Multiple Pressure Ulcers Management with Complex Surgical Reconstruction

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Abstract

Stage III and Stage IV pressure ulcers often require a multidisciplinary approach for effective treatment and resolution of a patient's wound. Should a patient fail conservative treatment consisting of patient education, wound care, or negative pressure wound therapy, surgical intervention must be considered for wound reconstruction. In severe cases, a patient may develop extensive injury consisting of multiple concurrent ulcerations, further complicating surgical planning. A thoughtful and staged surgical approach may be necessary in these cases to reduce surgical burden and increase chances of successful reconstruction. Here we present a case of a patient with a spinal cord injury and multiple recurrent pressure ulcers and describe the complex staged reconstructive approach utilized for treatment.

Keywords: Pressure ulcer; Girdlestone procedure; Spinal cord injury

Introduction

Pressure ulcers are a serious complication seen in patients with spinal cord injury. These pressure ulcers develop secondary to a combination of factors including lack of sensation, loss of motor function, muscle contraction, bowel and/or bladder dysfunction and unrelied pressure resulting in tissue maceration, tissue ischemia and ultimately progression to tissue necrosis and tissue death. These ulcers are often difficult to treat and severely limit the patient's ability to take part in activities of daily living. Preventing the formation of pressure ulcers is a continuous process involving both patient education and constant repositioning. However, despite the best efforts put forth by patients, care takers and physicians, pressures ulcers and pressure ulcer recurrence continue to be a common complication burdening this patient population.

In patients with multiple simultaneous pressure ulcerations, a comprehensive management strategy consisting of multidisciplinary care is critical for encouraging optimal outcomes. This strategy should include a full workup of the patient's nutritional status, preoperative wound cultures and microbial sensitivities, and a comprehensive wound care program and surgical treatment plan [1]. Additionally, it is importation to evaluate each pressure ulcer for concomitant osteomyelitis, joint destruction, soft tissue and muscle loss, and/or erosion into vital structures. Preoperative evaluation of these potential complications can help guide decision making with regards to surgical treatment and medical intervention.

Both non-operative and operative interventions have been described for the treatment of pressure ulcers. Non-operative interventions are those completed at the patient's bedside and include local wound care and negative pressure wound therapy. Although non-operative approaches are the preferred modality for treatment, recurrent and extensive pressure ulcers require surgical interventions to remove nonviable skin, muscle, and bone and recruit healthy vascularized tissue for coverage. Surgical approaches for the treatment of pressure ulcers therefore include wound debridement and tissue resection, split thickness skin grafting, and flap reconstruction.

Here we present a complicated case of a patient with a spinal cord injury with multiple recurrent pressure ulcers and extensive involvement of surrounding soft tissue and bone. Due to the extent of disease and metabolic requirements for recovery, a complex staged reconstruction was utilized for treatment.

Case Presentation

This case involves a 53-year-old male with past medical history of a gunshot wound resulting in a T4 spinal cord injury and subsequent paraplegia 20 years prior to presentation. Due to his injury, he suffers from neurogenic bowel and bladder requiring a diverting colostomy and urinary bladder augmentation, chronic anemia, severe muscle spasm, bilateral elbow/hip/knee contractures, and bilateral hip and knee ankylosis with heterotopic ossification. He previously developed multiple pressure ulcers two years ago that required multiple flaps for surgical reconstruction. Despite the previous reconstruction and appropriate precautions, including proper wheelchair cushioning, the patient now presents with recurrent stage IV sacral, bilateral ischial, and bilateral trochanteric pressure ulcerations with bilateral hip joint involvement (Figure 1). The recurrence is believed to be a result of the bilateral hip ankyloses secondary to heterotopic ossification (Figure...
2). In addition, the patient has had multiple hospitalizations for various medical concerns which diminished the patient's nutritional status and committed him to hospital bedrest without pressure relief.

**Operative procedure and technique**

The decision was made to proceed with surgical intervention as this patient had a history of previous pressure ulcers and is now presenting with recurrent wide spread ulceration which required the recruitment of large amounts of tissue to fill the soft tissue defects created by his ulceration. Given the extent of the ulceration, patient tolerance of the surgery, and projected volume of blood loss, utilizing a staged surgical approach seemed appropriate.

The first stage of surgery consisted of right posterior trochanteric/ischial stage IV pressure ulcer excision (Figure 3), right modified Girdlestone procedure and proximal femoral osteotomy with excision of right hip heterotopic ossification and debridement of right acetabular cavity (Figure 4). In order to fill the resulting dead space following ulcer resection, a right vastus lateralis muscle transfer was performed to cover the entire hip and ulcer cavity (Figure 5). The remaining exposed muscle following inset was covered with a split thickness skin graft from right leg to cover the muscle surface (Figure 6).

Three weeks later, the patient underwent the second portion of the staged reconstruction which consisted of left posterior trochanteric/ischial stage IV pressure ulcer excision (Figure 7), sacral pressure ulcer excision, left modified Girdlestone procedure and proximal femoral osteotomy with excision of left hip heterotopic ossification and debridement of left acetabular cavity (Figure 8). Similarly, a left rectus femoris muscle transfer combined with a left vastus lateralis muscle transfer was utilized in order to fill the dead space resulting from excision (Figure 9) and again, the exposed donor site covered with a split thickness skin graft from the left leg (Figure 10). One additional stage IV pressure ulcer limited to the left heel was debrided and covered with a split thickness skin graft from the left leg during this same procedure.

**Postoperative course**

The patient underwent a post-operative wound care protocol previously described by the senior author, which demands 6 weeks of bed rest on an air fluidized bed. Additionally, a hip abduction pillow is utilized to allow for appropriate healing of the flap incisions. Following this 6 week period, the patient began a gradual sitting program with a physical therapist [2]. The flap was closely monitored during this process and found to heal appropriately with no signs of wound breakdown (Figure 11). The patient's pelvic x-ray after the bilateral modified Girdlestone procedures is shown for reference (Figure 12).
Discussion

Although advancements in medical technology and management allow Spinal Cord Injury (SCI) patients increased longevity, it additionally puts these patients at increased risk of developing recurrent pressure ulcerations [3]. A critical aspect of treating these patients is developing a well-designed pressure ulcer management strategy to confront these wounds which are often difficult to treat, commonly recur, and can result in devastating morbidity and mortality. A multi-disciplinary work up consisting of wound cultures and sensitivities, nutritional optimization, and pre-surgical wound care, is imperative to provide patients with the best chances of surgical success when treating such a challenging condition. Such a comprehensive work up should include a physical exam to characterize the wound and determine nutritional status in conjunction with labs such as albumin, prealbumin, transferrin, nitrogen balance, creatinine, total cholesterol, which are outlined in the National Pressure Ulcer Advisory Panel and European Pressure Ulcer Advisory Panel (NPUAP-EPUAP) guidelines [4,5].

Once it has been determined that a wound will require surgical...
intervention for coverage, all reconstructive options should be considered using ulcer stage and location as a guide for surgical decision making [4]. Additional pathologic factors to consider include ulceration depth and associated heterotopic ossification, infection, osteomyelitis, joint or bone destruction, soft tissue loss, and involvement of vital structures. It is also imperative to consider the patient's ability to cooperate in their own post-operative care. Finally, patients with recurrent ulcers previously treated with reconstructive surgery may have limited tissue available for recruitment which can further complicate surgical planning.

If the ulceration is extensive enough and involves significant heterotopic ossification and involvement of the hip joint, a Girdlestone procedure is necessary. The Girdlestone procedure, first described by Dr. Girdlestone in 1943, is a hip procedure initially designated as a treatment for pyogenic arthritis [6]. Since then, the procedure indication has expanded and now includes treatment for end-stage pressure ulcers and heterotopic ossification of the hip in spinal cord injury patients [6-8]. The senior author has vast experience treating patients with end-stage pressure ulcers with heterotopic ossification. His experience has allowed him to modify the original Girdlestone procedure in an effort to improve patient outcomes [7]. Here we describe what the senior author has determined to be important considerations when treating these end stage ulcer patients.

The specific modification that distinguishes the original Girdlestone procedure from the senior author's modified procedure are as follows: a larger femoral resection is completed, the resulting dead space secondary to bony resection is filled with soft tissue, anti-spasmodic medication and abduction pillows are utilized to prevent femoral pistoning (proximal displacement of femur), and the procedure has been consolidated into a single-stage technique [7]. The elimination of dead space has long been recognized as an important concern since Girdlestone first described the procedure [6]. Although Girdlestone's description attempted to “flatten” the dead space, the original procedural technique unfortunately often results in a tissue defect rather than a flattened surface following bony resection [6,7]. The senior author's modification to the Girdlestone procedure utilizes the recruitment of healthy vascularized tissue to fill the defect created by bony resection effectively mitigating wound healing complications and concerns regarding dead space (Figures 5 and 9) [7]. This modification also includes resection of a larger segment of the femur than initially described. Specifically, excision including the head of the femur and greater trochanter to a level below the lesser trochanter is completed (Figures 4 and 8) [1]. This larger resection helps ensure elimination of all infected bone while functionally impairing the iliopsoas muscle by releasing its tendinous insertion with the consequence of preventing long term hip contractures and muscle spasms [7]. Decreasing the risk of hip contractures significantly contributes and improves patient's quality of life as 44% of SCI patients have been reported to develop at least one joint contracture at one-year post SCI [9].

Conclusion

Despite improvements in reconstructive techniques, recurrent pressure ulcers continue to present a major challenge for patients and their respective reconstructive surgeons. As longevity of SCI patients continues to increase, so does the incidence of severe pressure ulcers. There is therefore a great need for innovative and creative reconstructive approaches to prevent recurrence of this disease process. This multidisciplinary approach put forth by the senior author provides a durable treatment approach which has demonstrated success in treating patients with extensive pressure ulcers with involvement of the underlying bony and soft tissue structures.

References