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Case Report
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Complex Myocutaneous and Fasciocutaneous Flap Closure of a Large Wound Defect of the Posterior Pelvis, Hip and Thigh due to a Morel-Lavallee Lesion

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Abstract

Lavallee lesions are closed de-gloving injuries that occur secondary to traumatic shearing forces. A complex fluid collection of blood, lymph and fat can collect in the pre fascial plane. Conservative therapy can be used including bandaging, aspiration and sclerodesis. If the collection is large and/or infected, fat and muscle necrosis can create wound defects that require surgical debridement and closure. Our case involves local flap reconstruction for closure of an impressive wound defect of the posterior pelvis, hip and thigh.

Keywords: Morel-Lavallee; Closed de-gloving injury; Flap reconstruction

Introduction

The French physician Maurice Morel-Lavallee first described the Morel-Lavallee lesion in 1853 [1,2]. The lesion is a closed de-gloving injury brought about by trauma to the body in which shearing forces cause the subcutaneous tissues to separate from the deep fascia. As a result a potential space is created in which a complex fluid composition of blood, lymph and necrotic fat can collect [1]. Lesions can vary in size from only a few centimeters to large and cavitary, overlying large muscle groups. Lesions can also be acute or chronic, sterile or infected. Conservative treatment can include aspiration and compression or sclerodesis. Large lesions can cause significant damage to surrounding tissue *via* mass effect; if unresponsive or recurrent despite conservative treatment, surgical incision and drainage in the operating room is necessary. Infected lesions also require debridement in the operating room. Closure techniques depend on the size and shape of the surgical wound created. Plastic surgery teams often become involved in their management due to the complex nature of this soft tissue injury [3]. In this case presentation we present a patient whose large, infected Morel-Lavallee lesion of the posterior pelvis and thigh required surgical debridement. A unique design consisting of local muscle and fasciocutaneous flaps was employed to achieve closure of this impressive wound.

Case Presentation

The patient is an obese 26M with no prior medical history. The patient suffered significant traumatic injuries after being struck by a vehicle while changing a tire roadside. His traumatic injuries included a T1 compression fracture with no residual paraplegia, as well as fractures of the left knee tibial plateau, left sacral ala and pelvic ring. A CT scan performed showed fluid collection in the area of the left buttocks in the space between the subcutaneous tissue and the deep-fascia - a Morel-Lavallee lesion - which was initially treated with aspiration. Over the course of several weeks, the collection began to re-accumulate, with swelling, fluctuance and pain along the patient's left flank, buttocks and posterior thigh, and overlying skin necrosis. MRI was performed (Figure 1A) which shows the extent of the lesion. As the patient was also showing systemic signs of sepsis with the lesion as the likely source, the patient was taken to the operating room for excisional debridement. Post-debridement pelvic XR (Figure 1B) shows subcutaneous air in the area of the significant wound defect. A wound VAC was applied to this large area but due to purulent drainage and fevers, the patient was debrided again in the OR and the wound left open to drain. Dakin's dressings were applied to the wound and the patient received appropriate intravenous antibiotics.

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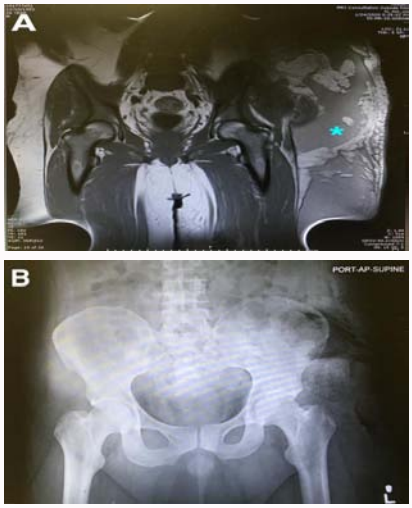

Figure 1: A: T1 weighted MRI at the level of the pelvis. The light blue asterisk denotes the Morel-Lavallee lesion with fluid contents containing fat and displacement of subcutaneous tissue outwards. **B:** Pelvic XR after debridement; note subcutaneous air over the left hip indicating the wound defect.

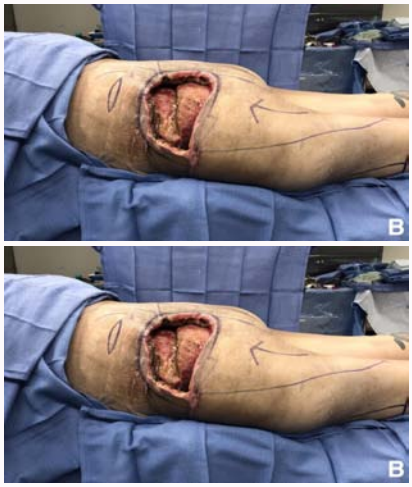

Figure 2: A) Potential flap designs, posterior view. B) Left lateral view.

The patient was transferred to our hospital for rehabilitation and evaluation for closure of this massive wound by the plastic surgery team. The wound extended from the left proximal posterior thigh to above the left hip and from the left posterior trochanter across the gluteus to the midline. A significant portion of the left gluteus had been debrided due to necrosis. Necrotic overlying subcutaneous tissue and skin were also excised. We recommended reconstructive plastic surgery using local muscle and fasciocutaneous flaps.

Operative Technique

We planned to use the vastus lateralis to fill this large cavitary wound because of its bulk and excellent blood supply. We anticipated that use of this one muscle would be sufficient to fill the dead space in addition to raised fasciocutaneous flaps, without causing significant debility in this ambulatory patient. We planned our incisions to access the vastus lateralis as well as designs for potential fasciocutaneous flaps, see (Figure 2A, 2B).

We first performed a thorough debridement of the entire wound and all devitalized tissue using sharp debridement, curettage, and

Figure 3: The wound after debridement; note the gluteus muscle extensively debrided due to necrosis.

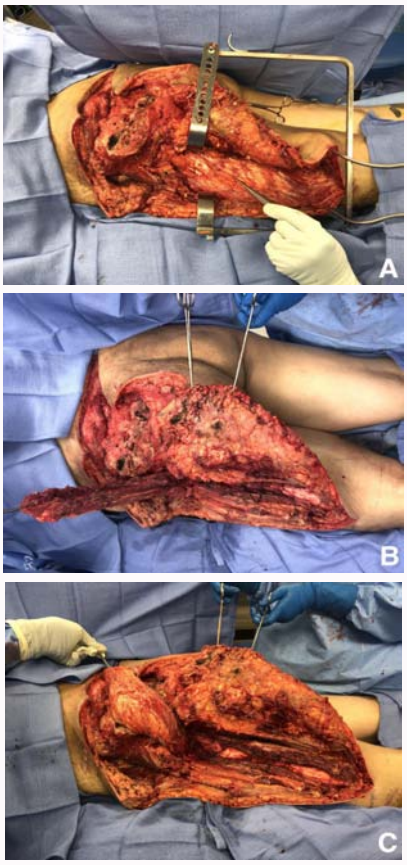

Figure 4: A) Left lateral thigh dissection to access the vastuslateralis; the forceps point to the muscle B) Vastuslateralis raised C) Vastuslateralis inset into the wound cavity.

pulse lavage. There was significant undermining in all directions. The wound measured 42 cm × 26 cm at its largest dimensions - Figure 3 showing the wound after debridement. To access the vastus lateralis muscle, an incision was made in the mid lateral thigh between the lateral intermuscular septum and the anterior territory of the tensor fascia lata [4]. On reaching the tensor fascia lata, we were able to identify the vastus lateralis. Using blunt dissection the vastus lateralis was isolated from the rectus femoris and biceps femoris. The distal insertion was divided and dissection continued proximally, being careful not to damage the main pedicle. The vastus was reflected and inset into the main wound covering a significant amount of the lateral and inferior portions of the wound. Figure 4A-4C show the vastus raised and inset into the wound. The vastus lateralis anchored to the wound bed using 3-O Vicryl suture. We then chose to create a right gluteus maximus rotational flap as this would provide coverage for the superior and medial portions of the wound. A French curve was

Figure 5: Gluteus maximus rotation flap raised with back cut. Vastus lateral is muscle is inset.

Figure 6: Surgical site incisions closed.

drawn from the lateral portion of the main wound extending towards the right hip with a back cut. The gluteus maximus muscle was incised minimally and the flap was serially tested for mobilization. Figure 5 shows the gluteus maximus rotation flap raised. Given the patient's significant tissue laxity, we saw that we would be able to close the wound directly; no further flaps were needed. Three sump drains were placed in the wound bed. All of the incisions were closed directly in a multilayer fashion. O-Vicryl was used to close the deep fascia, subcutaneous tissues and dermis. The skin was closed with 2-O Biosyn and oversewn with O-Prolene. Figure 6 shows all skin incisions closed.

Postoperative Course

Immediately post op the patient was placed in an abduction pillow to minimize movement, shearing and friction of the surgical site. The patient was also placed on strict bed rest on a special air fluidized bed for 4 weeks. The patient's drains were removed when output was <30 cc. He received a double portion high protein diet and nutrition labs were serially followed. Figure 7 shows the patient fully healed at 6 weeks. The patient was then sent to rehabilitation. He walks with a cane and has achieved a 4+ muscle function level of the left lower extremity in abduction and extension. He continues to participate in balance and strength training.

Discussion

Diagnosis

The Morel-Lavallee occurs after a traumatic event involving blunt force and shearing. However, as the injury is not immediately visible, the injury is missed on primary physical survey. Delayed presentation and diagnosis can occur weeks, months and even years after initial injury [5]. Kottmeier et al. reviewed 16 Morel-Lavallee lesion cases and reported that the diagnosis was initially missed in 44% of the cases [6,7].

The clinician should have high suspicion for this lesion when the trauma patient complains of pain and swelling over highly susceptible areas such as the trochanter or hip. On physical exam, fluctuance may

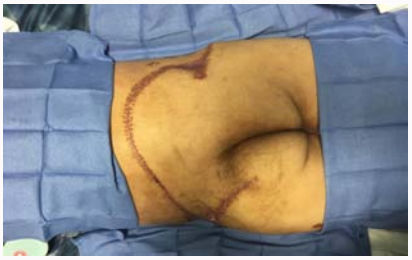

Figure 7: Surgical site incisions healed at 6 week.

be noted. Cutaneous hypothesis or anesthesia may be observed due to disruption of the subdermal afferent nerves [5,8]. There can also be overlying skin changes consistent with necrosis.

CT scan can identify the lesion by its unique pre-fascial location, especially when done as part of the initial trauma work up; fat stranding, fat globules and a complex fluid are noted. However, MRI is the imaging modality of choice for Morel-Lavallee lesions due to high contrast resolution, multiplanar acquisition and greater anatomic details [5,9,10]. On MR imaging, acute lesions usually do not show evidence of capsule formation as opposed to chronic and/or infected lesions.

Conservative treatment

Acutely diagnosed lesions can be managed with a variety of conservative measures. Compression bandaging of Morel-Lavallee lesions about the knee was shown to be an effective treatment in a series of studies done on American professional football players [1]. Such treatment requires a highly compliant patient. Percutaneous aspiration is another procedure that may be performed. However as a solo technique, recurrence is likely to occur and repeat aspirations may be required. Often, aspiration may be performed in conjunction with sclerodesis. Doxycycline, erythromycin, bleomycin, vancomycin, absolute ethanol and talc are possible agents [3]. These agents induce fibrosis of the wound cavity, closing the dead space. Sclerodesis can be efficacious in lesions up to 700 cc and can be used for acute and chronic lesions. An overall efficacy of 95.7% has been reported in using sclerodesis [3,10,11]. Sclerodesis, however, is contraindicated if infection is suspected [12].

Surgical treatment

Aggressive management requiring surgical intervention is indicated when conservative measures fail and when infection is present. Debridement should be thorough with curettage to encourage fibrosis of the wound cavity. If the lesion is chronic, the capsule should be completely excised. The surgeon then has a variety of options for wound closure. Closure of the dead space is vital for success [3,11]. This can be achieved with direct closure and quilting sutures. Healing *via* secondary intention using local wound care dressings or wound VAC are also options. Skin graft can then be used after appropriate granulation has occurred. However, as with our case, local tissue reconstruction may be appropriate with a large and complex wound. We recommended reconstructive plastic surgery as an option over conservative measures in our case for several reasons. Our plan would prevent further infectious seeding of this wound by environmental sources. The use of local muscle flaps with a robust blood supply is an acceptable technique to close dead space in a contaminated field. Also a reconstructive surgery would expedite closure in comparison to healing by secondary intention with a wound VAC or dressing changes, allowing this young ambulatory man to continue on to

rehabilitation quickly.

Conclusion

A clinician should have high clinical suspicion when diagnosing a Morel-Lavallee lesion. MRI is preferred for confirmation of the diagnosis. Conservative measures such as bandaging, aspiration and sclerodesis can be used when the lesionis acute. However when conservative treatment failure is apparent, the threshold for aggressive management must be lowered as large complex wounds may result. Closure of dead space is key to resolving Morel-Lavallee lesions. In our case we show how the prudent use of local muscle flaps of the posterior pelvis and thigh can effectively close dead space while preserving acceptable mechanical function in an ambulatory patient. The importance of post-operative physical therapy cannot be over stressed.

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