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A case of refractory massive morel lavallee lesion of the thigh: Pitfalls in diagnosis, management and the role of vac therapy

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Abstract
Morel-Lavallee lesion has been described as a post-traumatic soft tissue degloving injury. It is commonly seen in association with road traffic accidents or sports injuries where there is separation of the hypodermis layer from the deeper fascia caused by a shearing force. These injuries occur around the mid-torso, specifically at the flank, lumbar spine, scapula, buttocks and the knee but are most commonly seen over the greater trochanter. There is a complex serosanguinous fluid collection containing blood, lymph and necrotic material within the separated tissue planes. Various treatment modalities like compression bandaging, sclerodesis, percutaneous aspiration, open debridement, quilting sutures and VAC (vacuum assisted closure) therapy have all been described in literature, however a clear consensus on the management protocol does not exist.

Herein we reported a 45 year old gentleman who presented with a persistent fluctuant swelling over his left thigh following a motor vehicle accident. He had a history of multiple aspirations of the collection. Upon presenting to our Institute he underwent incision and drainage with sclerotherapy followed by open drainage and debridement with low suction drains. However on follow up visits there was recurrent swelling over the inferior most dependent aspect of the lesion which was finally managed by VAC therapy. The patient eventually returned to normal activity after 4 months from the initial injury with no residual loss of function.

The clinical significance of this case is to emphasize that a high degree of suspicion and early use of imaging modalities like MRI in suspected patients are essential to provide timely and appropriate treatment. We also aim to discuss the efficacy of various forms of treatment as per the available literature which shows that a low threshold for operative management is associated with lower recurrence and complication rates.

Keywords: Closed degloving injury, magnetic resonance imaging, morel-lavallee lesions, trauma, VAC therapy

Introduction
French surgeon Maurice Morel-Lavallee was the first to describe this characteristic closed degloving injury in a patient following trauma in the year 1853. These lesions can have a fairly non-specific and variable appearance on imaging modalities, thus mimicking a large spectrum of pathologies from simple soft tissue haematomas, superficial bursitis to necrotic soft tissue neoplasms. A failure to identify a Morel Lavallee lesion in time and appropriately manage it while it is still in the acute or early sub-acute phase, poses the risk of superinfection, overlying tissue necrosis and continued expansion [1].

The mechanism of injury is described as a high-intensity forces to the body in either a direct or tangential shearing manner, that causes a separation of the skin and subcutaneous tissue from the underlying muscle fascia [2, 3]. The resultant trauma and shearing forces lead to damage of the vascular and lymphatic supply, which eventually results in the accumulation of blood and lymph in the dead space generated by the separation of the superficial and deep fascia [3]. A chronic inflammatory process is thus initiated and significantly the morbidity and mortality associated with this lesion [2, 4]. If left untreated the serosanguinous fluid increases and the hemorrhagic material is reabsorbed. Once the fibrous capsule progressively develops resorption is markedly hindered and the lesion begins to gradually expand progressively [5].

The areas most prone to develop a Morel-Lavallee injury are the hip, greater trochanter, anterolateral thigh, gluteal, lumbodorsal, and scapular regions [2]. These areas are generally the ones overlying and adjacent to osseous protuberances [3]. The differential diagnoses to be considered include bursitis, haematoma, fat necrosis, haemangioma, soft tissue sarcoma or early myositis ossificans [6]. Various forms of management have been described in literature including conservative management with compression bandaging, percutaneous aspiration, sclerodesis and open surgery supplemented with quilting sutures, fibrin glue or VAC therapy. Open surgical debridement followed by Vacuum assisted closure has shown promising results in multiple isolated reports, however we found no high quality evidence based recommendations to suggest the appropriate use of VAC therapy based on the nature, size and site of the lesion.

Case history

The patient is a 43-year-old gentleman who presented to our institute with complaints of pain over his left thigh with a recurrent fluctuant swelling. The patient had got into a road traffic accident about a month and a half ago when his left thigh was run over by an automobile following a collision while riding a motorcycle. The patient sustained blunt trauma to the left hip and thigh region without any associated fractures. He subsequently developed a fluctuant swelling over the left thigh with a history of multiple percutaneous aspirations before presenting to our institute. On physical examination the patient had a fluctuant swelling over the lateral aspect of the left thigh starting at the level of the greater trochanter upto the mid-thigh about 20 x 8 cm in size (Fig. 1). There was a healing scar over the anterior aspect of the thigh. There were no clinically apparent signs of any bony injury or neurovascular compromise of the affected limb. The hip and knee joints exhibited full range of motion with intact muscle strength of the hip flexors and abductors and the quadriceps and hamstrings. An MRI was ordered which revealed a thin walled collection limited to the subcutaneous fat planes of the lateral compartment of the left thigh extending from the lower gluteal region to mid-thigh measuring about 1.2cm x 18.4cm (Fig.2, Fig.3). Musculotendinous structures were noted to be intact and no fractures were seen. The diagnosis of a Type III Morel-Lavallee lesion was established based on the classification system proposed by Mellado and Bencardino in 2005 [7]. It is an extensive six-stage imaging-based classification based on the shape of lesion, signal intensity on T1 and T2 - weighted images, presence of fibrous capsule, contrast enhancement, and sinus tract formation. The patient was hospitalized and underwent incision and drainage followed by sclerotherapy with doxycycline (500mg in 25ml 0.9% normal saline). On discharged he was advised to continue compression bandaging for a period of 4 weeks. On follow up visit after a month he was found to have persistent swelling. Hence he was readmitted and this time underwent open drainage and debridement of the lesion using a single extensive incision (Fig. 4). A thorough debridement was carried out in order to produce an adequate healing response. After meticulous irrigation the deep fascial layer was sutured to the deep layer of the subcutaneous fat in order to eliminate the cavity and allow the surfaces to heal to each other. Two low suction drains were placed (Fig. 5). The total output from both drains was 460ml and 220ml on the 1st and 2nd postoperative day respectively which reduced to a minimum by the 5th postoperative day when they were removed. The patient was discharged on the 6th postoperative day and followed up for regular wound dressing. The patient developed a moderate 5 x 5 cm fluctuant swelling over the inferior most dependent part of the lesion with discharge from the incision site. The fluid was drained; thereafter a small vacuum-assisted closure (VAC) sponge was placed and negative pressure therapy was initiated. The VAC dressing was changed every 5 days. After 4 sessions of VAC therapy satisfactory wound healing with dead space closure was noted. The incision was then closed with 2-0 Ethilon under aseptic conditions which went on to heal well. The patient was advised to refrain from strenuous activity for a period of 4 weeks followed by further progression as per tolerance. On a follow up visit about 4 months after the index injury, the patient was able to return to his normal routine activity and work with no residual loss of function.

Discussion

Morel-Lavallee lesions are closed post-traumatic degloving soft-tissue injuries. Clinical manifestation of MLL may vary to a great extent based on the nature and extent of the injury. Some patients complain of severe pain over the injury site with or without reduced mobility, whereas others might have no obvious symptoms other than swelling. A characteristic finding on physical examination is a soft-fluctuant swelling with hypermobile skin. Bruising, ecchymosis, laceration, and/or contusion are generally seen [8].

A well-defined fluid collection between subcutaneous tissue and deep fascia is seen on ultrasonography. Depending on the content and chronicity of the lesion, it may appear anechoic or hypoechoic. MRI however, is the best modality for diagnosis and evaluation of Morel- Lavallee lesions. A well-defined lesion with tapering margins that is continuous with adjacent fascial planes is characteristic on MRI. Signal intensity may be variable depending on the concentration of haemo-lymphatic fluid. The presence of a capsule depends on the duration of lesion and is an indication for surgical management [9].

Singh *et al*. [10] in their review of literature in the year 2018 have defined a treatment algorithm. They advise to refrain from use of conservative management, except in acute lesions around the knee. Patient selection is also important as this can be effective only in patients who are compliant with follow up instructions, tight compression bandaging etc. Percutaneous aspiration in isolation has shown poor results, especially in chronic lesions. Sclerosis using doxycycline is appropriate for smaller acute and chronic lesions up to 400 ml. Larger lesions are preferably treated with open surgery with drainage of the contents or a more extensive en masse excision of the lesion along with the capsule. Quilting sutures and curettage of the cavity have shown to help close off dead space. Their recommendations however do not comment on the role of VAC therapy which has shown excellent results in a handful of recent reports.

S Hakim *et al*. [11] in a retrospective analysis of 178 patients with degloving soft tissue injuries showed that the patients who needed serial debridement and washout due to re-accumulation were significantly benefitted with an early wound closure and VAC therapy.

D Kohler *et al*. [12] in their study of 8 patients with Morel Lavallee lesions treated with open debridement and application of vacuum systems showed favourable results with 6 wounds being closed secondarily and 2 requiring split skin coverage. The average duration of vacuum therapy was 8.5 days with a change in dressing every 2.6 days.

Pathophysiologically, VAC therapy aids evacuation of fluids, increases the perfusion pressure of the remaining subcutaneous vessels hence reducing risk of secondary skin necrosis. It has a positive impact on quality and quantity of granulation tissue and microcirculation and reduces bacterial colonization. Thus it accelerates wound healing and reduces the risk of infection. In cases associated with bony injury requiring surgical stabilization, placement and timing of the

vacuum system should be planned considering the requirements for fracture fixation.

Conclusion

The early diagnosis and timely management of Morel Lavallee lesion depends on a high index of suspicion, standardized diagnostic criteria and clear protocols and guidelines on the approaches of management. The use of VAC therapy seems to be effective especially in managing larger and refractory lesions. However most of this literature is small scale and retrospective in nature. Larger, randomized, comparative studies assessing the efficacy of VAC therapy at different stages and types of Morel Lavalle lesions could be an interesting area for future research.

Conflict of interest

The authors declared no potential conflicts of interests with respect to the research, authorship, and/or publication of this article

Appendix

Fig 1: Preoperative clinical picture showing the swelling over the lateral aspect of the right thigh.

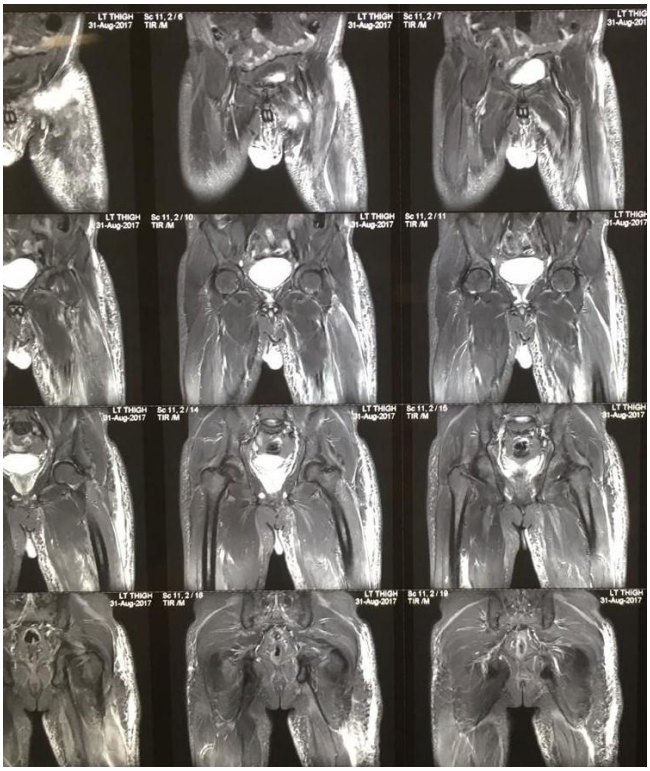

Fig 2: Coronal view MRI showing a thin walled collection in the subcutaneous fat planes of the lateral compartment.

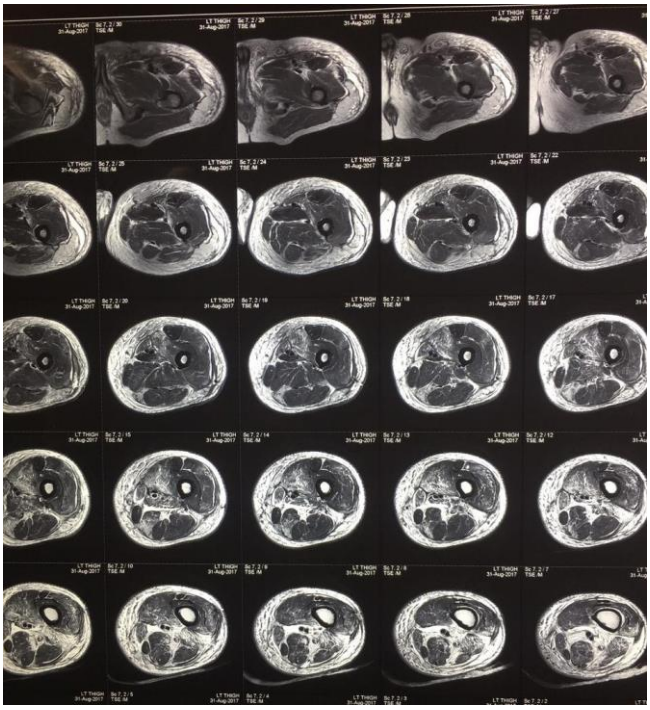

Fig 3: Axial view MRI shows the lesion extending from the lower gluteal region to the mid-thigh.

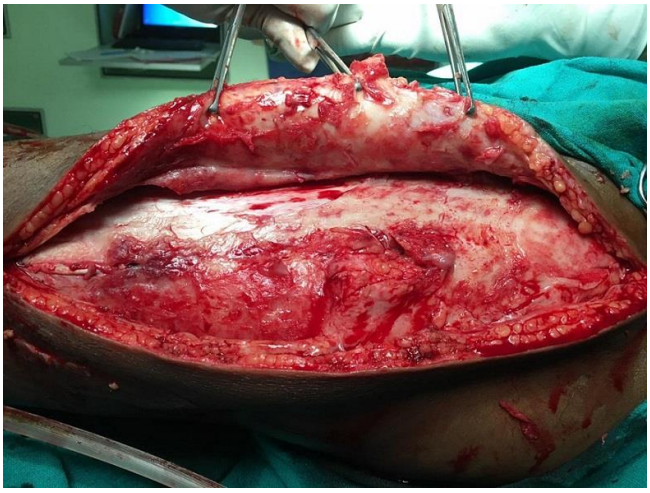

Fig 4: Extensive longitudinal incision with thorough debridement.

Fig 5: Surgical wound closure with 2 drains in situ.

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