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CASE REPORT
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Case Report: Stage VI Morel-Lavallée Lesion with a Large Challenging Defect

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Summary: Morel-Lavallée lesion (MLL) is a closed degloving soft-tissue injury that results in the accumulation of a hemolymphatic fluid between the skin/superficial fascia and the deep fascia. This is a rare injury that may be challenging to diagnose, and necessitates early identification and treatment to achieve the best outcomes. We report the case of a 45-year-old male patient who was referred to our institution for large wound closure after undergoing debridement of a misdiagnosed MLL that became complicated by infection and sepsis. The patient was retrospectively diagnosed with a Stage VI MLL and had to undergo 4 operations with skin grafting and vacuum-assisted closure therapy playing an essential role in achieving tissue closure. This case was presented as a reminder of this rare diagnosis, and the importance of considering it when faced with a patient presenting with a relevant clinical picture post trauma. An early diagnosis is important because early intervention can prevent complications and lead to better outcomes. The misdiagnosis in the case of our patient and delayed treatment led to an aggressive debridement with a large wound that was challenging to close. *(Plast Reconstr Surg Glob Open 2021;9:e3502; doi: 10.1097/GOX.0000000000003502; Published online 28 April 2021.)*

INTRODUCTION

In 1853, Maurice Morel-Lavallée, a French surgeon, described the Morel-Lavallée lesion (MLL) as a closed degloving injury that occurs post-traumatically and results in the separation of the skin and superficial fascia from the deep fascia, forming a potential space.[1,2] The disruption of the subdermal capillaries and lymphatic vessels that occurs through this injury results in the accumulation of a hemolymphatic collection in the potential space, which has also been called a Morel-Lavallée effusion or extravasation, a chronic expanding hematoma, and post-traumatic soft-tissue cyst or pseudocyst.[1,3,4]

In this article, we report the case of a 45-year-old male patient who presented to our department after multiple surgical debridements at another institution following a misdiagnosis of necrotizing fasciitis. After the revision of his primary MRI, he was retrospectively diagnosed as a stage VI Morel-Lavallee case. He underwent 4 surgeries at our institution. After multiple skin grafts, negative pressure wound vacuum, and postoperative physiotherapy, the patient had a positive outcome. This case demonstrates the challenging diagnosis of a stage VI MLL, and the necessity of early treatment, to preserve as much of the epidermal and dermal layer as possible. In this case report, the rare finding of stage VI MLL affected a significant area due to the delayed identification and treatment. This is, to the best of our knowledge, the largest reported wound case of an infected stage VI MLL.

CASE PRESENTATION

This is the case of a 45-year-old male patient who, while playing football, had a collision with another individual and a friction burn on synthetic grass. The patient waited until the next day to present to the emergency department despite having excruciating pain in his left hip and thigh. At the peripheral hospital, evaluation in the emergency department showed edema of the entire leg and a well-demarcated violaceous lesion affecting the left thigh and hip, as well as blisters and desquamation due to the friction burn (Fig. 1). The patient was diagnosed with a case of necrotizing fasciitis and began conservative management with antibiotics (vancomycin and meropenem). A sample was taken from the lesion for cultures. The patient was initially stable and afebrile. He was admitted for treatment, pain control, and observation. However, after a week, his status worsened and an MRI showed a lesion with variable T1 and T2 signals, sinus tract formation, and a thick capsule in the proximal medial location of the thigh with internal enhancement. He underwent

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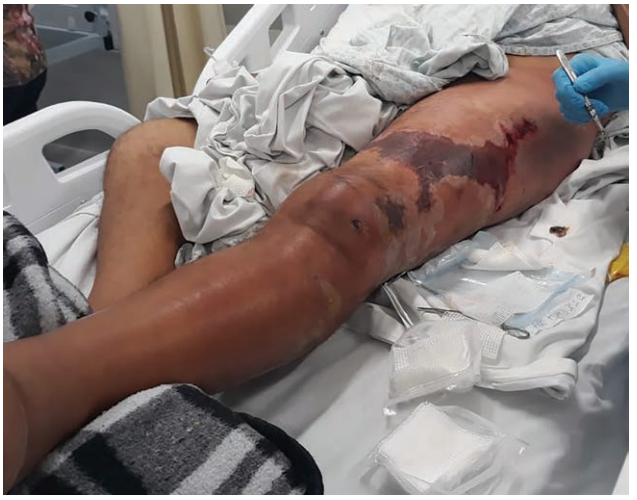

Fig. 1. Clinical evaluation in the emergency department showed edema and a well-demarcated violaceous lesion affecting the left thigh, as well as blisters and desquamation due to the friction burn.

multiple debridements until reaching viable skin with full preservation of muscle anatomy that was not involved in the infection (Fig. 2). At that point, he was referred to the plastic and reconstructive surgery team of our institution for help in closing the wound.

In our center, the patient underwent pre-intervention optimization. On admission, his nutritional level was assessed and his albumin level was 1.6 g/dL (normal range 3.5–5.5 g/dL). His hemoglobin was very low at 6.7 g/dL (normal range 14–18 g/dL). He received 3 units of packed RBCs and his nutritional status improved after consulting our nutrition specialist, reaching an albumin level of 3.2 g/dL and a hemoglobin level of 10.1 g/dL after 1 week. The patient was then scheduled for surgery. Calculation of how much skin graft was needed showed that approximately 1680 cm^2 was required. The patient underwent debridement of the necrotic tissue followed by hemostasis and skin grafting from the donor site right thigh, using an electric dermatome and a 3:1 skin graft mesher. The remaining area, or non-grafted area, was a dead space in the proximal left thigh, which we evaluated at around 6 cm × 4 cm, and approximated using 2-0 nylon. Dressing using wet rayon and wet to dry dressing was performed.

After another week of continuous optimization of nutritional status and maintenance of hemoglobin at 10.2 g/dL, the patient was taken to the operating room (OR) again, where the dressing was opened. Excess exudation was secreting from the dead space, affecting the

Fig. 2. The patient's leg after undergoing multiple debridements until reaching viable skin with full preservation of muscle anatomy.

Fig. 3. A negative pressure wound vacuum for the entire wound.

integration of the skin grafts, which was only 50% and the sutures closing the dead space had failed to heal. Thus, we opted to use a negative pressure wound vacuum for the entire wound (Fig. 3).

One week later, the wound was evaluated again in the OR; skin grafts had a 70% integration except for the dead space of the thigh. Negative pressure vacuum dressing was done in the dead space, and the rest of the wound was covered with rayon and wet to dry dressing. One week later, the wound was reevaluated in the OR, granulation tissue in the dead space was curetted, and the wound was reapproximated with a 2-0 nylon. Skin grafting from the rest of the right thigh using an electric dermatome with a 1.5:1 skin graft mesher was done on the external part of the remaining ungrafted area of the thigh and leg. After one week all skin grafts had 95% integration, the patient was hemodynamically stable, with psychological and nutritional status substantially improved, and was discharged. Follow-up in the ambulatory after 30 days (Fig. 4) showed mobility improvement with physiotherapy, which was initiated after the wound healed. Wound care with a hydrating cream and solar protection for the wound was recommended for proper scarring.

DISCUSSION

MLLs are rare, degloving soft-tissue injuries that are commonly misdiagnosed, as was the case with our patient.[5] MLLs have a reported incidence of 28%–8% in patients with pelvic fractures.[6] Lesions occur more commonly in men with a 2:1 male-to-female ratio, likely due to the predominance of men in polytrauma.[4]

MLLs most commonly occur unilaterally and in the anterolateral thigh, but can less commonly involve other

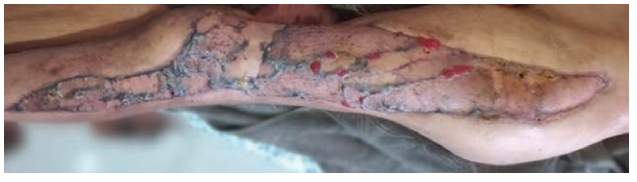

Fig. 4. Follow-up in the ambulatory after 30 days.

sites such as the trunk, lumbar, knee, prepatellar and scapular areas.[4,7] The typical presentation is hours to days following local trauma with localized persistent swelling and pain, but up to a third of patients can have a delayed presentation, with fluid accumulating over months to years after the initial injury.[1,2,4,7] Secondary skin changes (including drying, discoloration, and less commonly frank necrosis) can occur.[3] On physical examination, a compressible tender and fluctuant area is usually noted.[3] Despite the fact that our case was a male patient with a typical location and presentation of MLL, the diagnosis was missed, which may be attributed to the rarity of the disease. This can also be attributed to the broad differential diagnosis of a MLL. A variety of lesions mimic ML lesions, including hematomas, necrotizing fasciitis, fat necrosis, bursitis, and necrotic soft-tissue tumors, and the diagnosis can be challenging.[1,4] Imaging modalities can aid the definite diagnosis; unfortunately, the patient arrived at the hospital after his first debridement was already done. Ultrasonography is a rapid and inexpensive modality that is usually readily available, but the features of MLL are nonspecific. In the acute stage, the lesions appear heterogeneous and irregular, and they show no vascularity, and they become more homogeneous with time.[7,8] Computed tomography scans, though the first imaging modality in the case of trauma, are also of limited value in diagnosing MLL, as they do not allow soft-tissue characterization.[1,7] Magnetic resonance imaging (MRI) is the investigation of choice, as it is the best modality in characterizing the composition and chronicity of the lesions, and a 6-stage classification of MLL was developed by Mellado and Bercandino based on the shape, MRI findings, and presence of a capsule (Table 1).[1,4,9] Although the MRI description we received matched the findings of a stage VI MLL, the diagnosis was missed.

Management of MLL may be operative and nonoperative, and cases with no underlying fractures may achieve complete resolution with conservative treatment, including rest, pain management, compression, drainage and sclerotherapy, and physiotherapy.[1,2,4,10,11] No management guideline for ML lesions is currently available, but several algorithms have been proposed and the standard of care of ML lesions with friction burns is based on drainage followed by wide excision and grafting.[4,12] Conservative management with compression bandaging may be done for small and acute lesions with no capsule affecting the knee, but has not shown benefit in other areas.[4] Percutaneous aspiration alone should be avoided due to the high likelihood of recurrence, especially with volumes more than 50 mL, but it may be attempted in combination with sclerotherapy in chronic ML lesions.[1,4] Sclerodesis has a reported efficacy of 95.7% in treating ML lesions, and is recommended as the first line for acute or chronic lesions that are <400 mL.[2,4] If no resolution occurs or the patient does not fit the criteria for the previously mentioned treatment modalities, open debridement with drainage and mass resection of tissue should be considered along with subsequent reconstruction, and should be done early.[2,4,13] A missed diagnosis may lead to delayed treatment and worse outcomes.[5,14] Similar to around one third of the cases, our case was initially misdiagnosed, and after the MLL got infected and the patient became septic, an aggressive debridement was done, leading to a large wound that is difficult to close.[15] A study showed that among 13 cases with large wounds, early closure was not feasible, and achieving coverage of the tissue defects was hard and time-consuming.[16] The total amount of hospitalization in the case of our patient after the wound was opened reached 5 weeks, and complete healing took up to 1 month post discharge, with a total of around 2 months needed to achieve coverage of the tissue defects. This is, to the best of our knowledge, the largest reported wound of a closed infected stage VI MLL. The study also showed that the management of severe injuries may be done with multiple debridements and using vacuum-assisted therapy as a temporary coverage, which helps wound closure while reducing infectious complications.[16,17] The role of vacuum-assisted therapy was significant in helping the wound heal in the case of our patient; after introducing vacuum assisted closure, healing and skin graft integration were much more successful. Other successful adjuncts to achieve closure of the dead space include the use of fibrin sealant that has both hemostatic and sealing properties, quilting sutures, and suction drains.[12,18] A recently reported case of an acute ML lesion of 1200 mL showed complete resolution with the use of an instillation vacuum system approach, sparing the patient from excision and grafting, thus preventing large disfigurement from excisional debridement.[12]

Estimation of the wound area that needs skin grafting was done for educational purposes; it used the calculation method of burned areas, with wounded area = total body surface area × percent wounded area × 100, with the total body surface area being equal to BSA (m^2) = 0.007184 × weight power 0.425 × height power 0.725, and the wounded area estimated at 9% using the rule of nines.[19] This method is usually useful in estimating the amount of donor skin needed in non-autologous skin grafting, but in this case, it was not practically used as the skin grafting was from the patient himself.

Table 1. Six-stage Classification of MLL Developed by Mellado and Bercandino

Stages		Morphology	Signal	Capsule
Stage I	Seroma	Laminar	Low T1, high T2	Sometimes
Stage II	Subacute hematoma	Oval	High T1 and T2	Thin
Stage III	Chronic organizing hematoma	Oval	Intermediate T1 heterogeneous T2	Thick
Stage IV	Closed laceration	Linear	Low T1, high T2	None
Stage V	Pseudonodular	Round	Variable T1 and T2	Thin or thick
Stage VI	Infected	Variable sinus tract	Variable T1 and T2	Thick

CONCLUSIONS

The case presented here was a rare case of a stage VI MLL that resulted from a collision during a football game and was initially misdiagnosed, leading to a delayed treatment and a massive wound. This is the first case to be reported with this wound size of an infected closed MLL. A review of literature was done to discuss the adequate management of MLLs. This case highlights the importance of an early diagnosis and intervention, which may prevent the MLL from affecting such a large area and getting infected.

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