



Case Report

The Morel-Lavallée lesion revisited: management in spinopelvic dissociation

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Abstract

BACKGROUND CONTEXT: The Morel-Lavallée lesion occurs from a compression and shear force that usually separates the skin and subcutaneous tissue from the underlying muscular fascia. A dead space is created that becomes filled with blood, liquefied fat, and lymphatic fluid from the shearing of vasculature and lymphatics. If not treated appropriately, these lesions can become infected, cause tissue necrosis, or form chronic seromas.

PURPOSE: To review appropriate identification and treatment of Morel-Lavallée lesions in spinopelvic dissociation patients.

STUDY DESIGN: Uncontrolled case series.

METHODS: Retrospective review of medical records. No funding was received in support of this study. The authors report no conflicts of interest.

RESULTS: We present four cases of patients with traumatic spinopelvic dissociation. All had concomitant lumbosacral Morel-Lavallée lesions. All four trauma patients suffered traumatic spinopelvic dissociation with concomitant lumbosacral Morel-Lavallée lesions. Appropriate treatment included irrigation and debridement, drainage, antibiotics, and vacuum-assisted wound closure.

CONCLUSIONS: Our series reflects an association of Morel-Lavallée lesion in spinopelvic dissociation trauma patients. Possibly, the rotatory injury that occurs at the spinopelvic junction creates a shear force to form the Morel-Lavallée lesion. When presented with a spinopelvic dissociation patient, one should be prepared to treat a Morel-Lavallée lesion. © 2013 Elsevier Inc. All rights reserved.

Keywords:

Morel-Lavallée lesion; Spinopelvic disassociation; Spine trauma; Infection

Introduction

The Morel-Lavallée lesion or closed-degloving injury was first described in 1848 by Maurice Morel-Lavallée [1]. The lesion occurs from a compression and shear force that usually separates the skin and subcutaneous tissue from the underlying muscular fascia [2]. A dead space is created

that becomes filled with blood, liquefied fat, and lymphatic fluid from the shearing of vasculature and lymphatics. If not treated appropriately, these lesions can become infected, cause tissue necrosis, or form chronic seromas.

We present four cases of patients with traumatic spinopelvic dissociation. All had concomitant lumbosacral Morel-Lavallée lesions. We propose that patients with traumatic spinopelvic dissociation may have associated Morel-Lavallée lesions. In the setting of spinopelvic dissociation where operative fixation is needed, management of overlying Morel-Lavallée lesions becomes paramount for successful treatment to help avoid surgical complications from soft-tissue compromise or infection. All patients were informed that details of their respective cases would be presented for publication and provided written consent.

FDA device/drug status: Not applicable.

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Fig. 1. Case 1: Initial trauma anteroposterior pelvis X-ray with significant pelvic trauma and concern for injury at the spinopelvic junction.

Case 1

An 18-year-old man was walking his bicycle when he was struck by a construction dump truck and dragged several hundred feet. He presented as a Level 1 trauma and had sustained significant multi-trauma injuries requiring primary right-sided hemipelvectomy for unsalvageable ischemic right lower extremity. His initial trauma pelvic X-rays are seen in Fig. 1, which shows major pelvic trauma and concern for an injury at the spinopelvic junction. Any major pelvic trauma should raise the concern for Morel-Lavallée lesions of the pelvis. On a similar note, any concern for spinopelvic trauma should raise the concern for Morel-Lavallée lesions near the spine. He underwent a series of surgeries with orthopedic, vascular, general, plastics, and urologic surgical services for the treatment of open pelvic fractures, spinopelvic dissociation, urethral disruption, bladder injury, right testicular and epididymal head injury, ligation of external iliac artery and vein, and multiple irrigation and debridements (I&D). Approximately 1 month after the patient had been injured, he

was deemed stable enough for spinopelvic fixation. He was taken to the operating room (OR) and after incision was made into the subcutaneous tissue, a large amount of purulent material was found. Further exploration showed a Morel-Lavallée lesion traveling along the right side of our midline incision as shown in Fig. 2. The wound was thoroughly irrigated and debrided and packed open with sterile gauze and sealed with Ioban. The patient was brought back to the OR on postoperative day 2 and 4 for repeat I&D with two 10 French drains placed in the Morel-Lavallée lesion and placed to low-wall suction.

His spine injury involved right and left sacroiliac joint disarticulation and a left iliac fracture, as well as a rotatory subluxation of L5 on S1 with a U-shaped sacral fracture. On postoperative day 6 from the index procedure, he underwent L2-iliac posterior spinal fusion with L5–S3 decompression and Morel-Lavallée lesion closure. The Morel-Lavallée lesion was tacked down with suture. Two drains were placed within the lesion and placed to low-wall suction. One drain was removed on Postoperative Day 3 and the other drain was removed on Postoperative Day 4 after their drain output became <30 cc per 24 hours. Fig. 3 shows the postoperative X-rays. The patient is currently 8.5 months out from his initial spine surgery without evidence of an infected spine surgical wound.

Case 2

An unrestrained 17-year-old male was involved in a motor vehicle accident. He presented as a Level 1 trauma with a traumatic amputation of the left lower extremity, open fracture of the left upper extremity with vascular injury, pelvic fractures, lumbosacral fracture, and fluid on abdominal ultrasound. He ultimately underwent exploratory laparotomy for splenic and hepatic lacerations, surgical treatment of his left upper extremity injury, and left above-knee-amputation. His spine injuries involved a left-sided spinopelvic dissociation with fracture of the left L5–S1 facet with displacement and distraction as shown in Fig. 4. Approximately 2 weeks after his initial injury, he was cleared for spinopelvic fixation. He was taken to the OR and on skin incision was found to have a left-

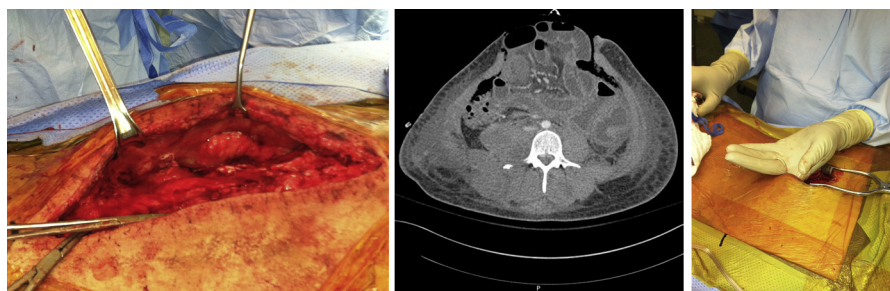


Fig. 2. Case 1: (Left) Right-sided Morel lesion with separation of the subcutaneous tissue from the underlying muscular fascia. (Middle) Axial computed tomography at L4 showing a fluid collection (Morel-Lavallée lesion) just deep to subcutaneous layer posteriorly. (Right) Right-sided Morel lesion with separation of the subcutaneous tissue from the underlying muscular fascia.



Fig. 3. Case 1: Postoperative X-ray showing L2-ilium posterior spinal fusion and instrumentation.

sided Morel-Lavallée lesion at the level of our incision. There was no obvious sign of infection, so the patient underwent L5-ilium posterior spinal fusion and instrumentation as shown in Fig. 5. The Morel-Lavallée lesion was tacked down with suture, and two drains were placed within the lesion and placed to low-wall suction. One drain was removed on postoperative day 3 and the other drain was removed on postoperative day 4, after their drain outputs

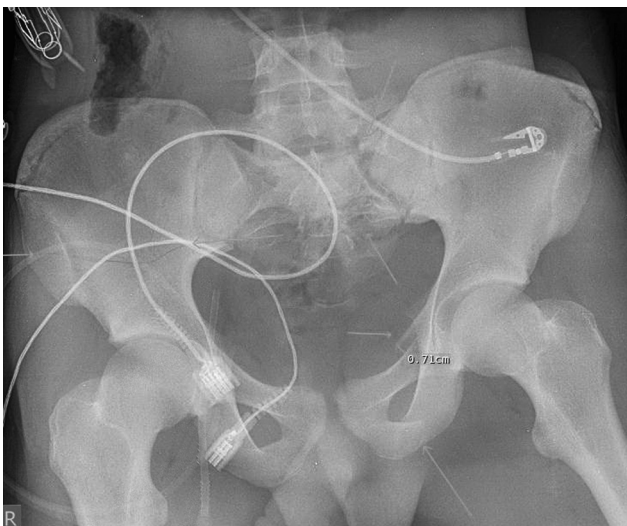


Fig. 4. Case 2: Initial anteroposterior pelvis X-rays showing vertically unstable L pelvis with left L5/S1 facet fracture/dislocation.

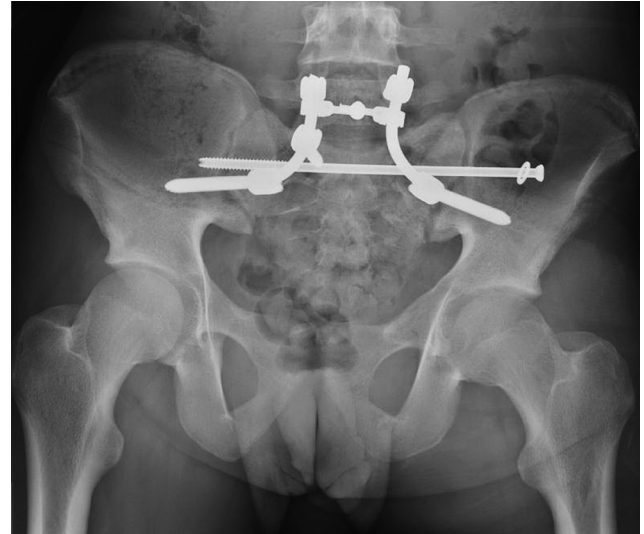


Fig. 5. Case 2: Postoperative X-ray showing L5-ilium posterior spinal fusion and instrumentation with trans-sacral screw.

became <30 cc per 24 hours. The patient is approximately 6 months postoperative without obvious signs of an infected spine surgical wound.

Case 3

A 58-year-old man who presented as a Level 2 trauma was involved in a tractor rollover and sustained multiple pelvic fractures. He was found to have a left L5/S1 fracture dislocation, as seen in Figs. 6 and 7. He was taken to the OR approximately 1 week after his initial injury for L4-ilium posterior spinal fusion and instrumentation with left sacroiliac screw as shown in Fig. 8. The Morel-Lavallée lesion was located to the right of midline and thoroughly



Fig. 6. Case 3: Initial trauma anteroposterior pelvis X-ray showing left L5/S1 fracture/dislocation with extension into sacrum and bilateral superior/inferior rami fractures.



Fig. 7. Case 3: Coronal computed tomography shows left L5–S1 fracture dislocation with complete extension through the sacrum.

irrigated with no drain placement within the Morel-Lavallée lesion. During this surgery, a single 10-french sub-fascial drain was placed. On postoperative day 3 from the index spine procedure, the patient began having significant amounts of drainage from his spine incision, with fevers up to 103 and boggy skin about the incision. He returned to OR for I&D. At this time, two 10-french drains were placed sub-fascially and two placed in the Morel-Lavallée lesion. His intraoperative cultures grew pan-sensitive enterobacter cloacae that were treated with long-term intravenous antibiotics (vancomycin and ertapenem). On postoperative day 7 from the index procedure, the patient continued to have fevers and returned to OR for a repeat I&D with one 15-french drain placed in the Morel-Lavallée lesion. All drains placed in the Morel-Lavallée lesion were placed to low-wall suction and removed after the drain output was <30 cc in 24 hours. The patient developed a partial wound dehiscence that was treated with wound vacuum-assisted closure (VAC). Ultimately, he developed a 10×4 cm sacral wound and underwent I&D and complex closure with the plastic surgery service approximately 3 months later. Two



Fig. 8. Case 3: Postoperative X-ray showing L4-ilium posterior fusion and instrumentation with left sacroiliac screw.

and a half weeks after this procedure, he presented with purulent drainage and returned to the OR with the plastic surgery service for I&D and treatment with a VAC for secondary closure. On most recent follow-up, approximately 7 months after the initial injury, the patient has a sacral wound that is slowing healing by secondary intention with VAC therapy. He has recently stopped his antibiotics with no subsequent signs of infection at this time.



Fig. 9. Case 4: Initial anteroposterior pelvis X-ray demonstrating the lumbo-pelvic dissociation and pelvic ring and acetabular injuries.

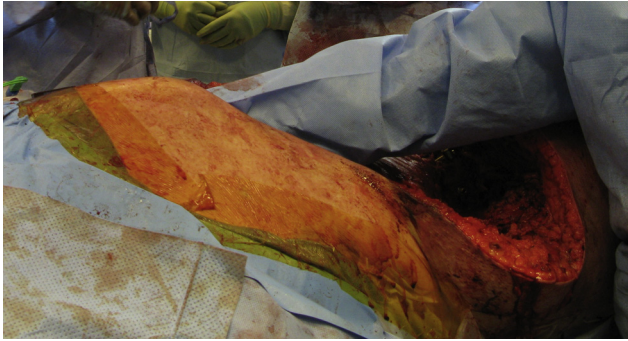


Fig. 10. Case 4: Intraoperative extension of the Morel lesion to the upper thoracic spine with the surgeons hand in the lesion.

Case 4

A 29-year-old woman was transferred to our Level 1 trauma center from another hospital as a pedestrian struck by a train. As shown in Fig. 9, she sustained lumbopelvic dissociation. She had multiple other injuries including L1 compression fracture, multiple rib fractures, scapula fracture, renal and splenic lacerations, and a closed head injury. Her posterior skin was noted to be de-vascularized over her sacrum and had a large Morel-Lavallée lesion that extended to her thoracic spine as shown in Fig. 10. She had a complicated hospital course that included rhabdomyolysis, splenectomy, and nephrectomy. She first underwent soft-tissue resection of the necrotic posterior skin and debridement of the Morel-Lavallée lesion as shown in Fig. 11. This was followed by spinopelvic fixation and anterior ring fixation as shown in Fig. 12. Her posterior skin coverage was a substantial problem throughout her course and required multiple I&D operations with VAC exchanges. Plastic surgeons were able to cover the area with a split thickness graft after two and a half months of wound management. Unfortunately,

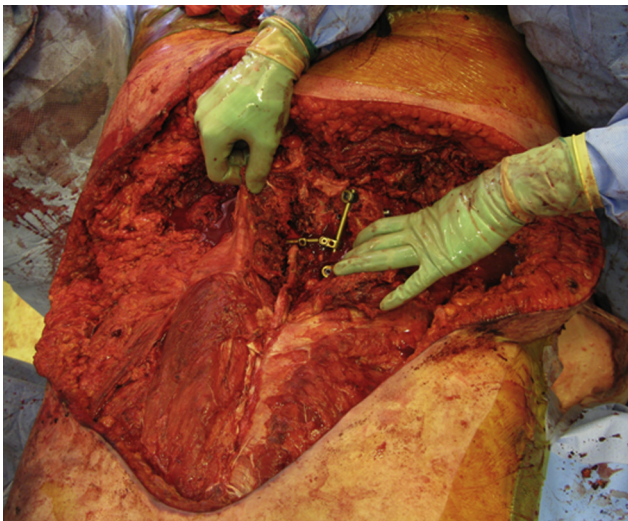


Fig. 11. Case 4: After debridement of the Morel lesion demonstrating the extensive soft-tissue damage and loss, note the spinal fixation in the distal portion of the wound.



Fig. 12. Case 4: Postoperative X-ray showing L3-ilium posterior spinal fusion and instrumentation with pelvic fixation.

she has gone on to develop a chronic draining sinus and has had her instrumentation removed to help eradicate the infection (Fig. 13). Plastic surgeons have been unable to achieve durable soft-tissue coverage for the posterior sacrum due to traumatic embolization of the gluteal arteries and the significant soft-tissue trauma. She remains ambulatory but has significant pelvic pain. Further spinopelvic stabilization is not possible until soft-tissue coverage can be achieved.

Discussion

The incidence of Morel-Lavallée lesions is often described in the literature in pelvic trauma cases where the incidence is about 8.3% but may be higher when including subclinical lesions [3]. Given that spinopelvic dissociation



Fig. 13. Case 4: Anteroposterior pelvic X-ray after debridement and removal of spinal instrumentation.

and pelvic trauma occur due to major trauma, these injuries may occur within the same trauma patient. We were unable to locate any literature to support which injury should be prioritized concerning patient outcomes; however, in our experience, these poly-trauma patients are initially stabilized medically and managed with a pelvic external fixator, if needed. Once final pelvic fixation has been performed, the patient may be appropriately positioned for posterior spinal surgery. Spinal precautions are maintained throughout this time by placing the patient on bed rest and log-rolling the patient. Given that our report suggests spinopelvic dissociation patients have concurrent Morel-Lavallée lesions, final spinal fixation is not a viable option until this lesion has been treated. During this time, pelvic fixation may be accomplished. Ultimately, a discussion with the trauma general surgery team, orthopedic traumatologists, and spine surgeons must be coordinated to discuss the best management options for any particular patient.

Diagnosis of a Morel-Lavallée lesion can be assisted by computed tomography or ultrasound; however, magnetic resonance imaging is the modality of choice [4]. In our case series, we were able to retrospectively identify the Morel-Lavallée lesion as a fluid collection in the subcutaneous region on computed tomography imaging obtained on their initial trauma images. These fluid collections can be subtle and sometimes difficult to interpret with the large pelvic trauma associated with these injuries. Given the data presented in this case series, we now actively look for these fluid collections or possible Morel-Lavallée lesions when spinopelvic dissociation patients are encountered. More importantly, a Morel-Lavallée lesion is primarily a clinical diagnosis. The skin may have signs of obvious shear injury from road rash or tire treads, and there will be a fluctuant boggy mass under the skin. Often the skin may have large areas of bruising, and patients may report decreased sensation over this area as well. If treatment is delayed, the resultant collection of fluid can become encapsulated by granulation tissue, which has the potential to form a fibrous pseudocapsule. Once formed, the pseudocyst prevents reabsorption of the serosanguinous fluid and may lead to a chronic Morel-Lavallée lesion [5]. A high index of suspicion must be kept by the operative surgeon for Morel-Lavallée lesions as up to a third of patients are undiagnosed at initial presentation [6].

The rate of complications increases in patients with Morel-Lavallée lesions. Suzuki et al. treated 20 vertically unstable sacral fractures with operative fixation; they included five patients with Morel-Lavallée lesions. Of the 20 patients, two had postoperative infections of which both had Morel-Lavallée lesions [7]. Given that 11 of 24 (46%) Morel-Lavallée lesions that were treated by Hak et al. had positive cultures, many have treated these lesions aggressively with I&D [8]. Additionally, they found the time to OR did not relate to positive cultures as the average time to OR was 13.7 days (range, 4–32 days) in patients with negative cultures and 12.5 days (range, 2–60 days) in patients with positive cultures. Often, these cases

involve polytrauma patients who have more pressing life-threatening injuries that prevent them from urgent surgical intervention for treatment of their Morel-Lavallée lesions.

There are examples of conservative management of Morel-Lavallée lesions that include aspiration or compressive wraps [9]. Carlson et al. demonstrated that nonoperative observation in patients without an underlying fracture generally results in spontaneous resolution of the lesion, usually without necrosis of the skin [10]. However, given the increased risk of infection, successful management by this means is dependent on multiple factors, including size of the Morel-Lavallée lesion, other wounds within close proximity, the amount of volume pressure on the skin, as well as the need for surgical fixation with hardware.

Surgical management includes some form of I&D, whether through two small incisions at the proximal and distal aspect of the lesion or through a larger incision traversing the length of the fluid collection. Often, multiple debridements are performed using drains or VAC, followed by closure of the Morel-Lavallée lesion by either suturing the subcutaneous tissue to the underlying fascia or using a sclerotic agent or adhesive [11–13]. Carlson et al. treated 22 patients with Morel-Lavallée lesions with surgical management that entailed making a longitudinal incision along the length of the lesion, evacuation of fluid, curetting or rongeur-ing the underlying soft tissue back to viable tissue, irrigation via pulsatile lavage, treatment of fracture (if present), drain placement (lasting 2–5 days for acute and several weeks for chronic Morel-Lavallée lesions), and then wound closure. This technique resulted in no infections or re-accumulation of fluid; however, two patients had marginal flap necrosis [10]. This is one potential surgical treatment strategy when dealing with a Morel-Lavallée lesion. Tornetta et al. described making two small incisions at the proximal and distal aspect of the Morel-Lavallée lesion and using a scrub brush and irrigation to debride the lesion. They placed two JP drains in the Morel-Lavallée lesion and applied them to low-wall suction and removed them when the output was <30 cc/24 hours [14].

Our case series reflects an association between Morel-Lavallée lesions and spinopelvic dissociation trauma patients. High-energy mechanisms of pelvic injury are associated with Morel-Lavallée lesions due to the shearing force they create. Similarly, we have found an association between spinopelvic injury and Morel-Lavallée lesions. Our opinion is that the additional rotatory mechanism in spinopelvic dissociation may play a contributory role in creating a shear force at the spinopelvic junction to further create the Morel-Lavallée lesion. When presented with a spinopelvic dissociation patient, one should be prepared to treat a Morel-Lavallée lesion. If initial exposure of the Morel-Lavallée lesion does not show obvious signs of infection, we believe that thorough I&D with surgical fixation may be performed. Two drains should be placed in the Morel-Lavallée lesion and placed to low-wall suction until the drain output is <30 cc per 24 hours. Additionally, the Morel-Lavallée lesion should be tacked down with suture

to the underlying fascia to help close this dead space. Furthermore, in this high-risk wound, vancomycin powder and incisional VAC therapy may be an appropriate adjunct. If the Morel-Lavallée lesion has signs of infection or is significantly compromised, multiple I&Ds may be warranted before definitive surgical fixation. We believe appropriate identification and treatment of Morel-Lavallée lesions in spinopelvic dissociation patients yields the highest probability of successful treatment of their injury.

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