J Orthop Spine Trauma. 2025 June; 11(2): 81-5. DOI: 10.18502/jost.v11i2.18888

Case Report

Prompt Diagnosis and Management of Morel-Lavallée Lesion: A Case Report

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Received: 23 December 2024; **Revised:** 27 February 2025; **Accepted:** 11 April 2025

Abstract

Background: The Morel-Lavallée lesion (MLL) is an unusual injury that occurs due to shearing forces separating the skin from the underlying layers. This lesion can lead to infectious hematoma and create a life-threatening condition.
Case Report: A case of a 21-year-old female patient is presented who visited the emergency department after a truck ran over her foot. It was later determined that she had an MLL in her thigh. The patient fully recovered using a vacuum-assisted closure (VAC).
Conclusion: It is crucial for orthopedic surgeons to be aware of the diagnostic steps and symptoms to quickly identify and treat MLL before it causes irreversible damage to the patient.

Keywords: Morel-Lavallée Lesion; Wounds and Injuries; Hematoma; Case Reports

Citation: Moulaei R, Moulaei K, Vosoughi F. **Prompt Diagnosis and Management of Morel-Lavallée Lesion: A Case Report.** *J Orthop Spine Trauma* 2025; 11(2): 81-5.

Background

Morel-Lavallée lesions (MLLs) are rare shearing injuries that cause the skin and subcutaneous tissue to detach from the underlying fascia, classified as closed internal degloving injuries. These lesions commonly occur near the greater trochanter (30.4%), pelvis (18.6%), and thigh (20.1%). They may also affect the knee joint (15.7%), gluteal area (6.4%), lumbosacral region (3.4%), abdomen (1.4%), lower leg (1.5%), and scalp (0.5%) (1). MLL can occur anywhere on the body (2). The male-to-female ratio for this lesion is noted to be 2:1. MLL is more frequently observed in adults between the ages of 30 and 40 and is uncommon in children. Additionally, a body mass index (BMI) of 25 kg/m^2 or greater is considered a secondary risk factor (3).

Typically, MLL occurs due to high-speed motor vehicle accidents and direct crushing in that area (4, 5). Shearing forces result in the movement of bone, muscle, and deep fascia in one direction, while the superficial layers, including superficial fascia, subcutaneous fat, and skin, move in the opposite direction. This differential movement causes the rupture of perforating arteries and lymphatic vessels (4). The separation of tissues results in a space filled with hemolymphatic fluid, blood, necrotic fat, and lymphatic tissue. This fluid contains metabolic and inflammatory factors that increase cellular permeability. Granulation tissue develops at the edges of the cavity, potentially leading to the formation of a fibrotic pseudocapsule (6).

The accumulation of blood and necrotic material in the space created by the lesion can potentially lead to abscesses, cellulitis, or osteomyelitis (6, 7).

The diagnosis and treatment of MLL have always been challenging. The most effective treatment for this lesion has been surgical intervention. However, there is a concern that if incisions are made on the site of the MLL, the extent of skin necrosis may increase and the risk of infection may rise. On the other hand, treatments without skin incision, such as aspiration of the fluid, have a high rate of recurrence. Given the challenges of treating MLL, this case serves as an opportunity to review the literature and present the actions taken for this patient along with the results.

Case Report

A 21-year-old female patient with a history of controlled seizures, treated with levetiracetam (LEVEBEL) and Depakene, presented with severe pain and swelling in her left foot after a truck ran over it. In the emergency department, swelling and ecchymosis were observed in the foot area (Figure 1). X-ray imaging showed fractures of the 4th and 5th metatarsals and the navicular bone (Figure 2).

Figure 1. Initial appearance images of the patient

Figure 2. Initial X-rays of the patient

No additional fractures were seen on computed tomography (CT). Due to significant swelling and severe foot injury, the patient was admitted to the orthopedic department for monitoring for compartment syndrome.

After one week of monitoring for compartment syndrome, the swelling in the foot decreased, and the patient was planned for discharge. However, swelling and ecchymosis were noted in the thigh, and the patient was re-evaluated. She reported that during the truck's passage over her foot, she was dragged along the ground, resulting in a crush injury to her left thigh. On examination of the medial thigh, an area of skin necrosis approximately 10 × 15 cm was observed, along with significant swelling and fluctuation (Figure 3). An ultrasound was performed on the patient. This ultrasound showed that, in the medial aspect of the thigh, a hypoechoic collection with floating echogenic foci and internal septations was seen, measuring approximately 30 mm in maximum diameter, suggestive of edema or hematoma.

Figure 3. Appearance of the patient after one week

The patient was initially bandaged; however, the swelling and fluctuation gradually worsened. On the tenth day of admission, the patient underwent percutaneous aspiration, and approximately 700 cc of fluid was removed, alleviating the swelling temporarily. However, upon examination the following morning, the swelling and fluctuation had completely returned (Figure 4).

Figure 4. Aspiration of fluid and temporary resolution of swelling in the thigh region of the patient

On the fifteenth day of admission, due to persistent swelling and fluctuation in the medial thigh, the patient was taken to the operating room. In sterile conditions, a one-centimeter incision was made in the medial thigh and approximately 500 cc of fluid was drained. No signs of infection in the wound or fluid were observed. A large sterile gauze was placed into the wound to eliminate the pseudo-capsule and necrotic tissue (Figure 5).

Figure 5. Placement of a large sterile gauze dressing inside the patient's wound to remove the pseudo-capsule and necrotic tissue

The wound was then thoroughly washed with normal saline, and the patient was placed under vacuum therapy (Figure 6).

Figure 6. Application of vacuum therapy for the patient

Additionally, a culture of the fluid was sent, which grew Enterococcus. The patient was treated with antibiotics for only four days.

The vacuum dressing was changed five times every 72 hours, and except for the first instance, gauze was not removed from the wound. Eventually, no signs of swelling or fluctuation were observed in the medial thigh, and the wound was sutured (Figure 7).

Figure 7. Closing the patient's wound

During follow-up in the orthopedic clinic, the patient's wound healed (Figures 8, 9).

Figure 8. Follow-up after one week of wound closure and the final session of vacuum therapy

Figure 9. Follow-up after 3 week of wound closure and the final session of vacuum therapy

Discussion

Diagnosis: MLL is often diagnosed late or incorrectly due to distracting injuries, such as the occurrence of multiple trauma. Kottmeier et al. reviewed 16 cases of MLL and reported that MLL was initially undiagnosed in 44% (7 out of 16) cases (8). The diagnosis of MLL is primarily clinical and should be considered in any traumatic situation. In cases of localized swelling, especially with fluctuation, a diagnostic suspicion should arise. After clinical suspicion, imaging studies should be performed. Magnetic resonance imaging (MRI) is the preferred method as it provides excellent soft tissue evaluation. Ultrasound is a quick and simple method for assessing MLL.

Findings of MLLs commonly reveal hypoechoic fluid collections situated deep to the hypodermis and superficial to the muscular plane, often with internal debris lacking vascularity. During the diagnostic process, it is crucial to evaluate the compressibility of the lesion using ultrasound and to verify the absence of flow on Doppler imaging, which helps distinguish an MLL from deep vein thrombosis (DVT) or a vascular structure (3). CT is not recommended but may show fluid accumulation. In delayed imaging, MLL may be interpreted as a soft tissue mass or neoplasm. MLL is considered chronic when the lesion contains a capsule (9).

Treatment Interventions: Treatment options vary from supportive care to surgical intervention. Mudiganti et al. stated that MLLs in patients with multiple trauma might be associated with rhabdomyolysis (10). Timely diagnosis of rhabdomyolysis [through elevated serum creatine phosphokinase (CPK) and lactate dehydrogenase (LDH) levels, dark urine, etc.] and proper management through fluid therapy can prevent kidney failure. If the lesions are distant from skeletal injury, fluctuation is not found on palpation, and the patient does not exhibit significant pain

or discomfort, non-surgical management is recommended (5, 11, 12). Supportive treatment with compression, activity restriction, and/or rest, followed by careful monitoring, is considered reasonable in the acute phase for lesions of limited size.

For large, chronic lesions or those that do not respond to conservative treatment, aspiration or needle drainage should be performed. Needle aspiration should be performed for MLL with a volume of less than 50 ml, as MLL with larger volumes tends to recur. Therefore, aspiration of more than 50 ml of fluid is an indication for surgical intervention (5).

Sanogo et al. demonstrated that corticosteroids were a valid treatment option as a sclerosing agent in the treatment of Morel-Lavallée syndrome (MLS). However, due to the potential risk of infection, they should be administered in non-infected lesion conditions (13).

Schwab et al. showed that video-assisted endoscopic debridement allowed for direct visualization and removal of the pseudocapsule in MLL (14). This method is recommended for patients seeking rapid recovery, such as young athletes, as it involves smaller incisions, providing comfort and quicker recovery. The use of adjunctive therapy (such as sclerosing agents) should be considered to promote faster adhesion of the internal cavity layers.

Simple open incision drainage is a standard treatment approach, usually involving a 2 cm midline incision over the proximal collection site. This is followed by draining the fluid and irrigating the area with a 0.9% normal saline/betadine solution. The wound may be closed using a vacuum-assisted closure (VAC) sponge to remove dead space (5). A study involving 13 patients with MLL in the lower limb demonstrated the effectiveness of this method when combined with elastic compression bandaging. All bacterial cultures from the aspirated fluid were negative. Each of the 13 patients healed without complications and achieved satisfactory cosmetic outcomes. The vacuum dressings were only removed once there was no further drainage from the incision site. Continuous drainage and appropriate pressure created optimal conditions for the rapid healing of the cavity and lowered the recurrence rates (15).

The application of sclerosing agents to close the space created by the lesion has been reported. These agents induce cellular destruction in the lesion area and encourage fibrosis. Doxycycline has proven effective in lesions with volumes of up to 700 ml, with an average volume of nearly 400 ml (16).

The doxycycline protocol described by Singh et al. involves 500 mg of doxycycline in 25 ml of 0.9% saline, autoclaved at 121 degrees Celsius for 15 minutes. The solution is injected into the lesion through a needle and remains in place for 60 minutes, with the patient rotating every 10 minutes to ensure even distribution (17).

The application of talc for treating chronic MLL was documented in four patients, each with lesions on the thigh or buttocks that had lasted over three months. Talc was administered under fluoroscopic guidance, along with suction drainage for 12 days. All persistent pseudocysts demonstrated immediate resolution of fluid accumulation in the treated area without any recurrence (18). Other agents, including bleomycin, tetracycline, and erythromycin, have been used but are not deemed ideal option (19).

Early percutaneous drainage combined with debridement, washing, and suction drainage also appears safe and effective. In a study of 19 patients, all patients were treated within three days of injury. Drainage was typically completed through two incisions (one at the distal end of the lesion and the other at the proximal and posterior part of the MLL), followed by the placement of a hemovac drain within the lesion. It was concluded that percutaneous drainage was an exceptional initial treatment strategy (20).

Ota et al. conducted a study on 96 patients with MLL (60 men, 36 women; average age: 40.0 years). In this study, after percutaneous aspiration or incisional debridement combined with vacuum therapy, favorable results were reported for most patients, with no evidence of recurrence or infection, indicating the effectiveness of this treatment (21).

Through a review of the literature and experiences from treating this patient, the following algorithm can be utilized in the diagnosis and treatment of MLLs (Figure 10).

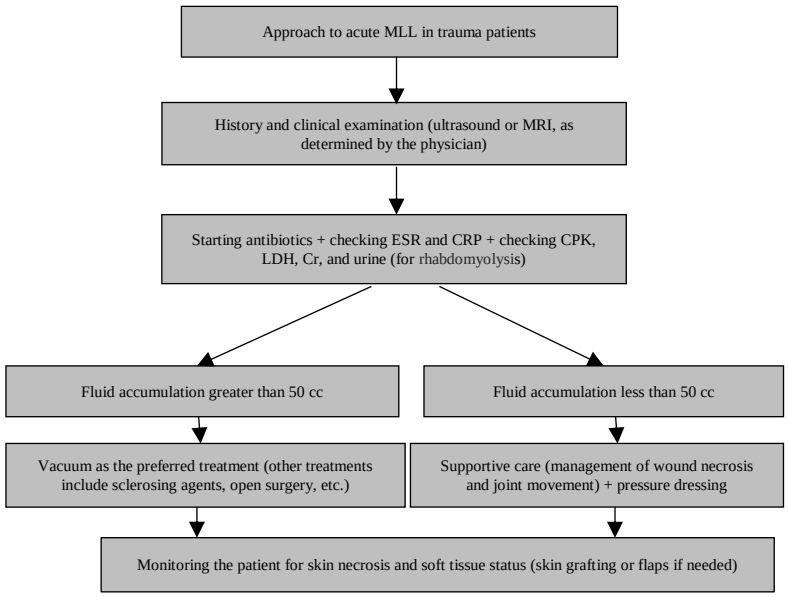

Figure 10. Approach to acute Morel-Lavallée lesion (MLL) in trauma patients (MRI: Magnetic resonance imaging; ESR: Erythrocyte sedimentation rate; CRP: C-reactive protein; CPK: Creatine phosphokinase; LDH: Lactate dehydrogenase; Cr: Creatinine)

In our study patient, given the issues with other methods, vacuum therapy was preferred, and fortunately, no complications such as infection, increased necrosis, adhesions, cosmetic issues, or limited knee mobility were observed. The outcome from the vacuum therapy was favorable, with complete restoration of knee motion and no increase in necrosis, leading to healing without skin grafting.

Conclusion

MLL is an unusual injury that can lead to a life-threatening condition or limb loss. In many cases, it is initially undiagnosed due to associated injuries. Physicians are advised to take a detailed history and perform thorough examinations for early diagnosis of this lesion. The use of vacuum therapy can be an effective treatment for this injury.

Conflict of Interest

The authors declare no conflict of interest in this study.

Acknowledgements

We hereby express our sincere gratitude to the patient for her cooperation and willingness to share her experience. Furthermore, we extend our profound appreciation to our esteemed colleagues in the Department of Orthopedic and Trauma Surgery at Tehran University of Medical Sciences, Tehran, Iran, for their invaluable support and expertise in the management of this case.

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