

Posttraumatic Morel-Lavallée seroma – clinic and forensic implications

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Abstract: The posttraumatic Morel-Lavallée seroma (MLS) completes, in medico-legal traumatology, the group of closed soft tissue injuries, along with the bruise, the hematoma and the muscular contusion. It is defined as a closed soft tissue injury produced most commonly as a result of direct trauma with tangential impact, followed by the shearing of the hypodermis from the underlying fascia, which results in a cavity filled with blood, lymph and both viable and necrotic fatty tissue. It can be seen in association with pelvic trauma, typically in the region of the hip, the thigh, the lower lumbar area, the gluteal area and the abdominal wall. Studies and articles on the subject are scarce in the medical literature in general, and even more so in the medico-legal one, although the problems it raises are complex. The present paper starts with an updated presentation of the MLS clinical aspects, followed by an analysis of the medico-legal implications with regard both to the interpretation of MLS injury mechanisms, and to the medico-legal criteria for the evaluation of diagnostic accuracy, evolution and complications for this post-traumatic entity that often has a prolonged trajectory, marked by repeated medical and surgical interventions and multiple medico-legal evaluations. Hence, an indirect change in the medico-legal interpretation of the severity of this initially benign type of injury can appear. Difficulties in establishing the causal link between the initial trauma and certain related complications may also occur.

Key words: soft tissue trauma, Morel-Lavallée seroma, medico-legal assessment

Morel-Lavallée seroma (MLS) was first described by the French surgeon Victor Auguste François Morel-Lavallée in the mid 19th century. It is defined as a closed soft tissue injury produced by degloving which results in formation of a cavity between the subcutaneous tissue and the muscular fasciae or a haemo-lymphatic mass located between hypodermis and the aponeurotic planes [3, 24]. Though it is a well known entity, MLS is rarely mentioned in literature. It is also known as: Morel-Lavallée lesion or syndrome, posttraumatic soft tissue cyst [25], posttraumatic extravasation [29] or Morel-Lavallée effusion. [22]

Case presentations

We present three relevant cases of closed soft tissue injuries to the hip, thigh and gluteal area, two of them with prolonged evolutions, diagnosed as Morel-Lavallée seromas. The cases were also submitted to medico-legal evaluation.

Case 1

Female, 24 year old, victim of a traffic accident. The orthopedic examination in the day of the accident shows a right hip contusion and recommends resting. Five days later, a new orthopedic diagnostic is: right thigh contusion with haematoma.

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Six days after the accident, the victim presents for a first medico-legal evaluation. Local examination shows: right thigh, proximal third, external aspect, intense purple, swollen area, 20/30 cm wide. One month later an orthopedic consultation chart shows contusion with haematoma of the right thigh, and recommends balneo-physio-therapy.

Nine months after the accident, a medical document states: Post-traumatic Morel-Lavallée effusion in the right thigh, medial third, external aspect. Elastic contention and anti-inflammatory medication is recommended. In case of infectious tendencies, surgical evacuation is recommended. At this point the medico-legal expertise shows that the anatomo-clinical aspect of the injury does not constitute aesthetic prejudice.

One year after the accident a hospital chart shows that a surgical intervention was performed; it resulted in the excision, from the suprafascial layer of the right thigh, of a 10/5 cm fibrous, encapsulated formation. After surgery the evolution was favorable, but with residual pain in the lower aspect of the surgical scar. More than one year after the accident the medico-legal opinion is that it is too early to discuss about the issue of aesthetic prejudice, since not all specific surgical possibilities have been exhausted.

Case 2

Female, 70 year old, victim of a traffic accident. The orthopedic examination in the day of the accident shows only right knee and ankle contusion (no change in the aspect or functionality of the right thigh). Elastic compression and cold bandages are recommended.

Five days after the accident, the medico-legal examination shows: right thigh, lateral aspect, proximal third, 40/20 cm purple bruising.

Two weeks after the accident the victim starts a 12 day hospitalization with the diagnostic: encapsulated Morel-Lavallée seroma in the right thigh. A surgical intervention under local anesthesia is performed for the excision of the encapsulated collection. After surgery the evolution is favorable. The patient also participated in a two-week recuperation program.

Four months after the accident a medico-legal expertise appreciates that there is a direct causal link between the traumatic incident and the injury.

Case 3

Male, 33 year old, suffers a skiing accident by lateral impact with a fence. Initially the clinical situation is dominated by the intense swelling, bruising and moderate pain in the inferior half of the left gluteal area and the postero-lateral aspect of the left thigh, in the upper third. In the following four days the swelling and the pain intensify, while the bruising extends to almost the entire left gluteal area and the upper half of the left thigh, on the postero-lateral aspect. The situation dictates presentation to the emergency ambulatory service. The diagnostic is: severe contusion of the left gluteal area, massive subcutaneous haematoma. Aspirative drainage is performed in the area of maximum swelling; a sero-sanguinolent liquid is extracted (consistent with an MLS collection). This therapeutic attitude was maintained for 9 days. Initially the volume of extracted liquid was of approximately 50 ml per day; it decreased progressively (a total of approximately 150-200 ml). The pain, swelling and bruising disappeared progressively in about three weeks. The healing was complete, with no residual symptoms.

Etiopathogenesis

The most common mechanism of injury is direct trauma with tangential impact, followed by the shearing of the hypodermis from the underlying fascia, which results in a cavity filled with blood, lymph and both viable and necrotic fatty tissue. It is seen in association with pelvic trauma, typically in the region of the hip, thigh, the lower lumbar area, the gluteal area and the abdominal wall, but the most frequent localization is the greater trochanter [4, 27]. We seldom find the lesion in the calf or the knee, but the latter has become increasingly recognized in contact sports such as wrestling and football and it is attributed to direct, high energy impacts [2, 26]. This pseudo-cystic formation is also a rare complication after abdominoplasty [9].

If the area of detachment is small, the number of lymphatic and blood vessels draining into it will also be reduced. In this case, complete resolution of the mass is possible with compression therapy after eventual puncture and drainage. On the other hand, if the area of detachment is large and persists for some time after the trauma, the inflammatory reaction may create a peripheral capsule around the lesion, which contributes to the permanence of the fluid mass [20, 24].

There is a rich vascular plexus in the dermis of the skin, depending on the muscular and subjacent fascia vessels. Therefore, the skin necrosis can be the result of direct trauma to the coetaneous layers but may also occur on a delayed basis secondary to swelling of the degloving cavity, resulting in ischemia of the overlying skin. [11]

Literature shows that the ratio of females to males in fatty tissue trauma of the hips, gluteal area and thigh regions in general is 12:1 [23] and that the cases of female patients with MLS are also significantly more numerous. [28] It seems that the explanation lies in the very structure of the fat tissue, which is composed of adipocytes included in a connective matrix, consisting of collagen, elastic fibers and several stromal cells. In some locations of the body, such as the ones mentioned above, a subcutaneous fascia that divides the subcutaneous fatty tissue into two layers is observed.

The superficial layer presents as a compact network and is relatively constant in thickness regardless of the localization. The deep layer is looser, localized in a less structured fascial network and shows significant variations in structure and thickness from one region to another. [15] The deep fatty compartment is more developed in the abdomen, gluteal area, thighs, and it is more developed in women than in men; hence the higher frequency of the MLS in women and in these localizations. [28]

Diagnosis and differential diagnosis problems

The diagnosis is based on anamnesis, physical examination and imagistic studies. In most cases, the patient history reveals a traumatic event, usually a high-speed motor vehicle crash or a pedestrian injury [4]. In other cases, the traumatic trigger can be a sport injury or an occupational accident. Although a history of trauma is essential for the clinical assessment, some patients may not remember any traumatic event [4].

The clinical diagnosis criteria consist in the presence of a soft area, fluctuant to palpation, commonly associated with coetaneous hyperesthesia or local discomfort. Certain bruising or excoriations can suggest the shape of the traumatic agent (e.g. tire marks and friction burns suggesting dragging). Skin hypermobility over the area has also been described as a useful clinical sign for the diagnosis of MLS [20].

Some authors reported that the diagnosis of the MLS can initially be missed in one-third of the cases. Therefore, the clinician and radiologist must be aware of both their acute and chronic appearances and implications for treatment [17]. Delays between the traumatic episode and the MRI study between 3 months and 34 years have been reported [18]. Sometimes, the swelling appears within days from the traumatic injury. Some patients may present months later, after all of their injuries have healed, complaining of soft-tissue swelling or contour abnormalities that have failed to resolve [4, 6, 12].

From the histological point of view, authors were unable to find any description of possible histological modifications of the fatty tissue in MLS. Samples showed nonspecific inflammatory changes, some liponecrosis and lipophagic reaction [28].

Imaging studies are essential for the localization, characterization and diagnosis of this posttraumatic condition [19]. Typically, a plain X-ray will show only soft-tissue mass [20]. Depending on the age of the collection, the lesion appears on sonography as anechoic relative to hyperechoic mass. The mass is located anterior to the muscular layer (several hypoechoic layers that represent the muscle fibers, and hyperechoic layers that represent the fibroadipous septum) and posterior to the hypodermis (a hypoechoic layer showing as thin bands of echoes). The mass may contain fat globules that appear as hyperechoic nodules along its wall [22]. A CT exam will show a capsule surrounding the mass. In addition, it may show the localization and the exact size of the collection. The fluid level results from sedimentation of cellular blood components [7].

MRI studies show homogeneous hyperintensity on both T1- and T2-weighted MRI sequences and appear surrounded by a hypointense peripheral ring representing a fibrous capsule [19]. The signal intensity of the collection depends on its age. All these features characterize the chronic expanding hematoma [1]. The heterogeneous hyperintensity on T2-weighted sequences correlates with the existence of haemosiderin deposits, granulation tissue, necrotic debris, fibrin, and blood clots characteristic of chronic organizing hematoma. MRI studies, like the CT exam, can show a fluid level (resulted from cellular blood component sedimentation) and possibly, the surrounding capsule [18].

In conclusion, history of a traumatic event, a typical localization and MRI images can be considered as criteria in the positive diagnosis of the MLS.

In some cases seroma may develop a chronic close degloving injury making it difficult to differentiate the condition from the adipose tissue necrosis or from the hematomas associated with coagulation imbalances. Chronic lesions with slow expansion may also simulate soft tissue tumors, such as soft tissue sarcomas [10]. Imaging in these cases is of value in establishing the correct diagnosis [8]. MLS should also be distinguished from a lymphocele, which can also occur after a closed trauma. The differential diagnosis is provided by the analysis of the protein content and of the cytology of the liquid. Moreover, if conservative treatment is applied, the progress of the lymphocele is more favorable. The swelling will resolve after a few weeks without any residual deformity [21].

Evolution and treatment

With early application of compressive bandages, some closed degloving injuries may resolve without surgical intervention. However, many may persist and require more aggressive management. In other cases, the condition may develop a pseudocyst with a fibrous capsule that prevents the reabsorption of sero-sanguinous fluid. In these cases it is recommended to perform conservative therapy, such as percutaneous drainage with suction tubes and compression therapy, and if this is not sufficient (some patients may present local swelling after one year from the traumatic event, despite the successful liposuction) surgical treatment is to be considered [4].

Several studies found that in 40% of the cases, cultures taken from the collection were positive, which is why authors believe that the therapy to be considered is the early aspiration and decompression or at least during orthopaedic therapy, if necessary [12]. Others recommend the evacuation of the collection through a limited incision, irrigation of the wound, and placement of a drain if the skin is viable, and if the collection is necrotic they recommended that the wound be widely opened and the necrotic fat excised [6].

Various methods have been suggested for the treatment of these degloving areas, including aspiration, injection of sclerosing agents such as tetracycline, deep fascial fenestration, compression dressings, and prolonged closed surgical drainage [5, 6, 11, 13, 14, 16].

If the chronic collection is large and enclosed, the therapy recommended consists in complete excision of the swelling with or without cutaneo-fascial suture to obliterate the dead space [13], in an attempt to prevent the relapse [8].

Non-invasive treatment methods (serial percutaneous aspirations and suction drainage, talc or doxycycline sclerodesis) have become increasingly popular, because some clinicians consider that iatrogenic injury to the remaining subcutaneous vascular supply is minimized and overall cosmetic results are improved [6, 26].

Roncera shows that the presence or the absence of the capsule could be the key element in choosing the conservative treatment and surgical excision, because on one side it can limit the collection, but on the other side it prevents the benefits of the conservatory treatment [24].

Medico-legal implications

The posttraumatic Morel-Lavallée seroma (MLS) completes, within medico-legal traumatology, the group of closed soft tissue injuries, along with the bruise, the hematoma and the muscular contusion. Although it has first been described in the mid 19th century, the notion has only been introduced as such in the medical literature in the mid 20th century, but published studies and articles are not numerous, and even more so in the medico-legal literature, although the problems it raises are complex, both regarding the interpretation of injury mechanisms and the medico-legal evaluation of diagnostic criteria, evolution and complications.

The most frequently incriminated injury mechanism is a direct trauma with tangential impact, possibly in association with pelvic ring trauma, typically in the region of the thigh, the lower lumbar area, the gluteal area and the abdominal wall. Literature doesn't exclude the direct blunt trauma and some authors even mention injuries produced by low kinetic energy impact. Therefore, from the medico-legal point of view, the lack of history data describing a tangential impact does not exclude the diagnosis of MLS. The less frequent location in the knee is also attributed to direct impacts, more likely at high kinetic energy. Although literature connects this location with contact sports, it could be encountered in medico-legal cases, as a result of intense trauma to the knee.

It is important to emphasize that the absence of a traumatic event in the history of the case (especially in children, elderly and mentally challenged individuals) does not exclude the diagnostic of MLS.

When evaluating the age of MLS, the medico-legal expert has to take into account the fact that this post-traumatic entity manifests progressively. The clinical symptoms, most frequently represented by bruising, swelling, local pain or hyperesthesia, are usually less evident upon early external examination (one-two days after the trauma). We draw attention upon the fact that in the case presentations above, aggravation of symptomatology that lead to presentation to the physician and the medico-legal service, onset several days after the initial trauma. In fact, upon early medical examination in case no. 2 (presented above), no thigh modification was evident, while in the other two cases the aspect of the area and the local pain became more dramatic after 5-6 days.

A good correlation between the history of trauma provided by the patient, accompanying medical documents and/or by the Police, and the objective medico-legal assessment will lead to a correct appreciation of the age of the injury but also of the possible mechanisms.

Because of the small number of MLS cases and the slowly progressive evolution of MLS, the medico-legal expert will be initially tempted, especially in the absence of local swelling, to label the injury as a low severity bruising, or a haematoma.

It is to be expected that the MLS medical and medico-legal assessment be performed repeatedly, at various post-traumatic time intervals. Its evolution may be rather prolonged, with repeated presentations for medical evaluation and treatment, and implicitly for medico-legal assessment, because even after the surgical intervention, proceeded by the exhaustion of non-invasive therapeutical procedures, there can still appear the need for recuperative therapy and/or plastic surgery, in the eventuality of aesthetic prejudice.

This situation can lead to an indirect change in the medico-legal interpretation of the severity of this type of injury. Thus, an initially benign injury can be appreciated, in time, as severe, not because of immediate factors of low prognosis, but because of the prolonged healing process, including possible complications, persistence, recurrence and eventual reconstructive surgical interventions.

Despite a prompt and correct application of compressive bandages (the election method in early therapy, with good results in some cases, especially in those with small surface degloving), MLS can evolve towards chronicity, with or without encapsulation. In fact, non-invasive therapeutical methods such as serial percutaneous aspirations and suction drainage, talc or doxycycline sclerodesis can dramatically prolong the time interval between the trigger event and the surgical intervention for the removal of the pathological collection. Still, non-invasive treatment methods have become increasingly popular, for reasons mentioned above. The criteriology of this clinical attitude trend prevails, even if, from the medico-legal stand point, it involves accentuating the severity of the case.

Adding to the clinical and medico-legal problems dictated by the prolonged MLS evolution, various complications can occur, such as those of infectious nature, the skin necrosis (which may be a direct result of the trauma or a secondary ischemic effect of degloving), and the compressive phenomena with negative effects on the subjacent and/or adjacent tissues and structures. From the medico-legal perspective, establishing a causal link between the initial trauma and these delayed complications can prove difficult.

Another problematic medical issue with MLS is recurrence, sometimes despite complete excision, with or without cutaneo-fascial sutures for the obliteration of the neoformation space. Recurrence can also raise difficulties for the medico-legal expert, regarding the causal link with the initial trauma and interpretation of the case severity.

One of the main medico-legal implications of the prolonged MLS evolution, with all its therapeutic, recuperative and prognostic implications, is the influence on the juridical interpretation of the unlawful act, such as in the two medico-legal cases presented above.

In conclusion, the medico-legal expert has to take into account the fact that in some situations, traumatism to the hip, thigh and gluteal area, most likely after tangential impact, initially resulting in benign closed injuries such as bruising or haematomas, can sometimes evolve towards lesions such as the Morel-Lavallee seroma which might exhibit a prolonged evolution, with possible necrotic or infectious complications, persistence, recurrence and eventual reconstructive surgical interventions. In such cases, the prolonged and difficult evolution in time reflects the presence of injuries with higher gravity than initially foreseen.

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