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Case Report

Peripelvic Morel-Lavallée lesion following high-energy spine trauma: Case report and review of treatment options

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ABSTRACT

The Morel-Lavallée lesion (MLL) is an internal degloving injury typically associated with high-energy trauma and is suspected to be underdiagnosed in a majority of cases. Here, we illustrate the typical clinical and radiological characteristics of an extensive peripelvic MLL in a 50-year-old patient presenting to our trauma outpatient clinic with peripelvic pain, bruising and swelling six weeks after severe spine trauma caused by a high-energy car accident. Using this case study as an example, current therapeutic approaches are discussed. Therapeutic decisions should be based on clinical symptoms, lesion size, severity, age and co-morbidities. Extensive, symptomatic and chronic lesions should be addressed with early débridement, irrigation and drainage in order to prevent complications like infection or soft tissue necrosis.

Background

The Morel-Lavallée lesion (MLL) was first described by the French physician Victor-Auguste-François Morel-Lavallée in 1863. It is a closed soft-tissue degloving injury typically seen after high-energy trauma characterized by separation of subcutaneous soft tissues from the underlying deeper fascial layers resulting in a typical hemolymphatic fluid collection between these tissue layers [1,2]. According to a review of 200 MLLs by Vanhegan et al., the most common manifestation is the greater trochanter/hip (30.4%), followed by thigh (20.1%), pelvis (18.6%), knee (15.7%), gluteal region (6.4%), lumbosacral area (3.4%), calf/lower leg (1.5), abdominal area (1.4%), and head (0.5%) [3]. There could be a delay in diagnosis, as MLL often may not become clinically present until weeks after the initial trauma and, in the polytrauma patient, more obvious injuries may distract from its presence [2]. Undesirable complications such as infection, tissue necrosis, pseudocapsule formation and cosmetic deformity may result from untimely diagnosis and management [2,4,5]. Diagnosis of a MLL is made by physical examination and imaging. Although MRI is the diagnostic modality of choice due to its high soft tissue contrast, in the trauma setting, CT can provide important additional information on fractures while postinjury changes in soft tissues can also be well differentiated [2].

We present a case of a massive peripelvic MLL following high-energy spine trauma, as it is highly important both for surgeons as

Abbreviations: MLL, Morel-Lavallée lesion.

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well as for radiologists to be aware of this condition in the emergency department setting. Taking this impressive case as an example, clinical as well as radiological aspects on which the therapeutic decisions should be made are presented. In addition, typical clinical and radiological findings as well as current treatment options are discussed.

Case presentation

A 50-year-old male Caucasian presented to our trauma outpatient clinic with severe left peripelvic pain, bruising and swelling six weeks after a severe spine trauma caused by a high-energy car accident. The only pre-existing condition was migraine, apart from which no other pre-existing conditions nor any allergies were known.

Initially presenting to our emergency room, the patient sustained left-sided posterolateral partially multifragmentary rib fractures involving ribs 9, 10, 11 and 12, multilevel spinous process fractures (L1–5) and left-sided multilevel transverse process fractures (L2–4). Further trauma sequelae included left-sided pulmonary contusions and mild traumatic brain injury. Based on the clinical and radiological findings, conservative management with inpatient neurological monitoring and pain-adapted analgesia was initially decided. With an uncomplicated course, the patient could be discharged from inpatient treatment after two days.

Six weeks later at the time of representation to our trauma outpatient clinic, the patient reported significantly increasing pain in the left gluteal region over the last weeks as well as swelling that progressed in size over time. He denied any history of fever. Physical examination showed extensive soft tissue swelling, fluctuance and discoloration of skin at the left gluteal area. Range of active and passive motion was painful, but not restricted. However, palpation of the left gluteal area revealed severe pressure pain.

CT was performed and showed an extensive predominantly serous fluid retention in the left gluteal subcutaneous soft tissues beginning at the level of the lower pole of the left kidney and extending caudally to the left greater trochanter (Fig. 1). In accordance with clinical and radiological findings, the diagnosis of extensive left peripelvic MLL was made.

Due to the patient's symptoms with severe pain and the size of the fluid retention, a surgical approach was decided upon, taking place on the same day. Via a skin incision measuring about 4 cm in size on the left lateral lumbar region, the seroma could be fully evacuated. In a second step, the previous fluid cavity was carefully curetted, and two 14-gauge Redon wound drainages were inserted. The wound was closed in layers with first subcutaneous single stitches and skin closure by Donati stitches.

The postoperative course was without complications. The patient was prescribed analgesics as well as an abdominal bandage to further support wound healing with permanent adhesion of the skin to the fascia in order to prevent seroma recurrence. After 14 days, the suture material could be removed, and the patient was almost symptom-free. In the further follow-up, the patient reported well-being without any limitations in daily life two months after surgery.

Discussion

The MLL is an internal degloving injury typically associated with high-energy trauma. Tangential shear forces imparted to the soft tissue envelope lead to separation of the hypodermis from the superficial fascia [2]. MLL usually follows four stages: Firstly, the dermis is separated from its underlying fascia, secondly, a fluid collection of blood, fibrin, lymph and fatty debris is exsanguinated from the

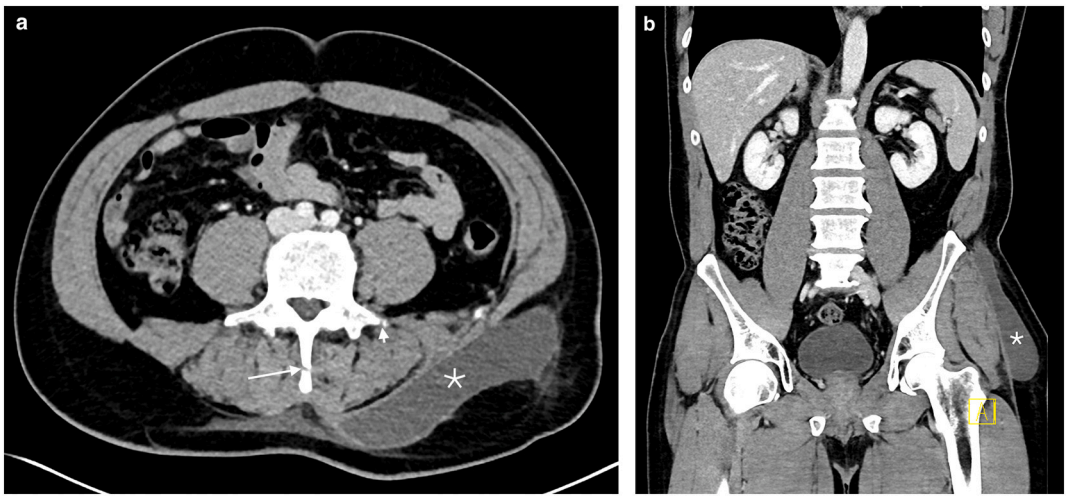

Fig. 1. 50-year-old male with extensive fluid retention in the left peripelvic subcutaneous soft tissues six weeks after high-energy spine trauma. CT demonstrating an extensive predominantly serous fluid retention in the left peripelvic subcutaneous soft tissues beginning at the level of the lower pole of the left kidney and extending caudally to the left greater trochanter (panels a and b, asterisks). There were no signs of intraabdominal or cutaneous fistulas. Preexisting fractures of the left-sided posterolateral ribs 9–12, nor multilevel spinous (L1–5) and left-sided transverse process fractures did show significant secondary dislocation (arrow shows L4 spinous process fracture, arrowhead shows left-sided L4 transverse process fracture).

vasculature and lymphatics. In the third stage, over time, the forementioned fluid collection is further enlarged due to potentiation of cellular permeability by inflammatory cytokines. If left untreated, this inflammatory process leads to the fourth stage, characterized by pseudocapsule formation and lesion maturation as sequestration of the fluid-filled space is attempted [2].

At the time our patient presented to the trauma outpatient clinic, his MLL already reached this fourth stage, as neofascia formation was present. As with our patient, the most common manifestation of MLL is the greater trochanter/hip region. This results from the prominence and large surface of this area as well as from the skin mobility and the dense capillary network [6].

The MLL may present acutely at the time of the initial trauma or may appear days to weeks following the initial injury. Commonly, as these lesions typically are associated with high-energy trauma, fractures of the pelvis and proximal femur often occur simultaneously [2]. In this context, it was previously hypothesized that the incidence of small MLL associated with pelvic fractures might be underreported as these lesions easily might be overlooked [7].

The diagnosis of MLL is usually made by clinical examination and additional imaging. In the trauma setting, in most cases, CT scan of the area of interest is performed, particularly when preexisting fractures are known. In unclear cases, MRI may provide important additional information to define lesions' age due to its high soft tissue contrast and its ability to distinguish and date different stages of hematoma evolution. Mellado et al. previously described six distinct lesion patterns with lesion age and lesion appearance on MRI are used to distinguish each type. To summarize, characterized lesion types are correlated with the increasing chronicity and complexity of the lesions, e.g., the presence of a neofascia respectively pseudocapsule indicates a chronic stage of a MLL [8]. Acute lesions appear hypointense on T1-weighted sequences and hyperintense on T2-weighted sequences, while more subacute MLL is homogenously hyperintense on both T1- and T2-weighted images. Yet, heterogenous parts may be present in subacute MLL, depending on the varied age of its contents with old hematoma settling and serous fluid accumulating in the empty space. Multiple septations also indicate for subacute lesions [8].

To date, several non-invasive and invasive treatment options are available. In general, treatment is based on the lesion size, age, severity, patients' co-morbidities, and proximity to an intended surgical incision in cases of coexisting injuries like fractures. While smaller MLL may be managed with close observation without surgical intervention, early surgical approach including percutaneous drainage, or open debridement and irrigation, should be favorized in more severe and extensive MLL to avoid complications [1,9]. Despite the closed nature of MLL, bacterial contamination from fluid aspirates has been documented. Therefore, early surgical debridement of MLL aims to remove fluid, which can serve as a medium for bacterial colonization [7]. In the past, open debridement of MLL has been shown to be effective in several studies [1,7,9–11]. Reviewing 19 studies, Becker et al. reported that in the area of the spine and pelvis, a radical débridement of MLL including drainage is advised, especially in cases of late diagnosed respectively chronic MLLs [9].

Despite this surgical approach is associated with less recurrences and secondary wound infections, it has to be kept in mind that via open surgical procedures the subdermal vascular plexus, and therefore the only remaining blood supply to the superficial tissue, is potentially endangered. Due to this fact, several authors suggested more minimally invasive procedures including smaller incisions. E.g., Tseng et al. described their approach with small 2-cm incisions strategically placed over the proximal and distal extent of the MLL achieving cavity access via these portals. To debride necrotic material a brush and pulsed irrigation were used, and a percutaneous drain was inserted. Drains were removed after a time period of two weeks or after fluid output was noted to be less than 30 ml over 24 h. All 19 patients healed without complications [12]. Another minimally invasive approach is percutaneous needle aspiration, often combined with compressive bandaging. Tejwani et al. reported the management of MLLs by needle aspiration alone in a previous case series of 27 National Football League players, 14 of whom received additional compressing bandaging, cryotherapy, and physical therapy. The final outcome has not been reported, yet the authors described the resolution of knee stiffness secondary to swelling at an average of ten days after needle aspiration [13].

No specific technique for acute MLL was identified as being superior to others, but chronic MLLs were treated best with open resection and surgical débridement [14]. These results are in accordance with those of Becker et al., who suggested radical débridement in late diagnosed MLLs with primary wound closure in cases of concomitant osteosynthesis if possible. In cases of extensive soft tissue damage, necrosis or infection, initially vacuum therapy with secondary wound closure should be favorized [9]. Sclerotherapy approaches using agents such as talcum powder or doxycycline are described in chronic MLL [15,16].

One limitation of our case report is the relatively short clinical follow-up of two months. Furthermore, it would have been interesting to perform a preoperative MRI to visualize, e.g., septations of the fluid retention, as MRI is the imaging modality of choice allowing best for the characterization of soft tissue injuries. Despite these limitations, a key strength is the typical history, clinical presentation, and CT findings of a MLL in our patient's case.

Conclusion

According to current literature and our own experience, we suggest that each MLL should be assessed individually with attention to both clinical examination and imaging findings. Therapeutic decisions should be based on clinical symptoms, lesion size, severity, age and co-morbidities. Extensive, symptomatic and chronic lesions might be addressed with early débridement, irrigation and drainage in order to prevent complications like infection or soft tissue necrosis.

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