex process that involves a series of organized cellular and biochemical events aimed at restoring the integrity and functionality of damaged tissues. Despite the existing treatments, researchers are looking to find natural compounds that may enhance the healing process. Betulin is a triterpenoid compound derived from the bark of various tree species, including birch trees. It has various therapeutic properties including anti-inflammatory, antioxidant, and anti-cancer activities. In this article, we explored the effects of betulin on wound healing.

Method: In this study, we searched reliable scientific databases from 2019 to 2023 for the keywords betulin, wound treatment, and wound healing.

Result: Betulin promotes re-epithelialization, which involves the migration and proliferation of epithelial cells to cover the wound area. Chronic inflammation and increased oxidative stress often impede the wound-healing process. Betulin has anti-inflammatory properties by suppressing the production of inflammatory mediators, such as prostaglandins and cytokines.

Additionally, its antioxidant properties neutralize free radicals, thereby protecting cells from oxidative damage and promoting optimal wound healing. Enough blood supply is important for wound healing, as it supplies necessary nutrients and oxygen to the site of injury. Betulin stimulates angiogenesis, by activating various growth factors and signaling pathways. This improved blood circulation enables tissue regeneration and speeds up the healing process. Collagen, the chief structural protein in the extracellular matrix, plays an important role in wound healing. Betulin has been shown to enhance collagen synthesis, which promotes proper wound closing. In addition, it reduces the formation of scars through the regulation of collagen regeneration and its organized alignment. The significant effects of betulin on wound healing make it a hopeful candidate for various applications in the field of medicine. Further research is necessary to determine the optimal dosage and potential synergistic effects with other wound healing agents.

Conclusion: Betulin enhances the natural healing process by reducing inflammation, accelerating wound closure, promoting angiogenesis, and stimulating collagen synthesis. So it has significant potential as a natural compound for improving wound healing

Keywords: betulin, wound treatment, wound healing

A Tri-component-based Hydrogel Wound Dressing with Antibacterial and Hemostatic Competences Based on the Naturally Occurring Macromolecules and Silver Nanoparticles

Mohammad Nouri

Amir Kabir university of Technology, Tehran, Iran

A nanocomposite hydrogel consisting of chitosan/gelatin/polyethylene glycol and silver nanoparticles was prepared for wound dressing application using gamma irradiation. The chitosan and gelatin solutions were mixed with different blending ratios in an aqueous solution of polyethylene glycol (PEG) and then silver nanoparticles were dispersed in the system using ultrasonic technique. The samples were treated at a dose of 10 kGy and

turned into a gel. Chemical, morphological, mechanical, swelling, antibacterial and hemostatic properties of the wound dressings were studied with a number of analyses. The results corroborated that water swelling and water vapor transmission decreased with the increase of gelatin content. The swelling ratio and vapor transmission rate of the sample with the highest amount of gelatin (C1/G3) decreased by 47.5% and 39% comparing the sample with the highest amount of chitosan (C3/G1). With the inclusion of silver nanoparticles, swelling ratio increased by 3-5%, whereas, vapor transmission rate decreased by 2-8% comparing the pristine hydrogels. The gel content raised with the increase of gelatin content and incorporation of AgNPs. The gel content of C1/G3 increased by 44% comparing C3/G1. And incorporation of AgNPs caused a 0-18% increase of gel content values. The tensile strength and elongation at break increased by 49% and 47% in C1/G3 comparing C3/G1 compositions. The nanoparticle inclusion further promoted the tensile strength and elongation at break by 2-11% and 3-42%, respectively. The blood clotting analysis proved that the blood clotting depressed in parallel with the gelatin increment. The results of antibacterial analyses corroborated that AgNPs loaded dressing possesses substantially higher bacterial inhibition zone. To sum up, chitosan/gelatin/AgNPs nanocomposites with the acceptable level of water swelling, water vapor transmission, blood clotting and considerable antibacterial properties can be a very appealing candidate as a wound dressing.

Keywords: Chitosan, Gelatin, Silver nanoparticles, Gamma irradiation, Wound dressing

Manuscript Title: Mistreatment of Diabetic Foot Ulcer with Leech Therapy Caused Necrotic Fasciitis and Amputation

Mostafa Javanian¹

Sara Mohammadnia^{2*}

Soheil Ebrahimpour³

1. Infectious Diseases and Tropical Medicine Research Center, Health Research Institute, Babol University of Medical Sciences, Babol, Iran

2. Student Committee Research, Babol University of Medical Sciences, Babol, Iran

3. Infectious Diseases and Tropical Medicine Research Center, Health Research Institute, Babol University of Medical Sciences, Babol, Iran

Diabetic foot ulcer is a common complication in diabetes patients. Different methods are used to manage the ulcer such as leech therapy. This therapy may have some noticeable complications like Necrotic Fasciitis. Introducing the case: A 72-year-old woman with a history of Diabetes mellitus was admitted to the hospital with loss of consciousness and Diabetic Foot Ulcer (DFU) on her right leg on June 26th, 2023. According to what her family said; one month ago, she was admitted to the hospital, and right leg amputation was recommended for her but she decided not to follow the recommendation and left the hospital. She got leech therapy two days ago, and after the therapy, the wounds started bleeding and the night before admission she started losing consciousness. In physical examination, she was lethargic but was oriented to time and place. It was noted that crepitation in the wound has been extended to the knee. A color Doppler ultrasonography in the evaluation of the DFU showed a monophasic arterial flow pattern, atherosclerotic plaques throughout the artery, and gas in foot muscle sheets from ankle to knee which was seen in X-ray, too. The patient was given Meropenem injections (1g, BD) and Linezolid injections (600g, BD) with Vitamin B6 orally (BD). Due to the evidence, the patient was diagnosed with Necrotic fasciitis and got a transfemoral amputation. Conclusion: One of the most important complications of Diabetic Mellitus (DM) is Diabetic Foot Ulcer (DFU). A significant number of the patients diagnosed with Diabetic Mellitus would experience DFU. Necrotic Fasciitis that can be developed in a DFU is a rare but dangerous infectious disease of soft tissue. Leech therapy as a treatment method for Diabetic Foot Ulcer may have complications, such as Bleeding; which can be controlled by topical thrombin and pressure; if not, blood transfusion can be helpful, Allergic responses and scarring. Aeromonas hydrophilia, a Gram-negative bacterium in a leech's digestive system can lead to abscesses, cellulitis, and sepsis if it's not developed in a standard criterion.

Keywords: Leach therapy, Diabetes mellitus, Diabetic foot ulcer, Mistreatment

Modified-Hyaluronic Acid Based Hydrogels for Mesenchymal Stem Cell Delivery of the Wound: Optimization, Characterization, and In-Vivo Experiment

Mozhgan Abedanzadeh¹

Ali Mohammad Tamaddon²

Reza Heidari³

Negar Azarpira^{4*}

Samira Sadat Abolmaali^{5*},

1. PhD Student, Pharmaceutical Nanotechnology, Department of Pharmaceutical Nanotechnology, Shiraz University of Medical Sciences, Shiraz, Iran

2. Full Professor, Pharmaceutical Nanotechnology, Department of Pharmaceutical Nanotechnology, Shiraz University of Medical Sciences, Shiraz, Iran

3. Assistant professor, Pharmaceutical Sciences Research Center, Shiraz University of Medical Sciences, Shiraz, Iran

4. Full Professor, Transplant Research Center, Shiraz University of Medical Sciences, Shiraz, Iran

5. Associate Professor, Pharmaceutical Nanotechnology, Department of Pharmaceutical Nanotechnology, Shiraz University of Medical Sciences, Shiraz, Iran

Following the injury, skin which is the largest physical barrier against harmful external stimuli, enters the four-stage healing process, including Hemostasis, inflammation, proliferation, and maturation. Hyaluronic acid (HA), as one of the main components of the skin extracellular matrix, has granted promising results in skin tissue engineering applications. Herein, by the use of design expert software, different experiment conditions were investigated to optimize the hydrogel formulation features such as modification degree, photo-crosslinker concentration, UV exposure time, and polymer concentration as a sign of morphological appearance, swelling degree, mechanical properties, and degradation time. Then, Wharton's jelly-derived mesenchymal stem cell (WJ-MSC), with potential activity for skin regeneration, was cultured on the final selected modified-HA hydrogel, and proliferation of the MSCs was investigated. The in-vivo data showed enhanced tissue regeneration and scarless wound healing within 21 days in the studied rats. In addition,

pathological and molecular studies of animal tissue revealed that the final hydrogel composite enhanced scarless wound healing due to the greater expression of VEGF, IL-10, TGF-B3/ TGF-B1 ratio, and Collagen III/ Collagen I ratio. As a consequence, the in-vitro and in-vivo evaluations proposed that this composite hydrogel can be a good choice for scarless healing of acute wounds.

Keywords: Hyaluronic acid, Photo-crosslinkable hydrogel, Stem cell, Scarless, Wound healing

Smart Wound Dressings: Revolutionizing Wound Care Through Advanced Technologies

Mozhgan Jirehnezhadyan¹

Arash Goodarzi²

Fariba Noori¹

Ahmad Reza Farmani²

Hamidreza Ghaderi Jafarbeigloo¹

Mohsen Safaei²

Zahra Abpeikar^{2*}

1. Student Research Committee, Fasa University of Medical Sciences, Fasa, Iran

2. Tissue Engineering Department, School of Advanced Technologies in Medicine, Fasa University of Medical Sciences, Fasa, Iran

Introduction: Smart wound dressings have shown promise in chronic wound care, such as diabetic ulcers and pressure sores, by preventing the formation of new ulcers and improving patient adherence to care regimens. Integrating smart wound dressings into telehealth systems allows for remote monitoring and guidance, reducing the need for frequent clinic visits and improving patient quality of life. Healthcare providers can access wound data remotely, enabling timely adjustments to treatment plans and potentially lowering healthcare costs. However, challenges such as affordability, accessibility, standardizing protocols, and data security need to be addressed. Collaborative efforts between researchers, clinicians, and industry stakeholders are crucial to fully harness the potential of smart wound dressings and bring them to the forefront of wound care.

Methods: In this review, PubMed, ISI Web of Science, Google scholar and SCOPUS databases were searched for studies published up to September 2023 related to "Smart Wound Dressings: Revolutionizing Wound Care through Advanced Technologies" were addressed.

Results: The review of studies shows that Smart wound dressings are equipped with sensors and materials that can detect various wound parameters, such as temperature, pH, moisture levels, and infection. In addition to monitoring, smart wound dressings are designed to actively interact with the wound environment. Many incorporate drug delivery systems that can release therapeutic agents, such as antibiotics, growth factors, or pain relievers, in response to specific wound conditions. This targeted drug delivery ensures that the wound receives the necessary treatment at the right time, minimizing the risk of systemic side effects associated with traditional oral or intravenous medications.

Conclusions: smart wound dressings represent a transformative approach to wound care, offering real-time monitoring, targeted drug delivery, and enhanced patient engagement. These dressings have the potential to improve the quality of care for patients with acute and chronic wounds while reducing healthcare costs. As the field continues to advance, it is crucial to address the existing challenges and collaborate across disciplines to bring these innovative technologies to the forefront of wound care.

keywords: Smart wound dressings, Revolutionizing wound care, Tissue engineering

The Reduction of Blood Viscosity for the Management of Noun Communicable Diseases by the Prophetic Medicine

Muhammad Saleem

D.G.Khan Medical College, Dera Ghazi Khan, Punjab, Pakistan

Introduction: The blood viscosity has the most important role as thick blood i.e high viscosity due to sedentary life style is the main cause of modern

diseases (Diabetes, HTN, MI, CVA, and Arthritis (Non Communicable diseases)). The management such diseases require preventive and lifestyle modification in almost all cases because accurate treatment is not present. The reduction of blood viscosity reduces the risk of onset and/or complications or progress of such diseases. The management (i.e. prevention or treatment), at community or solitary levels, is done in three known methods: 1)- Nutritional or diet modification during /or prior to sickness 2)- Psychological intervention (Counselling or life style Modification) and 3)- Medical or surgical intervention, by conventional or alternative medicine. One of the alternative ways is the medicine of the Prophet Muhammad (Peace be upon him). **METHODOLOGY:** Review of Literature regarding prophetic medicine as alternative medicine through reference books, Researches of Pubmed, researchgate and Google Scholar. **Results:** Study of Prophet's daily routine life shows that , 1)-Nutritionally, Intake of less quantity of food and food quality as simple, raw food (Dates, milk, raw olive oil), or less processed food (yogurt/ milk, water dipped barley, rice or boiled food, or less cooked food having no spices except vinegar or ginger or cinnamon/casia etc.), All such simple unprocessed or less processed food cause reduction of blood viscosity. 2)-Psychologically, Life style having prayers (as an aerobic special exercises on 5 fixed timings of a day reducing sedentary lifestyle and performed on ground charges red blood cells to reduce blood viscosity) and Counselling/Addressing his companions to enhance psychology And 3)- Medically, Simple, rather than compound drugs (or herbs) such as senna to relieve constipation (An important cause of high blood viscosity) And Simple Surgery (hijama) to reduce hematocrit. All the above mentioned methods reduce blood viscosity in most simple way.

Conclusion: Prophet (PBUH) demonstrated simple lifestyle and simple disease management, so that all the methods were reducing blood viscosity thus reducing non-communicable diseases.

keywords: Hijama. Diet modification. Non communicable diseases .Blood viscosity . Prophetic Medicine

A Review on Wound Healing Approaches Based on Availability of Medical Wound Dressings: An Algorithmic Review

Nahid Madhani¹

Arian Karimi Rouzbahani^{2,3}

Zahra Goudarzi⁴

Abdolrazagh Marzban^{5*}

1. Department of Nursing and Wifery, Lorestan University of Medical Sciences, Khorramabad, Iran

2. Student Research Committee, Lorestan University of Medical Sciences, Khorramabad, Iran

3. USERN Office, Lorestan University of Medical Sciences, Khorramabad, Iran

4. Students' Scientific Research Center, Tehran University of Medical Sciences, Tehran, Iran

5. Razi Herbal Medicines Research Center, Lorestan University of Medical Sciences, Khorramabad, Irandiabetes

Background: We aimed to provide a single, viable and user-friendly operative protocol for burning, pressure and diabetic wounds that meets the needs of all Iranian wound specialists.

Methods: The research was conducted through the abstract and citation databases of peer-reviewed literature Pubmed® (National Center for Biotechnology Information), Medscape® (General Surgery) and Scopus® (Elsevier), comparing existing data from 2010 to 2023 and it was totally modified available wound healing machines and dressings in Iran. A separated and dedicated research was accomplished for each of these wounds such as: Burn wound, pressure ulcer and diabetic foot ulcer.

Results: The findings for each wound included the choice of the wound dressing also wound machines available in Iran, the route and timing of administration and the clinical applications. Finally, the review has been condensed in an operative algorithm for wound dressing use to apply in each kind of wound.

Conclusion: We could provide Iranian wound specialist an effective, easy-to-use operative protocol for every sort of wound with accessible wound dressings in daily activity.

keywords: Iran , wound healing , wound dressings , algorithmic review

Application of Artificial Intelligence in Wound and Tissue Repair: Diagnosis, Prevention, Treatment

Nasim Aslani^{1*}

Maryam Dehghani²

Taleb Khodaveisi³

Mohammad Hosseini Rondi⁴

Maleihe Sadeghi⁵

1. Assistant Professor in Health Information Management, Health Information Technology Department, School of Para medicine, Lorestan University of Medical Sciences, Khorramabad, Iran

2. Master of Science in Health Information Technology, Alborz University of Medical Sciences.

3. Assistant Professor in Health Information Management, School of Para medicine, Hamedan University of Medical Sciences, Hamedan, Iran

4. Assistant Professor in Medical Informatics, Health Information Technology Department, School of Para medicine, Torbat Heydarieh University of Medical Sciences, Torbat, Iran

5. Assistant Professor in Health Information Management, Health Information Technology Department, School of Para medicine, Semnan University of Medical Sciences, Semnan, Iran.

Introduction: A wound is any type of injury in the body that causes damage to skin tissues and disrupts the integrity of the skin. there are different methods for treating each wound. artificial intelligence can be used as a useful tool to investigate the condition of these wounds and provide reliable recommendations to doctors. The purpose of this study is to identify the applications of artificial intelligence in the prevention, diagnosis and treatment of wounds and tissue repair.

Methods: This review was conducted in 2023. We searched PubMed, Web of Science, and Embase scientific databases, based on the combination of related Mesh terms. The articles selection process was based on Preferred Reporting Items for Reviews. Articles selection was done by using the inclusion and exclusion criteria. Data gathering was done using a data extraction form.

Results: Artificial intelligence can help in diagnosing and differentiating the types of wounds and their

treatment. By using machine learning algorithms and deep neural networks, artificial intelligence systems are able to analyze and recognize the type of wounds. For this purpose, an artificial intelligence system can use images of the wound (such as photos and scans) and, combining the patient's history, recognize the type of wound and its severity. This information helps doctors plan the right treatment for each patient. In addition, artificial intelligence systems can provide guidance and recommendations on appropriate treatment methods for each type of wound. This includes tips on cleaning the wound, using specific products and materials for wound healing, and scheduling treatment.

Conclusion: Artificial intelligence can play an important role in the diagnosis, differentiation and treatment of wounds using machine learning algorithms and deep neural networks and help doctors prepare accurate and appropriate treatment plans. It is recommended to use the artificial intelligence to help predict the best method of diagnosis and treatment in tissue repair

Keywords: artificial intelligence , wound ,tissue repair, machine learning

Preparation and Evaluation of a Wound Dressing Composed of PAN Polymeric Nanofibers Containing Green Synthesized AuNPs Using Allium Jesdianum Extract

Nasrin Kheradmand¹

Mehdi Azizi^{2*}

Hadi Samadian³

Tayebeh Artimani⁴

Maryam Rahimi⁵

1. PhD Student, Tissue Engineering ,Department of Tissue Engineering and Biomaterials, School of Advanced Medical Sciences and Technologies, Hamadan University of Medical Sciences, Hamadan, Iran

2. Department of Tissue Engineering and Biomaterials, School of Advanced Medical Sciences and Technologies, Hamadan University of Medical Sciences, Hamadan, Iran

3. Department of Molecular Medicine, School of Medicine, Hamadan University of Medical Sciences

4. Endometrium and Endometriosis Research Center, Hamedan, University of Medical Sciences, Hamedan, Iran

5. Department of Biology, Faculty of Sciences, Research Institute for Grape and Raisins, Malayer University

As a general defense system, the skin is the largest organ in the human body. The disruption of the integrity or malfunction of the skin tissue is generally called a wound. One of the wound dressings is biological wound dressings. Bioactive wound dressings include tissue engineering products from natural or synthetic sources. Nanotechnology-based platforms have gained a growing interest in wound healing. Metal nanoparticles, such as gold, exhibit attractive properties such as low toxicity in vivo and anti-microbial activity. Chemical methods typically leave some toxic reagents on the nanoparticles. For this reason, plants like *Allium jesdianum* as sustainable sources and used in the preparation of biocompatible nanoparticles have attracted the attention of many researchers in recent years. Non-toxicity, biocompatibility, cheapness, and production of nanoparticles with high purity can be mentioned from this method.

Methods: To fabricate the nanofibers containing AuNPs, concentrations obtained from MIC Au nanoparticles for each bacterium were added to the PAN solution. Thus, a scaffold containing 0.2% Au nanoparticles was produced for *S. aureus*. A scaffold containing 27% Au nanoparticles was fabricated for *E. coli*. A scaffold containing 8.3% Au nanoparticles was fabricated for *P. aeruginosa*. The morphology, size, and zeta potential of Au NPs were analyzed by TEM and DLS, respectively. FT-IR studied the surface functional groups of green synthesized nanoparticles. DPPH assays determined the antioxidant capacity of green synthesized nanoparticles. The migration capability was reflected by Scratch assay.

Results: The nanocomposites exhibited a high antioxidant effect and antibacterial activity against *S. aureus*, *E. coli*, and *P. aeruginosa*. Besides, based on the results of the cell viability assays, the optimum concentration of AuNPs in the nanofibrous mats is 0.08% w/v and had no cytotoxicity on fibroblast cells. The scaffold also showed good blood compatibility

according to the effects of coagulation time. As well as significant fibroblast migration and proliferation on the wound margin, according to wound-healing assay. The developed biocompatible, antioxidant, and antibacterial AuNPs incorporated in PAN nanofibrous mats showed their potential as an effective wound dressing. The results showed the prepared nanofibers adorned with Au nanoparticles possess considerable antioxidant ability and synergic antimicrobial activity.

Keywords: wound dressing, electrospinning, green synthesis, nanoparticles, *Allium jesdianum* extract

Evaluate the Effect of PI3K Pathway Regulators with Melatonin on Arrested Human Embryo Development In vitro

Nazanin Alizadeh

*MSc Student Stem Cell Technology Royan Institute
Tehran Iran*

Introduction: IVF is one of the methods used for assisted reproduction. According to studies, 40 to 50% of IVF Embryos cannot reach the blastocyst stage. Embryos stop on the third to fourth day after fertilization, and are divided into three groups: type 1, which is 2 to 4 cells, type 2, which is between 4 and 8 cells, And the third type, which is in the beginning. Morula stage, which is type 1 in MZT and type II and III. They are disturbed at the level of glycolysis and phosphoryl oxidation. And they may be disturbed in the Signaling pathways. Signaling pathways can be regulated by antioxidants. In this study, it was investigated whether melatonin can regulate the pi3k signaling pathway or not.

Method: In this study, with the consent of the subjects, the collection of IR.ACECR.ROYAN.REC.1402.008 samples from 72-hour-old human embryos began after obtaining the ethical charter. This study was conducted in three main stages. The first step is melatonin dosing and choosing the best dose. The second stage is to culture the embryos of the control group and the treatment groups with the appropriate dose obtained. The third phase is blastocyst evaluation. Embryos including pluripotency and cell cycle genes were

analyzed using the q-real-time PCR technique.

Result: The analysis showed that the PI3K pathway is one of the pathways involved in cell proliferation that can be regulated by melatonin. A melatonin antioxidant and supplement medium were used to prevent amage. melatonin with a concentration of 0.002 mmol causes a significant percentage of the aborted embryos to reach the blastocyst. After treatment, 11/35 embryos began to grow again. However, of the embryos that redeveloped (9.35, 25%), only 1 was compressed, and only (6.35, 20%) reached the blastocyst stage. In the next step, we examined aging and cell cycle-related genes that increased the expression of pluripotency genes compared to the control groups. The expression of the cell cycle inhibitor CDKN1A was also decreased. CDKN1A, the cycle inhibitory gene, had a significant decrease in expression in the treatment group

Conclusion: In fact, melatonin through the receptor Mtl activates the pi3k signaling pathway and its downstream The Erk pathway is responsible for regulating six basic cellular processes: cell proliferation, cell division, and cell division. survival, cell growth, cell metabolism, cell migration, and cell differentiation. Melatonin can play a role in the develop.

Keywords: IVF, arrested, embryo, antioxidantm, melatonin

Bioprinting in Skin Tissue Engineering & Skin Repair: An Advanced Method

Fariba Noori¹

Zahra Abpeikar¹

Mohsen Safaei¹

Ahmadreza Farmani¹

Hamidreza Ghaderi Jafarbeiglou¹

Mozhgan Jirehnezhadyan¹

Arash Goodarzi^{1*}

1. Department of Tissue Engineering, School of Advanced Technologies in Medicine, Fasa University of Medical Sciences, Fasa, Iran

Introduction: Even with many advances in design strategies over the past decades, a large gap remains

between existing tissue-engineered skin and natural skin. Reconstruction of the structure and function of the skin has remained an unsolvable problem until today. bioprinting offers an attractive and competitive solution for the fabrication of patient-specific skin grafts with multilayered biomimetic structures.

Material & method: A document search was conducted on the Scopus database, Google Scholar and PubMed database of studies published from January 2015 to September 2023 with English keywords, including Bioprinting, Skin Tissue Engineering, Repair. A combined Hunt of keywords was done using Boolean drivers AND and OR. Data analysis was done qualitatively.

Result: Compared to conventional skin tissue engineering approaches, bioprinting has many advantages in complex structure fabrication, spatial integration and reproducibility. In addition, bioprinted skin constructs may help improve regeneration, precise positioning of bioactive molecules, improve skin fabrication speed, reduce intervention, thus leading to better clinical outcomes. It also enables precise control of multiple combinations, spatial distributions and architectural complexity. Making 3D skin models by bioprinter, the requirements of cells, bioink and bioprinting process should be considered in a biomimetic and spatio-temporal way due to increasing biological performance. Among the polymers used for bioprinting of skin are: gelatin, collagen, alginate, chitosan and fibrin, PEG, PCL and dECM. Stem cells and seeds are an important part of biological essences. In addition, other emerging technologies, for example, four-dimensional (4D) bioprinting, skin-on-a-chip bioprinting, and microfluidic-assisted extrusion bioprinting, are also being used for skin tissue engineering and wound healing research.

Conclusion: Recent advances in stem cell biology and various biomaterials have provided tremendous opportunities for researchers to develop and manipulate skin Bioprinting for wound healing. The availability of suitable biomaterials and advances in bioprinting technologies suggest that bioprinting can be successfully used to fabricate novel wound dressings.

Keywords: Bioprinting, Skin Tissue Engineering, Repair

Comparing the Outcomes of Two Therapeutic Methods of Pilonidal Abscess Including Drainage and Delayed Surgery and Initial Cyst Excision in Patients with Acute Pilonidal Cysts

Bahar Noori-Rahmatabadi¹

Masoume Taghizadeh^{2,*}

Atefeh Sadat Shahidi³

Mina Alipoor⁴

1. Assistant Professor of Anesthesia and Clinical Care, Rafsanjan University of Medical Science, Rafsanjan, Iran

2. Assistant Professor of General, Surgery, Rafsanjan University of Medical Science, Rafsanjan, Iran

3. Medical Student, Rafsanjan University of Medical Science, Rafsanjan, Iran

4. Department of Anesthesiology school

Introduction: Surgical intervention for pilonidal sinus is associated with an increased risk of wound complications and recurrence. The therapeutic method of pilonidal abscess with delayed closure surgery was compared to initial cyst excision in patients with acute pilonidal cysts.

Materials and Methods: This study was conducted as a randomized double blind clinical trial on 200 patients with acute pilonidal abscess. Initially, demographic information including age, gender, BMI (body mass index), and patient symptoms were recorded and then the patients were randomly allocated to groups A and B. The group A underwent drainage and cyst excision in a single surgical procedure. The group B underwent incision and drainage of the abscess, and then discharged with antibiotic prescription with delayed cyst excision performed one month later. The occurrence of hematoma, cellulitis, seroma, infection, and wound dehiscence after surgery was evaluated. Furthermore, the overall cost and duration of surgery were compared between the two groups. Chi-square and Fisher's exact tests were used for qualitative variable comparisons between the two groups, and an independent t-test was used for quantitative variable comparisons using SPSS-25 software (p-value<0.05).

Results: No significant differences were found between the two surgical groups in terms of age, gender, BMI, wound characteristics, discharge, and pain (P>0.05). Seroma was not observed in any of the patients in both groups after operation. Moreover, there were no significant differences in the incidence of cellulitis, infection, and hematoma after surgery between the two groups (P>0.05). However, there was a significant difference in wound dehiscence, with a higher occurrence in the group A compared to the group B (13% versus 3%, P=0.009). Additionally, the percentage of surgeries exceeding one hour was significantly higher in the group A compared to the group B (42% versus 17%, P<0.001). However, there was no significant difference in terms of costs between the two groups (P=0.1).

Discussion and Conclusion: Considering the higher incidence of wound dehiscence and longer surgery duration, delayed closure surgery appears to have superiority over initial surgery for the treatment of acute pilonidal abscess.

Keywords: Pilonidal abscess, surgical treatment, delayed surgery, primary closure

Qualitative Analysis of Family's Role in Increasing Resilience Among Patients with Type 2 Diabetes

Reihaneh Jabbari^{1,*}

Nezam Hashemi²

Zahra Rasaei³

1. Ph.D. of Counseling, Department of Counseling, Qom Branch, Islamic Azad University, Qom, Iran

2. Associate Professor, Department of Psychology, Amin Police University, Tehran, Iran

3. Ph.D. of Psychology, Faculty of Psychology and Education, Allameh Tabataba'i University, Tehran, Iran

Introduction: Diabetes is one of the leading global causes of disability, and patients with type 2 diabetes require lifelong care. Positive resilience is a psychological issue that increases people's ability to deal with stressful situations. Resilience depends on a person's response to stress and problematic

situations, including social ability, self-management, purposefulness, belief in a bright future, and the type of interactions in the family. The role of the family in increasing resilience is important.

Methodology: This research is a qualitative phenomenological approach and uses purpose-based sampling. 15 patients with a 10-year history of type 2 diabetes make up the statistical population.

Data Collection: A deep semi-structured interview was used for data collection, which continued until the saturation stage, when no new theme was raised by the participants. The findings of each interview were repeated, and their accuracy was measured. Then, schematic analysis, which is a method for analyzing the intra-data themes, was used.

Main Question: How does the family provide the context for the patient to face challenges more effectively?

Findings: The findings include five main themes (effective verbal interaction, family emotional atmosphere, perception of justice in the family, family frameworks and rules, and communication networks) and 26 sub-themes related to patient resilience.

Discussion: Verbal interaction has a positive and significant relationship between family communication patterns, dialogue orientation, and resilience. Stopping or reducing it has a significant relationship with the increase in emotional distress in the family. Resilience increases the positive emotional atmosphere of the family. Benefiting from different support networks in family and friends plays an important role in the process of accepting disease conditions and caring behaviors. Family rules play a role in determining the ability of crisis prediction, problem solving, and the logical expectations of members from each other. A fair division of tasks and assets, a feeling of respect and dignity, and decision-making and responsibility in the family increase resilience in patients. It is suggested that the findings of this study be tested with quantitative methods and for other communities of patients.

Keywords: Diabetes, Resilience, Family, emotional atmosphere

Alcea Rosea and Wound Healing: A Review Study

Reza Ataee Disfani¹, Fereshteh Ghorat^{2*}

1. Medical Student, Student Research Committee, Sabzevar University of Medical Sciences, Sabzevar, Iran

2. Non-Communicable Diseases Research Center, Sabzevar University of Medical Sciences, Sabzevar, Iran

Introduction: Alcea rosea, commonly known as hollyhock, has been traditionally used for wound healing and its potential wound-healing properties has been a subject of interest. However, the efficacy of Alcea rosea in wound healing has not been systematically reviewed. This systematic review aims to evaluate the effects of Alcea rosea on wound healing.

Methods: A systematic search was conducted across electronic databases, including PubMed, Google Scholar, and specialized herbal medicine databases. Studies that investigated the effects of Alcea rosea on wound healing in animal or human models were included. Methodological quality and relevance of the selected studies were assessed using predetermined criteria.

Results: This systematic review identified a number of studies examining the effects of Alcea rosea on wound healing. After evaluating the articles, the results showed that Alcea rosea has positive effects on wound healing. Alcea rosea had a positive effect on wound healing, including increased wound closure rate, enhanced collagen deposition, reduced inflammation, and reduced pain in both human and animal studies.

Conclusion: The findings of this systematic review suggest that Alcea rosea has potential as a natural remedy for wound healing. Its effects are attributed to its anti-inflammatory, antioxidant, and tissue-regenerating properties. However, further research, including well-designed randomized controlled trials with larger sample sizes, is needed to confirm these findings and establish standardized protocols for the use of Alcea rosea in wound care.

Keywords: Alcea rosea, hollyhock, wound healing, natural remedy

Bioinformatics-based Study on the Effects of Green Tea EGCG in Skin Wound Healing

Reza Zare

Fatemeh Sholehvar*

Department of Biology, Faculty of Science, Zand Institute of Higher Education, Shiraz, Iran

Introduction: Wound healing is a complex multifactorial process involving the interaction of inflammation, re-epithelialization, angiogenesis, granulation tissue formation, and collagen deposition. The presence of microorganisms is a major contributor to delayed wound healing. Therefore, the use of plants with antibacterial compounds in the wound site was considered in traditional medicine. Bacterial DNA gyrase has always been the target of antibacterial drugs due to its importance in the replication pathway of microorganisms. Epigallocatechin gallate (EGCG), the major polyphenolic compound is associated with various health benefits. The purpose of this study is to investigate the inhibitory effect of EGCG on bacterial DNA gyrase in order to facilitate and accelerate the healing of wounds.

Methods: In our study, the three-dimensional structure and properties of epigallocatechin gallate were obtained from <https://pubchem.ncbi.nlm.nih.gov/>. Then 3D structure of bacterial DNA gyrase was downloaded from <https://www.rcsb.org>, with pdb ID: 1KZN. In addition, the Discovery Studio 3.5 Client application is used to prepare 1KZN for the docking approach. Docking was done by Autodock Vina. Finally, the Results of docking were analyzed by Discovery Studio 3.5 Client.

Results: According to the PubChem database, epigallocatechin gallate with ID: 65064, MF: C₂₂H₁₈O₁₁, MW: 458.4g/mol has antioxidant activity. After docking, based on LP (Ligand - Protein) analysis amino acids ILE60, VAL71, GLN72, and VAL44 of 1KZN interacted with epigallocatechin gallate. The involved amino acids in the cocrystal-protein complex were ASP73, ASN46, ARG76, and ARG136.

Conclusion: Nowadays, the use of herbal medicine has been emphasized due to less side effects.

Epigallocatechin gallate (EGCG), is a herbal compound with many properties in medical science, which in this study was able to inhibit bacterial DNA gyrase

Keywords: Wound Healing; Bioinformatic; EGCG; Herbal medicine; Bacterial DNA gyrase

Polyester-based Bioactive Powder: A Novel Approach for Diabetic Wound Treatment with Sustained Hydrogen Sulfide Release

Saba Sayyareh¹

Reza Karimi-Soflou²

Akbar Karkhaneh^{3*}

1. Master's Student, Biomedical Engineering, Department of Biomedical Engineering, Amirkabir University of Technology (Tehran Polytechnic), Iran

2. Ph.D., Biomedical Engineering, Department of Biomedical Engineering, Amirkabir University of Technology (Tehran Polytechnic), Iran

3. Associate Professor, Biomedical Engineering, Department of Biomedical Engineering, Amirkabir University of Technology (Tehran Polytechnic), Iran

Diabetic patients often suffer from chronic, non-healing wounds due to underlying disease pathology. These wounds require advanced dressings that can simultaneously fight infection, reduce inflammation, and promote tissue regeneration and blood vessel growth. Hydrogen sulfide (H₂S) is an ideal candidate for such a multifunctional approach. As a natural signaling molecule in the body, H₂S plays various biological roles. Specifically, H₂S has been shown to stimulate angiogenesis and reduce inflammation, making it well-suited to improve diabetic wound healing. Intelligent dressing designs that leverage H₂S release could provide a much-needed solution for managing this chronic complication of diabetes. Sustained release hydrogen sulfide microparticles for topical wound powder application were successfully developed in this study. The microparticles were fabricated using the FDA-approved polyester polylactic acid (PLA). Sodium hydrosulfide (NaHS) was encapsulated within the PLA particles. Upon contact with wound exudate, NaHS undergoes a hydrolytic reaction to generate H₂S and sodium

hydroxide. The microparticles were synthesized via a water-in-oil-in-water emulsion technique, yielding spherical particles with a mean diameter of 8.5 ± 2.9 μm and low polydispersity of 0.15. Scanning electron microscopy (SEM) and Fourier-transform infrared spectroscopy (FTIR) confirmed the morphology and successful encapsulation of NaHS within PLA, respectively. The microparticles demonstrated high yield ($78 \pm 5\%$) and NaHS encapsulation efficiency ($80 \pm 6.2\%$). The release profile showed an initial 40 μM H₂S burst followed by sustained low-level release of 5 μM over 10 days. This was lower than free NaHS, indicating efficient control by the particles. MTT assay revealed the microparticles were non-toxic to human dermal fibroblasts. In fact, the particles significantly promoted fibroblast growth and proliferation. Overall, these NaHS-loaded microparticles show potential for diabetic wound treatment via topical application alone or when incorporated into various wound dressings.

Keywords: Microparticle, Hydrogen Sulfide Release, Polylactic Acid, Diabetic Wound Treatment

Exosome: A Natural Promising Agent for Wound Healing Promotion

Alireza Sadeghi Moghaddam Bijari¹

Hoda Keshmiri Neghab²

Mohammad Hasan Soheilifar²

Mahdi Alijanianzadeh^{1*}

1. Department of Cell & Molecular Biology, Faculty of Biological Sciences, Kharazmi University, Tehran, Iran

2. Department of Medical Laser, Medical Laser Research Center, Yara institute, ACECR, Tehran, Iran

Introduction: Skin is the largest organ in human body (16% of body weight) and it has critical functions such as protect the body from invasion of pathogens and prevent the loss of useful substances from an organism. The skin frequently undergoes the damages as a result of acute and chronic wounds such as extensive burns, trauma or diabetic ulcers. Wound healing is a complex process and in chronic cases wounds are difficult to heal. Many investigations have been done to provide a method for overcome this problem. Conventional

methods such as skin grafting and laser therapy had disadvantages that includes risk of atrophic scars and pigmentary abnormalities. Recently suggested treatment for example growth factors, stem cells and gene therapy each on has faces obstacles in safety and effectiveness. Exosomes are the novel promising agents for wound healing promotion. In this study we researched about benefits and advantages of exosomes for wound healing compared to other methods.

Methods: The key words were searched in PubMed and google scholar databases with a time limit from year 2010 to 2023 and reviewed to find out the benefits of exosomes.

Results: Inflammation phase begins immediately after injury. A chronic and inappropriate inflammation can lead to delayed wound healing. Exosomes can regulate the inflammation phase by upregulation of B-cells and suppressing the T-cells. They can also switch the pro-inflammation form of macrophage to anti-inflammation form. Angiogenesis is a critical step in wound healing because of abundant transferring of oxygen and nutrients to the injured area. Exosomes enhance the proliferation, migration and tube formation of human umbilical vein endothelial cells. They are enriched by angiogenesis related proteins and mRNAs. Furthermore reported that exosomes can promote collagen I and III production to prevent scar formation.

Conclusion: Generally the exosomes have appeared as an effective and promising treatment for wound repairing without obvious side effects compared to conventional methods.

Keywords: Wound healing, Exosome, Diabetic ulcer, Nano particles

Total Contact Casting (TCC) and Neuropathic Ulcers. A Case Study

Saeid Pasban Noghabi¹

Shaghayegh Ameli²

Saeid Namazi³

Sima Golboie⁴

Mohsen Rohani⁵

1. MSc in Nursing Education, Wound Nurse, Velayat and Sina Hospital, TOOS Clinic, Mashhad University of Medical Sciences, Mashhad, Iran

2. GP, TOOS Clinic, Mashhad University of Medical Sciences, Mashhad, Iran

3. Vascular Surgeon, Velayat Hospital, Mashhad University of Medical Sciences, Mashhad, Iran

4. Bsc in Nursing, Sina Hospital, Mashhad University of Medical Sciences, Iran

5. Bsc in Operation Room, Wound Nurse, Taleghani Hospital, TOOS Clinic, Mashhad University of Medical Sciences, Mashhad, Iran.

One of the most complications of Diabetes is diabetic wound and neuropathic foot ulcers. In treatment of these ulcers we use dressing and the key element is take weight off of the foot (off-loading). In this case study we use TCC to treatment a neuropathic chronic ulcer. In this study a 65 years old man with chronic ulcer in left foot from 18 months ago after forefoot amputations (image No.1). The medical history of patient was DM, ESRD, HTN, and Neuropathy. At the first vascular surgeon visit the patient and then we achieved ulcer culture that results was negative. The size of ulcer was 4*2*0.2 cm and the edge of ulcer was round, detriments the edge and use Collagen dressing with Foam. After that we use TCC in 2 sections of 14 days. According the result of study at the first the size of ulcer was 4*2*0.2 cm. in 28 days the ulcer has been healed after 2 section of TCC.

TCC is applicable in daily practice in a wide range of patients with neuropathic ulcers in clinic situation without especial device, with good healing rates, relative few major complications and reduce the cost.

Keywords: TCC, Chronic wound, Diabetic foot

Antibacterial Activity of Lucilia Sericata Extracts Against Wound Pathogens

Samaneh Shahrokh^{1*}

Azadeh Karimi²

Mansour Siavash²

1. PhD in Microbiology, Isfahan Endocrine & Metabolism Research Center, Isfahan, Iran

2. Isfahan Endocrine & Metabolism Research Center

Background: Wound infection is an ongoing problem and may result in prolonged hospital stay of patients

and increased healthcare costs. Since Infected wounds with antibiotic resistant bacteria are responsible for significant human morbidity and mortality worldwide, it calls for introducing new alternative antimicrobial agents. The present study investigated antibacterial activity of different extracts of *Lucilia sericata* larvae against wound pathogens.

Methods: Phosphate buffer saline (PBS) and different concentration of ethanol (30%, 50%, 70%, and 96%) were used for preparation of extracts from dried and frozen larvae of *Lucilia sericata*. The antibacterial activity of the extracts was assessed by disk diffusion and colony count techniques against *Staphylococcus aureus* isolates from wound samples. In all cases, solvents were individually tested as controls.

Results: Only dried larval extract (with 70% ethanol) showed significant antibacterial activities using disk diffusion method (the inhibition zone of 17 mm against *S. aureus* isolate) and colony count techniques (3 log reduction in the presence of the extract after 24 hours).

Conclusion: One of the prepared larval extracts showed significant antibacterial activity against wound pathogens and suggest new promise in treatment of wound infections. More investigations are needed for determination of MIC and MBC of this larval extract.

Keywords: Antibacterial agents, Larvae, Wound infection

Silver Nanoparticles and Their Effect on Wound Healing

Sara Hassani^{1*}

Mohadeseh Pakroo¹

Seyed Mehdi Tabaie²

Mina Sadat Naderi³

1. Department of Biology, Science and Research Branch, Islamic Azad University, Tehran, Iran

2. Department of Medical Laser, Medical Laser Research Center, Yara Institute, Academic Center for Education Culture and Research (ACECR), Tehran, Iran

3. Department of Biophysics, Faculty of Biological Sciences, North Tehran Branch, Islamic Azad University, Tehran, Iran

Wounds provide a suitable environment for the

growth of harmful bacteria, and the increasing bacterial resistance to existing antibiotics necessitates the exploration of new approaches in the medical field. *Scutellaria barbata*, a perennial herb widely employed in traditional Chinese medicine for its anti-inflammatory, anti-infective, and detoxifying properties, has garnered significant attention. Silver nanoparticles derived from *Scutellaria barbata* aqueous extract exhibit remarkable efficacy as a wound healing agent. Silver nanoparticles (AgNPs) produced through the biosynthesis method involving the probiotic bacteria *Lactiplantibacillus plantarum* exhibited enhanced antimicrobial activity against wound infection-causing pathogens and displayed effective in vitro wound-healing properties. While AgNPs have been explored for their antimicrobial properties, their limited ability to penetrate biofilms have remained areas of research interest. The incorporation of IONPs into the bionanocomposites demonstrated a synergistic enhancement of antibacterial and antibiofilm properties. Application of an external magnetic field (EMF) to IONP-loaded bionanocomposites resulted in significant AgNPs release. This controlled release significantly boosted antibacterial activity and effectively inhibited biofilm formation. Moreover, AgNPs have the potential to combat antibiotic-resistant bacterial biofilms, and its characterization and mechanism of action are described that offers new perspective on addressing bacterial infections by targeting biofilms with various nanocomposites.

Methods: In this article, the role of IONP-loaded bionanocomposites on silver nanoparticles (AgNPs) release and the effect of AgNPs on wound healing by targeting bacterial biofilms has been investigated. For this purpose, articles published in various databases such as PubMed, Google Scholar and Elsevier have been discussed and analyzed.

Conclusion: Researchers successfully developed a smart bionanocomposite wound dressing by optimizing the combination of AgNPs, IONPs, and polymers which exhibited significant antimicrobial and antibiofilm properties when subjected to an EMF, making it a promising candidate for wound management in cases involving antibiotic-resistant biofilms. Furthermore, biosynthesized AgNPs-LD nanoparticles are effective

antibacterial agents and promising novel wound healing products for clinical applications.

Keywords: Silver nanoparticles, Bionanocomposites, Bacterial biofilm

Fabrication and Characterization of an Allograft Col-GAG Scaffold as a Suitable Wound Dressing

Sara Tabatabaee¹

Mahsa Delyanee²

Reza Samanipour³

Amirhossein Tavakoli^{4*}

1. Bio-Computing Department, Interdisciplinary Sciences and Technologies Faculty, Tarbiat Modares University, Tehran, Iran

2. Biomedical Engineering Department, Amirkabir University of Technology, Tehran, Iran

3. Research and Development Supervisor, Iranian Tissue Product Company, Tehran, Iran

4. Iranian Tissue Bank and Research Center, Tehran University of Medical Sciences, Tehran, Iran

A wound refers to a disruption in the epithelial or mucous membrane of skin due to physical or thermal damage. Wound repairing is considered as a worldwide priority and a proper treatment of wound (minor/major injury) is of great importance. Wound healing is a dynamic complex process that requires a suitable environment to promote the process. Traditional wound dressing products including gauze, wound dressing cloth, plaster, bandage (natural or artificial), and raw dry cotton are utilized as primary or secondary dressings to protect clean and dry wounds with mild exudates. Currently, skin tissue engineering has been proposed as an outstanding method for the repair/regeneration of the damaged tissue and overcoming the limitations of traditional wound dressings. This novel approach has provided remarkable outcomes in the mentioned field.

In this project, regarding the urgent need for introducing an advanced wound dressing capable of curing various types of wounds, a scaffold composed of a glutaraldehyde (GA)-crosslinked matrix of collagen and glycosaminoglycan (GAG) originated

from human acellular skin has been fabricated and further subjected to structural and biological studies. A scanning electron microscope (SEM) has been used for evaluating the microstructure of the scaffold. Also, in order to examine its biocompatibility, human dermal fibroblasts (HDFs) were cultured on the wound dressing's surface and their viability after 48 and 72 hours was investigated through 3 - (4,5 - dimethylthiazol - 2 - yl) - 2,5 - diphenyl - 2H - tetrazolium bromide (MTT) assay. According to the obtained results, the porous structure of the graft was preserved after cross-linking procedure, and due to the interconnectivity of the pores, the prepared wound dressing may provide a favorable microenvironment for the initiation of cellular activities (such as migration, growth, proliferation, and differentiation) and eventually, regeneration of the damaged area. The output of the MTT assay also indicated the survival of more than 80% of the cells and demonstrated the lack of toxicity within the structure. Therefore, it can be claimed that this scaffold is a promising candidate to play the role of an efficient dressing for treatment of acute/chronic wounds.

Keywords: Wound, Wound Dressing, Skin Tissue Engineering, Allograft, Col-GAG

Triboelectric Nanogenerators: A Novel Approach in Wound Healing

Seyede Sara Azadeh^{1*}

Hedayatoallah Ghourchian²

1. Department of Medical Laser, Medical Laser Research Center, Yara Institute, ACECR, Tehran, Iran

2. Laboratory of Bioanalysis, Institute of Biochemistry and Biophysics, University of Tehran, Tehran, Iran

Wound healing, is regeneration physiological processes to tissue injury in human body that involves a complex interplay between numerous cell types with distinct roles. Due to the advances in medical technology in the field of wound healing, in the last decades we have seen the evolution of effective non-invasive treatment strategies, including hyperbaric oxygen therapy, compression bandaging, wound dressings, negative pressure therapy, ultrasound and electrical stimulation in the wound

area. Electrical stimulation at the wound site is one of the attractive adjunct strategies in skin wound healing. Recently, the advent of various types of nanogenerators has created many opportunities for wound healing due to their favorable properties, owing to their pertinent features including low cost, simple fabrication, high output power, and small size. Nanogenerator as a biomedical technology could harvest micro-/nano-scale mechanical energy into electricity. The triboelectric nanogenerator is a type of nanogenerator that use all kinds of mechanical energy, such as wind waves, water waves, sound waves, magnetically induced motion, human motion, as an available energy source. In triboelectric nanogenerator, charges are placed on the surface of the electrodes by three working moods such as free-standing, contact-separation, or sliding mood, and an electric potential is created between the surfaces of electrodes. The alternating potential created in induced triboelectric effect can be stored in a storage unit or it can be used to power electrical devices (self-powered sensors). The electrical stimulation caused by triboelectric nanogenerators can reduce the wound edema around the nanogenerator electrodes. Other benefits include increased blood flow, proliferation of fibroblasts and keratinocytes, reconstruction of collagen, stimulation and migration of epidermal cells, recruitment of neutrophils and reduction of mast cells in healing wounds and the increase of growth factors that are effective in wound healing

Keywords: Triboelectric nanogenerator, Wound healing, Electrical stimulation

Fast Healing of Skin Wound in Diabetic Rats Using Mesenchymal Stem Cells Derived from Umbilical Cord and Adipose Tissue

Shadi Mohammadzadeh Moghadam

Bachelor of Biomedical Engineering, Department of Biomedical Engineering, Rahman Institute of Higher Education, Ramsar, Iran

Background and objective: Diabetic wound repair is one of the main challenges for patients with diabetes. In recent research, stem cells have created a new perspective for repairing these wounds in cell therapy.

Of course, the results and findings of these cells are also associated with challenges. The purpose of this research is the effect of mesenchymal stem cells derived from adipose cells and Wharton's jelly umbilical cord in the healing process of diabetic animal wounds.

Methods: In this study, which was conducted on animal samples, MSCs were isolated from adipose cells and Wharton's jelly of human umbilical cord. Stem cells derived from adipose in the form of hydrogel and stem cells derived from Wharton's jelly umbilical cord were investigated by injection. The hydrogel used was made by the enzyme transglutaminase. Also, the differentiation of cells and the expression of MSC markers were also investigated. Rat with diabetes were divided into three control groups, the test group treated with mesenchymal stem cells derived from adipose tissue, and the test group treated with mesenchymal stem cells derived from Wharton's jelly umbilical cord. Also, rat were imaged and evaluated on days 0, 7, 14 and 21. Next, the data were analyzed using t-test, independent t, and one-way ANOVA.

Results: First, the desired health and quality of the cells was ensured. According to the results observed in the control group, the area of the wound surface on the 14th day compared to the 7th day was not significantly different, but on the 21st day compared to the 14th day, a decrease in the wound surface was observed. However, in the treatment method of using hydrogel containing mesenchymal stem cells derived from adipose, as well as in the method of injecting mesenchymal stem cells derived from Wharton's jelly umbilical cord, biometric measurement of the wound showed that the thickness and density of the skin can be increased on days 7, 14 and 21, has been noticed and the wound surface has been significantly reduced.

Conclusion: The results of this research showed that mesenchymal stem cells derived from adipose tissue that are mounted on gelatin hydrogel and transferred to the wound area. Also intradermal injection of mesenchymal stem cells isolated from Wharton's jelly of human umbilical cord can effectively They significantly accelerate the healing of diabetic wounds in an animal model.

Keywords: diabetic wound, mesenchymal stem cells, umbilical cord, adipose tissue, animal model

Applications and Potentials of Artificial Intelligence-based Interventions in Tissue Engineering

Taleb Khodaveisi^{1*}

Mohammad Hosseini Ravandi²

Nasim Aslani³

Soheila Saeedi⁴

Farzaneh Kermani⁵

1. Assistant Professor of Health Information Technology, Department of Health Information Technology, School of Allied Medical Sciences, Hamadan University of Medical Sciences, Hamadan, Iran

2. Assistant Professor of Medical Informatics, Department of Health Information Technology, School of Allied Medical Sciences, Torbat Heydarieh University of Medical Sciences, Torbat Heydarieh, Razavi Khorasan, Iran

3. Assistant Professor of Health Information Technology, Department of Health Information Technology, School of Allied Medical Sciences, Lorestan University of Medical Sciences, Khorramabad, Iran

4. Assistant Professor of Health Information Technology, Department of Health Information Technology, School of Allied Medical Sciences, Hamadan University of Medical Sciences, Hamadan, Iran

5. Assistant Professor of Medical Informatics, Department of Health Information Technology, Sorkheh School of Allied Medical Sciences, Semnan University of Medical Sciences, Semnan, Iran

Background: Tissue engineering has emerged as a promising field in regenerative medicine, aiming to restore, maintain, or enhance tissue and organ functions. In recent years, artificial intelligence (AI) has shown great potential in transforming biomedical research and enhancing the effectiveness of tissue engineering strategies, thanks to its ability to analyze and interpret complex datasets. Despite these advances, our understanding of the applications and effectiveness of artificial intelligence in tissue engineering continues to evolve. In light of this, the aim of the present study is to investigate the applications and potential of artificial intelligence-based interventions in the field of tissue engineering.

Methods: The present study was conducted using a scoping review method without a time limit in 2023. To search for and extract valid studies, the keywords "artificial intelligence", "computational intelligence", "machine intelligence", and "tissue engineering" and their synonyms were used in the PubMed, Scopus, IEEE, and Web of Science databases. After removing duplicate articles and those unrelated to the purpose of the study, the bibliographic and content information of the remaining studies were extracted according to the study's objectives.

Results: The findings of the present study demonstrate that the use of artificial intelligence-based interventions in the field of tissue engineering can enhance the design and fabrication of tissue scaffolds, optimize cell culture conditions, and improve the overall effectiveness of tissue regeneration strategies. The potential of artificial intelligence applications in predicting and optimizing the length and number of micro-branches or roots, biomass in plant cell cultures or hairy root cultures, improvements in the manufacturing process, optimization in tissue-specific clonal selection, and regeneration of bone-like tissue with natural anatomical structure has been demonstrated.

Conclusion: The ability of artificial intelligence to analyze and interpret complex datasets has been instrumental in advancing biomedical research, opening new avenues for personalized medicine through the development of patient-specific tissue constructs. Future research should focus on harnessing the full potential of AI in this field, emphasizing the development of more advanced AI algorithms, improving data quality, and ensuring the ethical use of AI.

Keywords: Artificial intelligence, Tissue engineering, Machine intelligence, Computational intelligence

Introducing Organization and Wound Journals

Tannaz Faregh

BSN, Nursing, Shahid Sadoughi University of Medical Science, Yazd, Iran

The virtual prevalence of chronic wounds is

estimated at 1.5 to 2.2 per 1000 people of the global population, and its incidence is expected to rise regarding growing aging population who are the most susceptible to wounds and huge leap in obesity, diabetes, and other risk factors rate which contributes in skin integrity and continence issues. Not only do chronic wounds impose substantial financial burden on healthcare system through prolonged hospitalization and treatment process but also they have negative effects on their life-quality by posing loss of mobility, depression, and other psychosocial problems. According to aforementioned points, various organizations such as WOCNS, WCET, NPIAP, and other related institutions in different countries were founded in order to educate and train professional care-givers who are expert in caring for patients with wounds, ostomies, and incontinence and they can meet acute and rehabilitative needs of these patients in addition to collaborating with other members in interdisciplinary team to prevent occurrence of these wounds or its comorbidities and promote patients' outcomes. Moreover, these forums have been attempting to advance cutting-edge research and presenting it as evidence-based educational content in associated journals for nurses worldwide in order to bridge between research and practice. Unfortunately, Iranian people are also prone to the same mentioned circumstances and even worse in some cases; for instance, the prevalence of DFUs -one of the most common type of chronic wounds- in Iran is 8.1% while the world proportion is roughly 6.4%. Furthermore, absence of standard and localized wound treatment protocol based on cultural and geographical issues and inadequate educated nurses in this field have been impacting healthcare system negatively. Therefore, in order to change destructive customs, create interprofessional care team, and translate high-quality and cost-effective wound care plan to practice, foundation of integral institution in Iran seems necessary. Besides, designating special journals to record research achievement and promulgate clinical result for other care providers should be considered.

Keywords: wound care education, wound organization, wound associated journals, chronic wound, human wound burden

Fabrication and Characterization of Thymus Daenensis Essential Oil and Glycyrrhiza Glabra L. Extract Loaded Core-shell Nanofiber Scaffolds for Wound Healing

Vahid Reisi-Vanani¹

Ebrahim Soleiman Dehkordi²

Vajihe Azimian Zvareh³

Mehdi Alipour⁴

Zahra Lorigooini^{2*}

1. Student Research Committee, Shahrekord University of Medical Sciences, Shahrekord, Iran

2. Medical Plants Research Center, Basic Health Sciences Institute, Shahrekord University of Medical Sciences, Shahrekord, Iran

3. Core Research Facilities (CRF), Isfahan University of Medical Science, Isfahan, Iran

4. Department of Surgery, Shahrekord University of Medical Sciences, Shahrekord, Iran

Since ancient times, the wound healing properties of herbal medicines have been of interest and plant extracts have been traditionally used for such applications. In this study, A core-shell nanofiber scaffolds of PVA and Gelatin was designed by electrospinning technique that Thymus daenensis essential oil (5,10 and 20%), as a natural antimicrobial agent, and Glycyrrhiza glabra L. extract (2,4 and 8%) as wound healing agent were incorporated into core and shell of nanofiber scaffolds respectively. The electrospun were done successfully and all samples showed bead-free and tubular nano-fibers with no phase breakdown in the structure. The diameter of the nanofibers with adding essential oils and extracts in different concentrations, between 215.999 and 280.893 have been prepared. Presence of Thymus essential oil and Glycyrrhiza glabra L. extract in the electrospun fibers was approved by Fourier Transform Infrared spectroscopy. Incorporation of Thymus essential oil and Glycyrrhiza glabra L. extract into the nanofiber mats exhibited significant synergistic antibacterial activity against bacterial cells. Cell viability and proliferation were confirmed for all fabricated nanofibers on L929 cells. All concentrations of T. daenensis essential oil and G. glabra extract in nanofibers had positive effect on fibroblast migration in the scratch test, which showed

that this fibroblast migration causes skin regeneration and production of new granulation tissue and faster wound healing. Therefore, the results of this work showed that Thymus essential oil and Glycyrrhiza glabra L. extract incorporated core shell nanofibers have a great potential to be used as the biodegradable, biobased and antibacterial wound healing dressings.

Keywords: Electrospinning, core-shell nanofiber, electrospinning, Thymus daenensis, Glycyrrhiza glabra

Bioinformatic Strategy to Identify HUB Genes and Potential Drug Repurposing in Epidermolysis Bullosa

Zahra Azadian

Razieh Dalirfardouei*

Faculty of New Sciences and Technologies in Medicine, Department of Medical Biotechnology, Hamadan University of Medical Sciences, Hamadan, Iran

Background: Recessive dystrophic epidermolysis bullosa (RDEB) is an inherited blistering skin disease caused by biallelic mutations in the COL7A1 gene, which encodes type VII collagen, an important component of the anchoring fibrils at the dermal epidermal interface. Hereditary epidermolysis bullosa (EB) is associated with blistering of the skin, formation of difficult-to-heal wounds, and severe scarring. Therefore, a great unmet need exists to improve and accelerate wound healing. Here, we performed transcriptomic analysis of the RDEB GEO dataset to discover new therapeutic targets.

Method: Gene expression and miRNA datasets were obtained by searching the GEO database. Studies using a high-throughput dataset examine normal keratinocytes and RDEB as well as skin biopsies from the edges of chronic RDEB wounds compared to normal skin. To identify differentially expressed genes (DEGs), eligible gene expression profiles were investigated using the GO2R package, $|\text{LogFc}| > 1$, and $\text{adj.P.value} < 0.05$. To create and analyze the protein-protein interaction networks, STRING (12.0) and Cytoscape software (Cytohubba and MCODE plugin) were applied. The DAVID database was used for finding significant molecular pathways, gene ontology,

and enrichment analysis. Finally, the drug repurposing database CLUE (<https://clue.io/>, accessed on 16 July 2022) was used to identify FDA-approved drugs for potential repurposing and drug-hub Gene Interaction.

Results: Based on the DEGs identified in the GSE130767 dataset, hsa-miR-3663-3p and hsa-miR-10a-5p are differentially expressed between normal and RDEB keratinocytes, making them potential therapeutic targets. The most important HUB genes in EBDR wounds compared to healthy wounds are CXCL8, MMP9, TLR4, IL6, IL1B, EGFR, and CXCR4, which are involved in the inflammatory response, extracellular organization, cell adhesion, regulation of nitric oxide synthase activity, regulation of ERK 1 and 2, MAP kinase activity, regulation of TNF activity, Immune response and Angiogenesis. Loss of function of some of these genes is a promising candidate for preventing nonhealing wounds in patients with epidermolysis bullosa. We found 9 hub genes out of 25 key genes against which 77 drug candidates could be targeted, with Ibudilast having the same inhibitory effect on three of them; IL6, IL1B, and TLR4.

Conclusions: Our results confirmed that the Ibudilast, hsa-miR-3663-3p, and hsa-miR-10a-5p can alter the inflammation and fibrosis-like microe

Keywords: epidermolysis bullosa, inflammation, chronic wound, GEO database

The Effects of Lucilia Sericata Larvae and Eisenia Fetida Earthworm Extracts Either Alone or in Combination on Healing Third-degree Burns in Male Mice

Radin Reisi¹

Masih Sharifzadeh¹

Alireza Gandomkar¹

Amirmohammad Mahsa¹

Hossein Salehi²

Parham reisi³

Zahra Jokar^{4*}

1. Student, Shaid Ejei 2 High School, Isfahan, Iran

2. Associate Professor, Department of Anatomical

Sciences, School of Medicine, Isfahan University of Medical Sciences, Isfahan, Iran

3. Professor, Department of Physiology, School of Medicine, Isfahan University of Medical Sciences, Isfahan, Iran

4. Msc., Department of Physiology, School of Medicine, Isfahan University of Medical Sciences, Isfahan, Iran.

Introduction: Burn is one of the most common injuries that disrupt the protective function of the skin and induces complications in patients with burns. Therefore, the treatment of these patients presents a significant clinical challenge. The aim of this study was to evaluate the effects of *Lucilia sericata* (*L. sericata*) larvae and *Eisenia fetida* (*E. fetida*) earthworm extracts, alone or in combination, on the healing of third-degree burns in male mice.

Materials and Methods: In this experiment, a third-degree burn model was created on the skin of the interscapular region using consistent pressure. Then, the extracts of larvae and earthworms were topically applied separately or simultaneously every other day for a period of 21 days. To evaluate the process of wound healing, macroscopic parameters were monitored and examined during the study period. At the end of the experiment, the animals were sacrificed, and skin sampling was performed for histological investigations.

Results: The results of the study showed that both larvae and earthworm extracts accelerated the wound-healing process ($P < 0.01$). The group receiving earthworm extract had better wound healing than the groups receiving Vaseline and Silver sulfadiazine, and histological evidence also confirmed these observations. However, the using of two extracts simultaneously did not affect the wound-healing process.

Conclusion: The results of the present study demonstrated that the extracts of *L. sericata* larvae and *E. fetida*, the earthworm, especially *E. fetida*, include effective compounds that can significantly enhance the rate of burn wound healing. However, more studies are needed to identify and purify the effective compounds of these extracts involved in the process of wound healing.

Keywords: Burns, *Lucilia sericata*, *Eisenia fetida*, wound healing, extraction, mice

Wound Healings Based on Self-Healing Hydrogels: Goals, Materials, Mechanisms, and Quality Control

Zahra Mohammadi^{1*}

Fahimeh Gholamshahi²

1. Associate Professor, Biomedical Eng., Bioceramics and Implants Laboratory, College of Interdisciplinary Sciences and Technologies, University of Tehran, Tehran, Iran

2. MSc Student, Biomedical Eng., Bioceramics and Implants Laboratory, College of Interdisciplinary Sciences and Technologies, University of Tehran, Tehran, Iran

Wound healing is very important due to the importance of the skin as a protective barrier of the body against external pathogens, and for this purpose, the design of suitable wound dressings has always been considered. Traditional dressings such as gauze and bandages are not suitable options for wounds due to the need for constant replacement and causing pain, as well as not having sufficient drainage. Therefore, the use of wound healing based on self-healing hydrogels can be very helpful. These wound dressings repair themselves in case of damage and are superior to traditional dressings due to the absence of secondary damage when changing, being hydrophilic, similar to living tissue, having biomolecules and active substances, and mechanical durability. In this research, firstly, the types of natural polymers used in this type of wound dressings, such as sodium alginate, chitosan, gelatin, and hyaluronic acid, as well as synthetic polymers such as polyvinyl alcohol, polyacrylamide, and polyethylene glycol have been studied. Then, the types of wound dressings based on this type of hydrogels, such as antiseptic dressings, gentle cell/drug carriers, self-adapting smart materials on wounds of different sizes and sticky and durable hydrogels have been described. Various self-healing mechanisms include chemical covalent cross-linking (acyl hydrazone bonds, disulfide bonds, imine bonds, reversible Diels-Alder bonds, phenyl boronate complexes, and reversible radical reactions) and physical non-covalent cross-linking (hydrogen bonding, hydrophobic aggregation, host-guest interactions, and π - π stacking) as well as methods used to evaluate self-healing properties such as gelling properties, cut- heal properties

and tensile properties, the final part of this study.

Keywords: Wound healing, self-healing hydrogels, polymers, covalent cross-linking, non-covalent cross-linking

Docking Study for Assessment of Wound Healing Potential of Quercetin in the Treatment of Diabetic Foot Ulcers

Zahra Rahmani

Fatemeh Sholehvar*

Department of Biology, Faculty of Science, Zand Institute of Higher Education, Shiraz, Iran

Introduction: Diabetes mellitus (DM) is a complex disease affecting almost all the vital organs in the body. Up to 25% of DM patients suffer from diabetic foot ulcers (DFU), which are associated with infection, amputation, and death. A group of important endopeptidases that play a vital role in the repair of damaged skin are matrix metalloproteinases (MMPs). This group of enzymes in the normal range, accelerates the wound healing mechanism by helping angiogenesis and vasodilation, but elevated MMPs are believed to be responsible for poor wound healing. Oxidative stress and High glucose in diabetic patients, increase matrix metalloproteinase expression. Quercetin is a flavonoid that is found in many plants and foods such as grapes, onions, and broccoli. In this article, we focus on quercetin's function as a MMP inhibitor for the assessment of wound healing in the treatment of diabetic foot ulcers.

Methods: In this study, HyperChem Professional application is used to draw Quercetin compound. Then Matrix Metalloproteinase enzyme is extracted from the PDB site with 1G49 pdb ID. In addition, Discovery Studio 3.5 Client application is used to delete the water molecules and co-crystal structure from the MMP3 to be prepared for docking with Quercetin. We did molecular docking in Autodock vina. After docking Hydrogen bonds and involved aminoacids are marked by Discovery Studio 3.5 Client. To compare with the control ligand, Hbonds of the co-crystal and the MMP3 were determined.

Results: According to Autodock vina results, the affinity

between the enzyme and studied ligand was -8.321 kcal/mol and it was linked with amino acids ASN603, HIS651, PHE646 of B chain, and GLU150 in the A chain. According to Discovery Studio 3.5 Client application, the involved amino acids in the Hydrogen bond between MMP3 and co-crystal were LEU664, ALA665, HIS701, HIS711, and GLU702 of the B chain. One pi interaction between HIS701 and the co-crystal was detected.

Conclusion: Based on the results of this in silico study, Quercetin showed inhibitory potential towards the enzyme, and a good affinity was established between ligand and target protein, but laboratory confirmation will complement these results.

Keywords: Docking; Wound healing; MMPs; Bioinformatics; Diabetes mellitus

Macroscopic Evaluation of the Effect of Low Level Laser and Plasma Jet on Wound Healing in Rats

Zahra Tabarsi^{1*}

Mehdi Marjani²

Masood Ghasemzadeh Soroush³

1. Resident of Veterinary Surgery, Islamic Azad University, Iran

2. Department of Clinical Sciences, Faculty of Veterinary Medicine, Karaj Branch, Islamic Azad University, Karaj, Iran

3. Master of Medical Lab Sciences, Kermanshah University of Medical Sciences, Iran

The aim of this study was to evaluate and compare the macroscopic effect of low level laser and plasma jet for wound healing in rats. The study was performed on 40 old male white rats with an average weight of 250 g and an average age of the same age. After preparing the rats from Ibn Sina Research Institute, they were kept the same for one week under environmental conditions such as temperature, humidity and light, and nutrition such as the type of diet and the number of meals. Then, to start the research, rats were randomly divided into two groups (A): laser treatment of wounds, group (B): plasma wound treatment. All rats were inhibited 4 hours before each anesthesia under conditions of abstinence and up to

2 hours after drinking water. Rats were anesthetized by intraperitoneal injection of ketamine 10% and xylazine 2%. After scrubbing between two shoulders of each rat, a circular wound was created by sterile 5 mm biopsy puncture. Group A rats were treated with low level laser in three sessions (each one 5-7 minutes) and group B in three sessions (each one 2 minutes) with argon plasma. Based on the wound contraction and observed results, it seems that Low level laser radiation has more acceptable and appropriate effects than cold plasma on the healing of rat skin wounds.

Keywords: Wound healing, Low level laser, plasma jet

Preparation of Polylactic Acid/ Hyaluronic Acid Electrospun Wound Dressings Containing Niacinamide

Soroush Shams*

Vida Heidari

Mohsen Shahrousvand

Abdolmajid Bayandori Moghaddam

Jamshid Mohammadi-Roshandeh

polymers Research Laboratory, School of Chemical Engineering, College of Engineering, University of Tehran, Tehran, Iran

Drug-loaded electrospun fibers have attracted increasing attention as a promising wound dressing material due to their capability of preventing from infections and inflammation and maintaining an appropriate environment for wound healing. polylactic acid (PLA) and Hyaluronic acid (HA), which is widely used in wound management, was chosen as electrospinnable polymer. Hyaluronic acid (HA) is a main constituent of the extracellular matrix (ECM) of a vertebrate's connective tissue, represents a promising biomaterial for wound dressing thanks to its intrinsic biocompatibility, hydrophilicity and bacteriostatic properties.

The wound healing ability of PLA/H.a-based electrospun nanofibers loaded with niacinamide is explored. Niacinamide known for its anti-inflammatory, Improve angiogenesis and wound healing effects was chosen to produce niacinamide loaded PLA/H.A electrospun

fibers for wound dressing. morphology of niacinamide loaded PLA/H.A electrospun fibers was investigated by scanning electron microscopy (SEM). SEM images showed that PLA/H.a-based electrospun nanofibers loaded with niacinamide possessed a denser network with smaller pores than PLA or H.a which prevents bacterial penetration. In vitro release studies showed that PLA/H.a membrane in a Fickian diffusion manner, whose experimental data were well fitted using the Korsmeyer-Peppas model. Moreover, culturing experiments with human dermal fibroblast (HDF) cells demonstrated that all samples are biocompatible and showed that the niacinamide loaded PLA/H.A nanofibrous membranes support better cell attachment and proliferation compared to the PLA/H.A nanofibrous membranes, owing to the superior hydrophilicity. In conclusion, the design and development of PLA/H.a-based electrospun nanofibers as a wound dressing can be improved by the addition of loaded with niacinamide to obtain the fibers with optimal properties for wound management.

Keywords: Polylactic acid, Hyaluronic acid, Electrospinning, Niacinamide

Investigating the Effect of Propolis Mouthwash in the Treatment of Mucositis Caused by Chemotherapy

Maryam Jalili Sadrabad

Faculty of Dentistry, Semnan University of Medical Sciences

ed oral mucositis is regarded as a painful and discomforting chemotherapy complication, affecting patient's quality of life and endurance to continue the treatment. Hence, treatment of mucositis is of great significance. The present study was conducted to evaluate the effect of Baremoom mouthwash in treatment of chemotherapy-induced mucositis.

Methods: This interventional double-blinded randomized clinical trial study was performed on 40 adult patients under chemotherapy in blood and oncology department of Shahid Sadoughi hospital. The total of 40 patients were randomly divided into two groups: an experimental baremoom group and a control

placebo group each containing 20 subjects. Baremoom mouthwash (30% extract, Soren Tektoos, Mashhad) and placebo mouthwash (Sterile water with allowable additives, Soren Tektoos, Mashhad) with same apparent properties were given to the patients (3 times a day) for 7 days after mucositis detection. The patients were evaluated in regard with mucositis grade (0-4 WHO) and wounds extension on 1th, 3th and 7th days after the study beginning. In order to statistically analyze the collected data, Friedman, Mann-Whitney, and Wilcoxon W tests were applied utilizing SPSS software (ver, 17).

Results: On 3rd and 7th days, mean degree of wound extension and mucositis were demonstrated to be significantly different between the two groups. According to Friedman test, both experimental and control groups revealed a significant difference in regard with wound extension and mucositis grade within the three time periods.

Conclusion: The study findings indicated that Baremoom mouthwash was more effective in chemotherapy-induced mucositis than placebo. Hence, this agent can be recommended as an appropriate medicine in order to eliminate mucositis symptoms and decrease oral ulcers

Keywords: Baremoom, Chemotherapy, Mucositis, Propolis

Evaluation of Diagnostic Methods of Patients with Necrotizing Skin and Soft Tissue Infections (NSTI) and the Need for Hospitalization in the Intensive Care Unit

Maryam Hejri Moghadam

MSc Student in Medical Education, Specialist Nurse of Wound and Ostomy, Ghaem Hospital, Mashhad University of Medical Sciences, Mashhad, Iran

Necrotizing skin and soft tissue infections (NSTI) includes a wide range of infections that can develop in different anatomical locations or after breaking the integrity of the skin (or mucosa). In fact, necrotizing skin and soft tissue infections (NSTI) are infections of the skin, subcutaneous tissue, and superficial fascia that cause necrosis in them. The aim of the present study

was to evaluate the diagnostic methods of patients with necrotizing skin and soft tissue infections (NSTI) and the need for hospitalization in the intensive care unit. The current literature is of a systematic review type and is from English articles extracted from foreign information banks (PubMed, Web of Science and SCOPUS) using the keywords care unit, critical care, critical illness, fasciitis, necrosis, Fournier's gangrene, gas gangrene, soft tissue infections, and skin or infectious diseases and other related keywords are used in the period of 2010-2023. Since the initial diagnosis of patients with NSTI is confusing and can be associated with the progress of the disease and may even kill the patient. Additional imaging in critical patients can be mentioned among the disease diagnosis methods. Also prompt surgery with aggressive debridement of necrotic tissue is required for source control and allows for microbiological sampling. Prompt administration of broad-spectrum antimicrobial therapy has also been effective in some cases, but the role of immunoglobulins and hyperbaric oxygen therapy in the treatment of NSTI still needs further investigation. Overall knowledge of the treatment options within a multidisciplinary team-with special attention to the appropriate use of antimicrobial therapy and invasive treatment techniques for source control-is essential in the treatment of this complex disease.

Keywords: NSTI, Special care, Surgery, Microbiology, Immunoglobulin

Prolonged Nitric Oxide Release from Composite Hydrogels Containing S-Nitroso Glutathione Microparticles for Diabetic Wound Care

Mahboubeh Shafiei, Reza Karimi-Soflou, Akbar Karkhaneh*

Department of Biomedical Engineering, Amirkabir University of Technology (Tehran Polytechnic), Iran

Wound dressings play a critical role in preventing infections, maintaining optimal moisture levels, and expediting healing to enhance wound recovery and minimize scarring in diabetic wounds. Impaired diabetic wounds exhibit persistent inflammation, reduced

growth factor secretion, and suppressed angiogenesis, resulting in slow and difficult healing. Nitric oxide (NO) plays a vital role in wound healing, but its production is hindered in diabetic wounds under hyperglycemic conditions. This study explores encapsulating NO donors in polymeric hydrogels to enable controlled and prolonged NO release directly into diabetic wounds.

In this study, a NO-releasing hydrogel using chitosan (CS) and S-nitroso glutathione (GSNO) as the NO donor was developed. First, GSNO was successfully synthesized, as confirmed by NMR, FTIR, and UV-vis spectroscopy. After that, GSNO was encapsulated into poly(lactic acid) microparticles through the emulsion solvent evaporation technique, with $69\% \pm 5\%$ encapsulation efficiency. Scanning electron microscopy verified microparticle formation with the diameter of $5.2 \pm 2.7 \mu\text{m}$. The microparticles were then incorporated into CS hydrogels, synthesized by ionic gelation, to provide prolonged NO release. FTIR confirmed gel formation, while SEM revealed an average pore size of $153 \pm 16 \mu\text{m}$ and uniform microparticle distribution. The hydrogel exhibited a swelling ratio of 22.7 ± 4.1 and a water vapor transmission rate of $2237 \pm 183 \text{ g/m}^2/\text{day}$. In vitro NO release studies over 10 days, quantified by the Griess assay, demonstrated controlled and prolonged NO release. Cytocompatibility assays using human dermal fibroblasts (HDF) confirmed that GSNO directly enhances cell proliferation. Overall, this NO-releasing hydrogel shows promise as an advanced wound dressing to treat diabetic wounds.

Keywords: NO-releasing hydrogel, S-nitroso glutathione, Microparticle, Hydrogel

Using Artificial Intelligence in Reinventing Wound Care

Zhila Saneipour

Cardiac Nurse, CCU1, Bahman Hospital

Analyzing the wounds and finding the appropriate treatment are complex tasks. Rapid developments in Information Technology (IT) have enabled the development of Artificial Intelligence (AI)-based systems. Developing a decision-making support system for nurses based on clinical records and

Artificial Intelligence facilitates diagnosis of classify burn severity, predict of wound healing trajectories, and track changes of wound. This system will be able to automatically recognize and characterize wounds both qualitatively and quantitatively, and suggest adapted treatments. In addition, the application will offer the opportunity to practice knowledge and skills of wound care using a training platform. AI allows clinicians to see what is happening beyond what one can see with the naked eye. An AI-based system includes knowledge base of experts and can make the best decisions with respect of the wound. Different branches of AI including computer vision, expert systems, and machine learning can improve Reinventing Wound Care. Although AI accelerates managing and reinventing wound care, technical, financial, and experience are three main challenges to implementation of AI-based systems.

Keywords: AI-based systems, wound healing, Reinventing Wound, Artificial Intelligence (AI)

Fabrication of an Injectable Drug Delivery System for Biomedical Applications

Sanaz Alizadeh
Ebrahim Zarkesh
Zohreh Bagher*

Iran University of Medical Science, Tehran Iran

The drug delivery system is an important subject in regenerative medicine. An effective system should facilitate controlled release and ensure prolonged drug delivery into the target site in contrast with injection. Utilizing hydrogel carriers to be injected into the target tissue is considered to be a proper strategy to achieve both reduction of injection frequency and sustained drug release. Micron-size particle hydrogels present an excellent choice, not only enhancing drug release but also, adjusting the physical and chemical properties of the hydrogel. The Fabrication of droplets will take place using microfluidic devices and polymerization through a chemical or physical reaction. In the current study, the thermosensitive polymer was chemically modified, resulting in the fabrication of non-uniform

size and self-aggregation of spherical microgels which are key factors in the encapsulation process. In our approach, the fabrication of micron-sized spherical hydrogel constructs was performed by utilizing an appropriate parameter within a microfluidic device with a surface-modified thermosensitive polymer. Injectable microparticles with self-assembly properties in physiological temperature fabricated using conjugation of phenol moieties into polyvinyl alcohol (PVA-Ph) as the base core. Following this, the thermosensitive modified Pluronic (Plu)127 with phenol moieties (Plu-Ph) was synthesized as a shell of the microparticle. The core-shell-based microparticle can form hydrogel within the physiological condition in the target site through interpenetrating of the Pluronic on the shell part of the microparticle. Based on the result, the core-shell microparticle was fabricated correctly. The fabrication of the construct was characterized using NMR and SEM, and its effect on the cell viability was evaluated via Live live-dead assay. The NMR result confirmed the PVA-Ph and Pluronic-Ph synthesis. The SEM micrograph and macroscopic image of the microparticle showed the spherical and relatively monodisperse in size of particles. Our present study provides a new drug delivery system based on PVA-Ph/Plu core-shell microparticles that could dope with drugs.

Keywords: Core-shell; Drug delivery; Wound healing

Effects of Wound Healing Peptides Derived From Amphibians in the Treatment of Skin Wounds

Mohaddeseh Zeinali Ali Abadi^{1*}
Donya Safari¹
Fatemeh Hayeri Mehrizi¹
Reihaneh Seyedebrahimi²

1. Medical Student, Student Research Committee, Qom University of Medical Sciences, Qom, Iran

2. Cellular and Molecular Research Center, Qom University of Medical Sciences, Qom, Iran

Background: Wound healing is a complex process consisting of four stages: homeostasis, inflammation, proliferation, and regeneration. The incidence

Tehran, Iran

of skin wounds is high and it causes infection, numerous complications, and imposes significant costs. Therefore, the choice of suitable and effective methods of treatment is necessary. A novel method is the use of the skin of amphibians. Many studies showed that after damage to the skin of amphibians, peptides are secreted from their skin, some of which showed restorative effects. So, in this study, we reviewed the effects of Peptides extracted from amphibians that aid in wound healing on mammalian skin wounds.

Methods: A number of keywords including peptide, amphibian peptide, wound healing, and repairing tissue were searched in databases such as PubMed, Google Scholar, Science Direct, etc. (2019 to 2023).

Result: During the process of wound healing, infection caused by microorganisms can disrupt the epithelialization process, leading to the production of free radicals and oxidative stress. To promote better wound healing, it is essential to have compounds that are antibacterial, antioxidant, and restorative. It was observed that after damage to the skin of amphibians, the peptides secreted from their skin have antimicrobial and antioxidant properties. Prolonging the inflammation process leads to scar formation, therefore inhibition of TNF- α levels, activation of MAPK, and NF-kB signaling pathways by some of the mentioned peptides that reduce inflammation, help to reduce scar formation. Despite the advantages of these peptides, such as high bioactivity, short sequence, and ease of synthesis, they also have disadvantages, including unstable chemical properties, short half-life, rapid clearance, and easy enzymatic hydrolysis. Therefore, in order to increase the efficiency of peptides, their structure can be modified or even combined with other molecules such as nanomaterials. It is also possible to make new peptides artificially.

Conclusion: Wound-healing peptides derived from amphibians, with various modifications, can be an effective method for accelerating wound healing and reducing scarring.

Keywords: Peptide, Amphibian peptide, Wound healing, Repairing tissue

Effect of Cloves Plant on Skin Wound Healing

Mohaddeseh Zeinali Ali Abadi^{1*}

Fatemeh Hayeri Mehrizi¹

Ali Torkamandi¹

Donya Safari¹

Reihaneh Seyedebrahimi²

1. Medical Student, Student Research Committee, Qom University of Medical Sciences, Qom, Iran

2. Cellular and Molecular Research Center, Qom University of Medical Sciences, Qom, Iran

Background: Skin ulcers are one of the most important and common skin disorders that can decrease the quality of a patient's life. Wound healing is a dynamic process with several stages including homeostasis, inflammation, cell proliferation, and tissue remodeling. If the wound is not treated correctly, it may lead to loss of organs or even death. So far, various treatment methods have been offered in this field. Clove plants have a lot of phenolic compounds, especially eugenol, which has antioxidant, anti-inflammatory, antifungal, antimicrobial, and wound - healing properties. Therefore, in this study, we reviewed the effects of cloves on the healing of skin wounds.

Methods: The keywords clove, eugenol, wound healing, and wound treatment in reliable scientific databases such as PubMed, Google Scholar, Scopus, etc. were searched (2019-2023).

Result: Clove extract has anti-inflammatory properties and reduces swelling and pain caused by wounds. It also increases effective growth factors in the wound-healing process and promotes angiogenesis in the damaged area. In addition, it stimulates the growth of fibroblasts, which increases collagen production. Clove essential oil shortens the wound-healing process by increasing contraction and reducing the wound epithelialization period.

Conclusion: Studies have proven that cloves can improve wound healing. Therefore, it can be used as an effective and innovative method to treat skin wounds.

Keywords: Clove, Eugenol, Wound healing, Wound treatment

Effect of *Chromolaena Odorata* Leaf Extract on Wound Healing

Fatemeh Hayeri Mehrizi^{1*}

Mohaddeseh Zeinali Ali Abadi¹

Donya Safari¹

Ali Torkamandi¹

Reihaneh Seyedebrahimi²

1. Medical Student, Student Research Committee, Qom University of Medical Sciences, Qom, Iran

2. Cellular and Molecular Research Center, Qom University of Medical Sciences, Qom, Iran

Introduction: Wound and its treatment are an important issue in human life and there are different drugs with various effects for that. One of the appropriate treatments with fewer side effects is the use of medicinal plants which prompted researchers to search for these. One of these plants is *Chromolaena odorata*. This research aims to investigate the effect of *Chromolaena odorata* leaf extract on wound healing.

Methods: Some terms including “*Chromolaena odorata*”, “Siam weed” and “wound healing” were searched in PubMed and Google Scholar in recent years to provide an up-to-date review.

Results: Studies showed that *Chromolaena odorata* Leaf Extract contains a mixture of powerful antioxidant compounds including phenolic acids, complex mixtures of lipophilic flavonoid aglycones, etc. These compounds enhance conserving the fibroblast and keratinocyte proliferation on wounds and thus wound healing. In addition, they protect cultured skin cells against oxidative damage. This plant has anti-inflammatory and antimicrobial properties. Its phytochemical components are alkaloids, flavonoids, flavanone, essential oils, phenolics, saponins, tannins, quercetin, terpenoids, eupolin, quercetagenin, and chromomoric acid which all contribute to its healing properties. The results showed that the use of the appropriate concentration of plant leaf extract in the wound causes blood clotting and reduces the bleeding. also, it was received that heme oxygenase-1 (HO-1), the accelerating wound healing enzyme, was increased at the transcriptional and translational levels. In addition, this plant accelerated hemostatic and wound healing activities by altering the expression of genes, including HO-1, TXS, and MMP-9.

Conclusion: In summary, the obtained results show that *Chromolaena odorata* leaf extract can be one of effective herbal medicines for healing and treating wounds.

Keywords: *Chromolaena odorata*, repairing tissue, wound healing, treatment

The Latest Smart Wound Dressings

Mona Esmaeili^{1*}

Hoda Kheshmiri Neghab²

Mohammad Hasan Soheilifar²

Hossain-Ali Rafiee- Pour¹

1. Department of Cell and Molecular Biology, Faculty of Chemistry, University of Kashan, Kashan, Iran

2. Department of Medical Laser, Medical Laser Research Center, Yara Institute, ACECR, Tehran, Iran

Introduction: Smart wound dressings have emerged as a solution to the spread of infectious wounds and complications in their recovery. These dressings can sense and respond to changes in the environment, release medicine at the wound site, and use fluorescent molecular probes and colored light analysis to determine the extent of infection and damage. Additionally, wearable wireless sensors, biodegradable metal electrodes, and laser-induced graphene are being used to create innovative and effective smart wound dressings. The use of colorimetric sensors in wound dressings for detecting blood glucose in diabetic patients, along with growth factor releasing components, has also been successful in wound healing and infection control.

Method: Researchers have developed a two-layer smart wound dressing that can detect temperature, pH, and uric acid levels at the wound site, and release antibiotics when needed. The dressing utilizes sensors and a wireless connection to a smartphone to monitor and control the wound environment. This information is taken from Elsevier, Pubmed, Research Gate databases.

Result: Recent studies have found that smart dressings, such as pH-sensitive and heat-sensitive dressings, are more effective in treating wounds and preventing infection compared to traditional dressings. Additionally, colorimetric sensors used in diabetic patients can not only measure blood glucose levels but also aid in healing scars and reducing infection through temperature-sensitive

sensors and controlled drug delivery.

conclusion: Smart dressings have helped a lot in treating and improving wound control. The emergence of biodegradable dressings has helped to protect the environment. The presence of moisture in the wound area as well as very high or sub-zero temperatures may endanger the sensitivity of the sensors.

Keywords: Wound dressing , Smart dressing , Sensor

Benefaction of Probiotics on Skin Wounds Healing

Sana Yahyazadeh Jasour^{1*}

Farideh Mohammad Hossein Zadeh¹

Hoda Keshmiri Neghab²

1. Department of Microbiology, School of Biology, College of Science, University of Tehran, Tehran, Iran

2. Department of Medical Laser, Medical Laser Research Center, Yara Institute, ACECR, Tehran, Iran

Skin wound healing processes are a mechanism of complex biological procedures involving many extracellular and intracellular macromolecules. it plays a significant role in remodeling and reestablishing the skin barrier following the damage. Management of the wound healing process costs billions of dollars per year directly and indirectly. Although antibiotics are applied in modern wound management as routine care, they cannot cover all aspects of wound management. Therefore, looking for an alternative strategy that accelerates the skin wound healing process is a noticeable research field for basic scientists and medical experts .

Probiotics are living microorganisms, which when consumed in adequate quantities produce a beneficial effect on human health. During the last century, possible beneficial effects of probiotic bacteria on wound healing have been proposed. it is found that certain probiotic strains may improve wound healing processes through antibacterial, anti-inflammatory, and proteoglycan deposition, as well as immunomodulatory effects and angiogenesis traits.

Proven mechanisms by which probiotic bacteria exert their beneficial effects include direct killing of pathogens, competitive displacement of pathogenic

bacteria, reinforcement of epithelial barrier, induction of fibroblasts, and epithelial cells' migration and function. Beneficial immunomodulatory effects of probiotics relate to modulation and activation of lymphocytes, natural killer cells, and macrophages through the inducing of cytokine production. Systemic effects of beneficial bacteria and the link between gut microbiota, immune system, and cutaneous health through gut–brain–skin axes are discussed as well .

Potential of beneficial probiotic species as a safe alternative approach for treatment the skin wounds and cutaneous infections is a new therapeutic perspective. Moreover, the promising industry of probiotics demonstrates a significant upsurge as more and more healthy individuals rely their well-being on alternative medicine. According to this, it is necessary to pay special attention to probiotic therapy as a helpful alternative solution in skin wound healing.

Keywords: alternative strategy, probiotics, skin, wound healing

Comparative Evaluation of the Cold-atmospheric Pressure Plasma Jet and Medical Treatment Effect on Chronic Wound Healing in Native Dogs

Mahsa Fathabadi^{1*}

Zohreh GHorannevis²

Mahdi Marjani³

1. D.V.S student, Science and Research, Islamic Azad University, Tehran, Iran

2. Department of Physics, Karaj Branch, Islamic Azad University, Karaj, Iran

3. Department of Clinical Sciences, Department of Surgery, School of Veterinary Medicine, Karaj Branch, Islamic Azad University, Karaj, Iran

The loss of the structural integrity of the skin leads to the creation of various types of wounds, which .affect the structure and function of the subcutaneous tissues. Plasma is considered as one of the non-invasive scientific methods in the field of medicine and veterinary medicine. Wounds are one of the clinical problems and can be acute or chronic. Due to the importance of wounds, especially

chronic wounds, their management and treatment are considered important priorities in veterinary medicine. In this research, 12 native dog collars with an average weight of 20 to 25 kg were used, which had relatively similar wounds on the skin. The dogs were divided into two groups of 6. The first group was treated ointment and the second group was treated with plasma jet. In this study, the speed of wound healing and contraction of the plasma group was higher and more obvious than that of the control group. In the continuation of the healing process of pathology and macroscopic observations, it was found that the amount of wound contraction in the control group occurred slower than that of plasma, so that the complete healing of the wound in the control group lasted until the 31st day after wound renewal, while this rate for plasma was On average, it has been 14 days.

Keywords: cold-atmospheric pressure plasma jet, Wound healing, silver sulfadiazine

The Comparison Between Thyme and Cinnamon Essence in Wound Healing

Fariba Noori

Zahra Abpeikar

Ahmadreza Farmani

Mohsen Safaei

Mozhgan Jirehnezhadya

nHamidreza Ghaderi Jafarbeigloo

Arash Goodarzi

Department of Tissue Engineering, School of Advanced Technologies in Medicine, Fasa University of Medical Sciences, Fasa, Iran

Introduction: The wound is described as injury and any disorder in the normal structure of the skin, which can cause loss of conjunction in the body tissue. Wound healing is a normal physiological process to tissue injury. However, wound healing is not a simple phenomenon and includes a complicated interaction between many cell types, cytokines, mediators, and the vascular system. The efficacy of herbal medicine in effective wound healing is undeniable. Cinnamon and thyme are useful herbal medicine and have several applications.

Methods and Materials: After nanogel synthesizing by ionic gelation, the particle sizes were evaluated by DLS methods. To study nanogel effects in wound healing, 18 rats were considered under control, thyme, and cinnamon groups. These rats were examined in 3, 7, and 14 days macroscopically (wound closure) and histologically (inflammation, abscess, edema, granulation, and second epithelialization).

Results: DLS results demonstrated that particle sizes of thyme and cinnamon essence nanogel were in the acceptable range (220 ± 8 and 198 ± 8 nanometers, respectively). Macroscopic results from wound closure revealed that on day 14, the thyme and cinnamon nanogel groups showed significant reduction. ($p < 0.001$). Also, thyme nanogel showed a significant decrease compared to cinnamon nanogel ($p < 0.05$). Histological results showed that in the thyme nanogel group, vessel numbers, inflammation, and edema in granulation tissue were reduced and an increase in the collagen content of the connective tissue.

Conclusion: The results showed that thyme and cinnamon nanogels are effective in wound healing and skin regeneration, and thyme nanogels are more effective than cinnamon nanogels in wound healing.

Keywords: Wound Healing, Thyme Nanogel, Cinnamon Nanogel

Artificial Intelligence-Enhanced Chronic Ulcer Classification and Assessment

Haleh Fateh

Mojtaba Khayat Ajami

Mehrangiz Totonchi

Hooman Taghavi

Hesameddin Allameh *

Lifestyle Medicine Research Group, Academic Center for Education, Culture and Research (ACECR), Tehran, Iran

The increasing prevalence of challenging-to-heal wounds, often linked with aging populations and the growing occurrence of chronic illnesses, poses significant challenges within the healthcare sector.

Ensuring safe and efficient care for the increasing number of patients with chronic ulcers is a complex undertaking. Due to the multidisciplinary nature and the intricate, dynamic processes involved in wound healing, accurately predicting the precise course of wound recovery is a formidable task. In response to these challenges, healthcare teams have started collecting extensive datasets of wound images acquired during clinical visits. The integration of artificial intelligence systems into clinical practice has the potential to assist clinicians in diagnosing conditions, assessing the effectiveness of therapeutic interventions, and predicting healing outcomes.

A notable advancement is the emergence of AI-driven remote consultation systems that utilize smartphones and tablets for data collection and seamless connectivity. These systems expedite timely interventions and enhance communication among healthcare professionals.

Another significant challenge in the realm of complex wound management and treatment is the continuous monitoring and measurement of various wound indicators. This study emphasizes the importance of the Model for Telemedicine Assessment and envisions the development of an eHealth-supported wound assessment system, underpinned by AI. Leveraging convolutional neural networks (CNNs), a subset of artificial neural networks known for their proficiency in visual imagery analysis holds great promise for categorizing chronic ulcers.

The primary objective of this pilot study is to introduce an AI-driven classification methodology that addresses the increasing demands of wound care and management. Specifically, we explore the feasibility of wound segmentation for diabetic foot ulcers and venous leg ulcers by training a CNN on relevant datasets. Furthermore, we conduct a comparative evaluation of various CNN architectures for wound segmentation, identify the area within the wound, calculate its size, and establish a classification system based on convolutional networks.

The outcomes of this study evaluate the effectiveness of our proposed approach as a decision support system for the classification of wound images.

Keywords: Artificial Intelligence, Convolutional Neural Networks, Chronic Ulcers, Chronic Wound Classification, Telecare

خلاصه مقالات
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