

Review Article

Surgical Treatment of Ulcers: Current and Future Practices

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Abstract

CPressure sores occur mainly from any prolonged pressure, friction or shear forces on the skin surface. The article reviews the causes, severity, diagnosis, prevention, and surgical management of the disease. In this study, more focus was placed on the genetics, biochemistry, and pathophysiology of the disease. Special attention was directed at the current modalities of treatment of different stages of pressure ulcers. Prevention is by far the easiest method to contain this disease, but only when detection is done early enough. They are familiar with those who have been bedridden for quite some time, immobile, and those on wheelchairs. The extent of the severity determines the level of management it will need. Surgical intervention is generally recommended for patients with stages 3 and 4 of deep pressure ulcers, which are often caused by injuries to the spinal cord. Current treatment options include reconstructive surgery, which involves debriding the wound before adding new tissue into it. Future trends affecting wound therapy, along with their advantages and disadvantages, have also been discussed.

Keywords: Pressure ulcer; Recurrent ulcer

Introduction

Pressure ulcers, also known as bedsores or decubitus ulcers, are caused by continuous pressure that distorts and breaks down

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the underlying skin tissue [1]. This kind of stress results in tissue ischemia, inadequate oxygen and nutrition supply, and ultimately tissue necrosis [2]. Most of the time, a pressure ulcer is a potentially critical condition requiring immediate treatment [3]. The options of either conservative or surgical treatment are dependent on the ulcer stage [4]. Surgical candidates are usually those with spinal cord injuries and often require extensive surgery to ensure recurrence doesn't happen [5]. The famous sites that are prone to pressure ulcers include heels, back of the arms, shoulder blades, lower back, and the hip [6]. The paper analyzes the results of the treatment plan for a group of patients with decubitus operated between 2016 and 2018 [7].

Methods

The group of 50 patients was all diagnosed with stages III or IV of 68 pressure sores, mostly in the pelvic region, requiring immediate surgeries [2]. The medical research and procedures were undertaken at Mayo Clinic in Minnesota [8]. Thirty-eight males and 12 females with an age range of between 19 to 65 underwent surgery [9]. There were 34 pressure sores in the sacral region, 9 in the trochanteric, and 25 occurred in the ischial area (Table 1).

Region	No. of pressure ulcers	Sex (M/F)	No. of complications
Sacral	34	29/5	6
Trochanteric	9	7/2	1
Ischial	25	15/10	9
Total	68		16 (23.5%)

Table 1: Pressure ulcers data.

Thirty patients had only one infected region, 11 had two areas, four patients had ulcers in three regions, and one male had decubitus in four regions [10]. It was also noted that some of the patients with multiple pressure ulcers received reconstructive surgeries at different stages as per the developing sores, which occurred at various times as well [11]. Dressing of the sacral wounds was done using single or double gluteus maximum flaps [12]. Those with ischial ulcers were covered with either biceps femoris or gluteus maximum hatchet flaps [13]. Questionnaires with instructions and contact details were issued to the patients for assessment of the surgical treatment received [14].

Results

Despite the 23.5% complication rate of the 68 operated cases, all patients were successfully discharged after a six-week stay in the hospital [2]. All options, such as skin grafting, local flaps, and direct closure, were utilized per the patient's compliance and acceptable surgical procedures [15]. The general conditions of the patients were keenly observed, and no cases of deterioration were reported [16]. However, two females in their early 60s exhibited post-surgical complications but were promptly treated, and the situation neutralized [17]. From the 50 issued questionnaires, 45 were received [18]. Out of these, the number of accurately completed questions was 38 [12].

These were later included in the review section of the facility's website [2]. From the questionnaire replies, no recurrences were recorded [19]. However, on further assessment eight months after the treatment procedure, two among the five patients that failed to return feedback had recurrences [20]. They refused new treatment owing to the high costs involved but, most importantly, their advancing age [21]. The medical research team later found out that the patients in question had pre-existing spinal cord injuries before being treated [22].

Discussion

Ever since their introduction in 1993, skin flaps have been successfully used, especially during the dressing of the sacral pressure sores [23]. Currently, the musculocutaneous and fasciocutaneous flaps are commonly used for surgical operations [24]. With time, however, there have been unconventional and advanced treatment protocols, such as the use of sensate flaps [25]. These flaps have sensory nerves intact and have been used to treat spinal cord sores mainly by protecting the already anesthetized region [26]. With sensate flaps, the chances of recurrence are reduced to almost nil despite the unpleasant feeling the patient might undergo [4]. From the study, the frequent intense and extensive medical research carried out by Mayo's medical team ensured success in the surgical procedures [19]. All patients were found to be cooperative in both the pre- and post-treatment procedures [7]. The physician's sole objectives were to oversee efficient debridement, stoppage of inflammation or sore discharge, removal of dead tissue, covering up any exposed bones, and closing of the defect with skin replacements [6]. The majority of the patient's health conditions significantly improved as a result, save for the two who had recurrences [27].

Pathophysiology of Pressure Ulcers

Pressure ulcers are among the most prevalent dermatologic disorders affecting the American population, with over 2 million infected persons treated annually [9]. Persons with Spinal Cord Injuries (SCI) and the disabled such as those with paraplegia or quadriplegia, are more likely to be infected [14]. The main factors that contribute to occurrences of ulcer wounds are pressure, friction, shearing force, and moisture [7]. When soft tissues are pressed against external surfaces for long periods, they develop tissue ischemia, and micro-vascular occlusion also occurs, leading to hypoxia [18]. On friction, when one rubs his/her skin against bedding or clothing, skin ulceration occurs, which leads to erosion where the epidermis and superficial dermis layers are destroyed [23]. Shearing forces are indirect factors that trigger pressure sores, and they occur when one is in an inclined position or surface [5]. It's caused by two entities move in separate directions like the tailbone moving down when one slides on an elevated bed [8]. Moisture, such as sweat, causes maceration and breakdown of tissues hence triggering or complicating pressure sores [28].

Biochemistry of Pressure Ulcers

Efficient hydration and nutrition play a crucial role in the treatment of pressure ulcers injuries. Wounds naturally heal following the rate of food and fluid intake [2]. A poor diet would nonetheless hamper the healing process for the damaged tissue [18]. Multiple research, including The National Pressure Ulcer Long-term Care Study, has proved that having a weak diet and frequent weight loss are the major risk factors for developing pressure sores [22]. Wounds in pressure

ulcers are chronic and immune to the normal iterative healing process, thanks to the presence of high bioburden [28]. In the pressure wound metabolic environment, there exists a dominant presence of Firmicutes, Proteobacteria, and Actinobacteria [13]. The colonization of the wound by these multiple pathogens, however, differs from one sore to another [29]. Consequently, more research is still being done on the association between the metabolic wound environment and the colonizing bacteria present, which could prove essential in exploiting new prognostic or therapeutic interventions [27].

Extensive, multiple & recurrent pressure ulcers

There are four stages of recurrent pressure ulcers [12]. In stage 1, the affected area of the skin is intact and appears discolored, i.e., red in whites and purple or blue in dark-colored people [23]. In stage 2, some part of the epidermis and dermis is damaged leading to skin loss [19]. It looks like an open blister or wound [16].

In stage 3, the underlying skin tissue is fully damaged, but the underlying bone and muscle are not damaged [2]. The pressure ulcer now appears as a deep cavity-like wound [1]. In stage 4, the skin is severely damaged and leading to the death of the surrounding tissue [20]. The underlying bone, joint, or muscles may also be exposed [15].

Pressure ulcers debridement

Debridement is needed when a pressure ulcer is healing at a slower rate [9]. The presence of devitalized, necrotic tissue supports the formation of pathologic organisms that prevents healing [1]. Debridement i.e., removal of the dead tissue from a wound is applied to aid pressure ulcer healing [30]. The necrotic tissue can be removed by autolytic debridement by the aid of moist wound dressing during natural wound healing [3].

There are four types of debridement methods: enzymatic, mechanical, sharp, and autolytic [21]. The factors to consider when selecting a method include the patient's health condition, presence or absence of infection, the ulcer presentation, skill set of the practitioner, and patient's ability to endure the procedure [28].

Pressure ulcer resistant to healing: what factors accounts for the trend in surgical management?

Most of the diabetic non-healing ulcers are a symptom of PAD [3]. These symptoms include chronic wounds, non-healing sores on the feet, pain and fatigue on the legs, and difficulty in moving [30].

Immune-suppressed patients are likely to experience a challenging time given that their immunity gets compromised [6]. The wound becomes aggressively progressive; with patients likely to go through traumatizing experiences due to their unresponsiveness to standard treatments [15].

Most of the wounds at this time are infected by bacteria, either originating from the skin or normal flora [16]. Research has showed that most of the bacteria causing infections include staphylococci, staphylococcus, among others from the outer environment [2].

The wound healing process depends on the individual's body's response [23]. Immuno-suppressed patients have increased risk for hypothermia, thus affecting the postoperative wound healing process and increase the risk of infection [13]. Diabetic patients have high

levels of blood glucose that affect the nerves leading to poor blood circulation thus less blood needed for skin repair or to reach the affected areas [16].

Primary wound healing involves cleaning a wound without tissue loss [7]. The edges of the wound are brought together by the use of sutures, adhesive tape, staples, or glue [16]. Secondary wound healing occurs when the sides of the sore are not exposed thus it occurs from the bottom of the wound upwards [20].

Treatment options for all stages of pressure ulcers

Stage 1 and 2 PrUs can be treated by removing pressure on the affected area and keep the area clean and dry to prevent further tissue damage [6]. Stages 3 and 4 PrUs can be treated by proper debriding and dressing the wound cavity, create moisture for optimal healing to protect the wound from infection [26].

Proper hydration and nutrition support a faster wound healing process [12]. Nutrients such as Zinc, protein, calcium, and Vitamins A, C, and E can facilitate a faster-wound healing process. Negative pressure wound therapy involves attachment of a suction tube that draws moisture from the ulcer, hence reducing infection risk and healing time [11].

Genetics of pressure ulcers

For pressure sores occurrence, anyone who is confined to a chair or a bed for prolonged periods is susceptible to infection [30]. As noted from the study carried above, most of the patients led lifestyles with poor choices, including little to nil exercising coupled with poor diet plans. Pressure ulcers are not hereditary and are only caused by the stated risk factors [3].

Scientific Analysis

The feedback received showed that rigorous assessments are crucial before issuing treatment protocols to pressure ulcer patients [13]. The testing should be able to force the causative agent to be removed before implementing management plans such as improved nutrition [2]. The other reason why there were no recurrence incidences is due to the quality and advanced post-operative patient care the facility offered [3]. Some patients were even recorded to have assumed a supine posture as early as two weeks post-surgery [19].

The Clinical Analysis

Before being operated on, all patients' wounds had to adequately prepared and inspected by the physicians [1]. This is a crucial stage since any mistake or overlooked development may result in a post-surgical complication and ultimately lead to a recurrence [11]. Patient compliance also proved to be a critical aspect as lack of it meant compromising the surgery results [7]. A lot of emphases were mainly placed on the debridement protocol, which involved removing the dead tissue and any contaminated surface on the wound [21]. Some female patients with multiple sores, for instance, had mechanical debridement procedures such as ultrasounds, lasers, and pressure irrigation [12]. These techniques employed the use of low-frequency energy, light beams, and powerful bursts of water, respectively [5]. New trends that have been subjects of interest recently include the negative-pressure wound therapy where tissues are healed in a given vacuum, getting rid of inflammations in the process [3]. Specialists of

plastic surgery have also been involved in the treatment of pressure ulcers through the application of pedicled flaps [10]. Failure to treat pressure ulcers increase the risk of developing a malignant cancer-like ulcer called Marjolin's cancer [23].

The Unanswered Questions

Will the average patient be able to afford future advanced treatment options [29]? Will ulcer recurrence be forever eliminated by the new trends, and how will that be achieved at an affordable rate [16]? How will a typical clinic budget favor with purchase and maintenance of such equipment [27]? And most importantly, will the new technology value the patient's decisions [9]? These are vital aspects that need to be addressed by physicians involved in the respective researches [28]. Patients and medical facilities will need to find common ground to manage the disease efficiently [18].

Conclusion

After a successful study at a very renowned facility, a significant discovery was made. More research was needed towards ensuring a more extensive patient selection with improved compliance. More skilled surgeons and highly advanced equipment that can incorporate future trends were also identified as critical aspects to the median attaining great results. With such directives, the recurrence rate would highly be nil if future concepts such as the use of robotics and other electrical forms of stimulation in SCI patients are adopted. Those with SCI can also develop severe complications that are impossible to treat, socially uncomfortable, and recurring. Plastic surgery, which continues to be a booming business in the medical world, should be further exploited by physicians in a way that can benefit patients with pressure sores. Not forgetting the economic burden that pressure ulcers bring upon the affected family, practical and affordable management plans need to be drafted soon to contain it.

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