Management of the Morel-Lavallée Lesion

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KEYWORDS

• Closed degloving injury • Morel Lavallée lesion • Soft tissue injury • Hematoma • Sclerodesis

KEY POINTS

- Diagnosis of Morel-Lavallée lesions is often missed or delayed.
- The presence of a lesion over operative fractures increases the risk of postoperative infection.
- Advanced imaging may help determine the best methods of treatment.
- Treatment options include compression, aspiration, percutaneous or open surgical treatment, and sclerotherapy. Additionally, postoperative management plays an equal role in treatment success.
- Specific treatment should be individualized for each patient based on a surgeon's thorough understanding of Morel-Lavallée lesions.

INTRODUCTION

In 1863, a French physician named Maurice Morel-Lavallée[1] first described a unique posttraumatic fluid collection that developed in a patient who fell from a moving train. More than a century later, while Letournel and Judet[2] compiled their well-known series of acetabular fractures, they also witnessed the same characteristic lesions develop over the greater trochanter and named them *Morel-Lavallée* (ML) lesions. Such lesions have been described by other terms in the literature, such as ML effusion or hematoma, posttraumatic pseudocyst, posttraumatic soft tissue cyst, closed degloving injury, or chronic expanding hematoma.[2,3] If a lesion occurs, it is almost always after direct trauma to the pelvis, thigh, or knee. A hypovascular suprafascial space develops in which fluid easily accumulates. Posttraumatic hematoma formation increases the risk of infection, and a unique combination of physical properties inhibits physiologic dead space closure.[4]

Such lesions are rare, and diagnosis is often delayed or missed. As a result, their natural history is not yet clearly established. In a series of approximately 1100 consecutive pelvic fractures, Tseng and Tornetta[5] reported that 19 (1.7%) patients developed ML lesions. However, the actual incidence is higher because lesions can occur without an underlying fracture and a small portion likely persist subclinically.[6] Letournel and Judet[2] published an incidence of 8.3% after trauma to the greater trochanter.[2] Consequently, the true incidence is unknown. The current body of available literature consists entirely of case series composed of heterogeneous groups of patients. Therefore, no standard treatment algorithms exist. This article helps physicians understand the currently accepted surgical indications, techniques, and controversies when managing patients with an ML lesion.

CAUSE

Individuals are at risk for developing an ML lesion after sustaining a significant blow or sudden shearing force to any area with strong underlying fascia, most often around the pelvis or lower

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limb. Motor vehicle collisions tend to be responsible for most of these lesions, and more than 50% are due to high-energy mechanisms.[7,8] However, a low-energy mechanism does not rule out the possibility. ML lesions have been reported to occur after sports injuries or, very rarely, less violent mechanisms.[9–11] The lower limb is involved in greater than 60% of cases, with most involving the greater trochanter.[12] This area of the body is predisposed given the increased mobility of soft tissue, limited anterolateral perforator vessels to the subdermal vascular plexus originating from the lateral femoral circumflex vessels, subcutaneous nature of bone, and strength of the fascia lata as it attaches to the iliotibial band.[13–15] A substantial number of these lesions will occur with underlying osseous fractures and injuries to other organ systems.[14] Female sex and a body mass index of 25 or greater are proposed risk factors, presumably because of the increased fat in predisposed regions.[12,16] However, more recent studies have brought these risk factors into question.[8]

PATHOGENESIS

As a result of violent shear, a thick layer of subcutaneous fat and skin is ripped from its underlying, firmly secured fascia. During this process, lymphatic channels and perforating vessels from underlying muscle are torn and release their contents into the newly created cavity. The fluid mixture now contains blood, fat, and necrotic debris within a relatively hypovascular space that is ill equipped to drain internally because of the intact underlying fascia. As lesions progress beyond the acute phase, blood is reabsorbed and replaced by serosanguineous and lymphatic fluid, which has low coagulation ability and high molecular weight.[17] A sustained inflammatory reaction eventually leads to a cystic mass surrounded by a fibrous capsule that forms as a result of peripheral deposition of hemosiderin, granulation tissue, and fibrin.[3,18] Exact timing of the aforementioned mechanisms is unknown, but MRI classifications detecting lesions in various phases suggest that lesions are altered with age.[19]

CLINICAL MANIFESTATIONS

A large swollen bruised area whereby a hematoma develops in a delayed fashion should alert practitioners to the possibility of a closed degloving injury (Fig. 1). Clinical manifestations of ML lesions include soft tissue swelling with or without ecchymosis, skin contour asymmetry and hypermobility, and soft fluctuance with minimal or absent tenderness. Lesions can occur anywhere but are most often located around the peritrochanteric or peripelvic region. Skin will often have decreased sensation and may appear dry, cracked, or discolored in more chronic lesions (Fig. 2). Lesions may not be apparent at the time of initial trauma. Either they are masked by more serious injuries or it takes some time for the hematoma to develop. Reported delays to diagnosis occur in approximately one-third of patients.[12] Depending on the study, the average time to diagnosis ranges between 3 days and 2 weeks.[8,12,20] Patients have even presented complaining of chronic contour deformities up to 13 years after injury.[12] Because ML lesions are a result of trauma, they can present at any age. The youngest documented case was in a child aged 28 months.[21] Those caring for pediatric trauma patients should be especially vigilant when managing soft tissue wounds given the decreased clarity with which children communicate their symptoms.

Fig. 1. Clinical appearance of an ML lesion 7 days after the patient sustained a shearing force to the greater trochanter while snowboarding. After the initial injury, the patient resumed sporting activities until a discolored, fluctuant area developed 4 days later.

IMAGING

Standard radiographs can confirm the presence of a soft tissue mass without calcifications.[22] They can also be used to determine whether or not the lesion has underlying fractures, which may significantly affect further management.

Ultrasound is useful as both a diagnostic and therapeutic modality. Neal and colleagues[23] observed ultrasound characteristics in 21 ML lesions. Acute lesions are heterogeneous and lobular with irregular margins. Lesions older than 8 months