

EDITORIAL

## Chronic Wound Management : A Brief History from Past to Present

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Today, chronic wounds continue to be a problem for patients and in the budget expenditures allocated to health by countries. Although chronic wounds occur due to predisposing factors, they are mainly caused by deterioration in the healing process of the skin. According to the definition that has gained prominence recently, a wound is deemed chronic when its volume has not decreased by 50% in the end of four weeks or its size not decreased 10 - 15% per week.<sup>1</sup> With the prolongation of the average life expectancy and the increase in diseases such as diabetes mellitus, peripheral vascular diseases, pressure ulcers and chronic complications, the incidence of chronic wounds that impair skin integrity has also increased.

The approach to wound healing has shown a progressive process from prehistoric times to the present.<sup>2</sup> The first written records of wound healing were discovered in Mesopotamia inscribed on clay tablets about 2500 BC. Later, the Ebers papyrus were documented using the closed method in wound treatment about 1500 BC. In ancient Egypt, honey, lard, lint, beer and different minerals, especially copper, were used in wound care. In this period, plant-based treatments were the priority.<sup>3</sup> Hippocrates defined the wound as a *disease* and stated that it occurs due to the deterioration of the body balance. Although the effectiveness of treatment was demonstrated by clinical observation in the Hippocratic period, belief in magic and higher powers continued due to the unpreparedness of the society. Galen, who later became a gladiator surgeon in Rome, did his first work about wound healing at the Asklepon medical center in Pergamon, Anatolia. In the Middle Ages, with the shift of civilization from Rome to Byzantium, medical science was later influenced by the Arabs. Abul-Quasim, one of the Arab scholars, made studies that contributed to wound healing in Cordoba, Spain.<sup>4</sup> As an important source in the Middle Ages, Theodoric wrote his work called *Chirurgia*, and Guy de Chauliac wrote the *Cirurgia Magna*. In this period, removal of the foreign body, joining the wound edges, approximation of the tissue, protection of the tissue, which are the main principles in wound healing, and complication treatment came into

the practice. In Europe, studies on wound care were carried out by Ambrose Pare, Joseph Lister, Dominique Jean Larrey and Carl Reyher, and in Anatolia, the treatment of wounds with cauterization was carried out by Şerafettin Sabuncuoğlu.

Wound healing results obtained with contemporary medical practices have also been documented in written articles for the medical community. Today, many publications and books on the topic of wound care have been prepared. There are 87,509 articles in the pubmed search with the keyword “chronic wound”. Although the establishment date of wound care associations around the world dates back to previous years, “The Wound Care and Repair Association” in Turkey was founded in 1996. Our hospital, on the other hand, is a wound care center affiliated with the University of Health Sciences and was established in 2020. In 2020, while the patients hospitalized in the palliative care unit treated particularly for pressure sores, an increase was observed in the wound and stoma patients in 2022. In our service, wound debridement was performed on 539,750 and 1555 patients in 2020, 2021 and 2022, respectively. Enzymatic debridement, surgical debridement, hydro-surgery, collagen dressings and antibacterial dressings were used in clinic practice. Vacuum assisted aspiration systems and hyperbaric medicine were used as auxiliary methods. However, it is very difficult for undeveloped countries to reach this material and it is tried to be treated with conventional dressings.<sup>5</sup> At the present time, in order to shorten patients' hospital stays and let them return to their jobs sooner, as well as to lower the hospital's bed occupancy rate, faster recovery techniques and bandages are needed. Although local and systemic factors are important in the formation of chronic wounds, some systemic features as age, gender, stress, obesity, diabetes, nutrition and infections, which are unlikely to be managed.

Today, advances in wound treatment have been seen with the understanding of the role of cytokines in chronic wound formation, biofilm formation as well as proteolytic mechanisms. With the imbalance of

decomposition (degradation) and production (synthesis) in the chronic wound, an increase in decomposition occurs. The main factors that play a role in the differentiation of chronic wound from acute wound are disorders in the quantity and activity of inflammatory cytokines that play a role in the imbalance of the microenvironment, increase in matrix metalloproteinases (MMP), decrease in angiogenesis, increase in inflammatory mediators, decrease in growth factors and biofilm formation. Therefore, today therapeutic materials are aimed at the treatment of the deficiency or excess of these factors.<sup>6</sup> One of these inventions used in practice in the last decade is the preparation of stem and regeneration cells from the patient's adipose tissue. The resulting cells are injected into or around the wound. Another supplementary technique is to expose human epidermal stem cells to radiation using a helium-neon laser in order to promote cell growth and migration.<sup>7</sup> Cold plasma application in chronic wound healing is also a promising research. Collagen-containing wound dressings have been applied for about 2 decades, but today, collagen type 6 containing dressings are used due to their antimicrobial properties in addition to the to the natural conversion of collagen type 3 to collagen type 1. Biofilm formation in chronic wounds is a factor that negatively affects wound healing because it hides microorganisms. Today, it is treated with enzymatic or surgical debridement. However, since these methods are time consuming and there are problems in distinguishing between healthy tissue and non-viable tissue, biofilm treatment with laser technology is developed.<sup>8</sup> The oxygen pressure and pH of the wound are important in wound healing and its diagnosis presents difficulties. For this purpose, color scanning methods have been developed to detect low oxygen-containing tissue regions. These studies are carried out in vivo and tissue mapping is performed with oxygen and pH sensors using RGB digital camera.<sup>9,10</sup> After these studies, dressings that are heat-and pH -sensitive and that spontaneously release antibiotics with pH changes are developed.<sup>5</sup> Treatment of chronic wounds seeking treatment options from past to present and future that options range from Galenic applications to modern applications provided by innovations. Although not all countries have these opportunities, as a result, in order to

eliminate all these deficiencies the aim of the caregiver is to take care not only of the wound but also of the whole body.

## REFERENCES

1. Sen CK, Gordillo GM, Roy S, Kirsner R, Lambert L, Hunt TK et al. Human skin wound :a major and snowballing threat to public heat and tne economy.Wound Repeir Regen 2009; 17:763-71.  
[doi:10.1111/j.1524-475X.2009.00543.x](https://doi.org/10.1111/j.1524-475X.2009.00543.x)
2. Broughton GH, Janis J, Attinger CE. A brief history of wound care. *Plast Reconstr Surg* 2006; 117(7 Suppl):6S-11S. [doi:10.1097/01.prs.0000225429.76355.dd](https://doi.org/10.1097/01.prs.0000225429.76355.dd)
3. Shah JB. The history of wound care. *J Am Col Certif Wound Spec* 2011; 3:65-6.  
[doi:10.1016/j.jcws.2012.04.002](https://doi.org/10.1016/j.jcws.2012.04.002)
4. Forrest RD. Early history of wound treatment. *J R Soc Med* 1982; 75:198-205.  
[doi:10.1177/014107688207500310](https://doi.org/10.1177/014107688207500310)
5. Faramarzi N, Tamayol A. How can smart dressings change the future of wound care? *J Wound Care* 2021; 30:512-3. [doi:10.12968/jowc.2021.30.7.512](https://doi.org/10.12968/jowc.2021.30.7.512)
6. Barud Hda S, de Araújo Júnior AM, Saska S, Mestieri LB, Campos JA, de Freitas RM, et al. Antimicrobial Brazilian Propolis (EPP-AF) containing biocellulose membranes as promising biomaterial for skin wound Healing. *Evid Based Complement Alternat Med* 2013; 2013:703024.  
[doi:10.1155/2013/703024](https://doi.org/10.1155/2013/703024)
7. Liao X, Xie GH, Liu HW, Cheng B, Li SH, Xie S et al. Helium Ne-on Laser irradiation promotes the proliferation and migration of human epidermal stem cells in vitro: proposed mechanism for enhanced wound re-epithelialization. *Photomed Laser Surg* 2014; 32:219-25.  
[doi:10.1089/pho.2013.3667](https://doi.org/10.1089/pho.2013.3667)
8. Al-Watban FA. Laser therapy converts diabetic wound healing to normal healing. *Photomed Laser Surg* 2009; 27:127-35.  
[doi:10.1089/pho.2008.2406](https://doi.org/10.1089/pho.2008.2406). PMID: 19193104
9. Schreml S, Meier RJ, Weiß KT, Cattani J, Flittner D, Gehmert S, et al. A sprayable luminescent pH sensor and its use for wound imaging in vivo. *Exp Dermatol* 2012; 21:951-3. [doi: 10.1111/exd.12042](https://doi.org/10.1111/exd.12042)
10. Basiri A, Nabili M, Mathews S, Libin A, Groah S, Noordmans HJ, et al. Use of a multi-spectral camera in the characterization of skin wounds. *Opt Express* 2010; 18:3244-57.  
[doi:10.1364/OE.18.003244](https://doi.org/10.1364/OE.18.003244)