Morel-Lavallée lesions: a phenomenon in cats? Case report and review of the literature

Authors: McGhie, Jayne A, Gibson, Ian D, and Herndon, Aaron M

Source: Journal of Feline Medicine and Surgery Open Reports, 4(1)

Published By: SAGE Publishing

URL: https://doi.org/10.1177/2055116918774469

Case Report

jfms OPEN REPORTS

Journal of Feline Medicine and Surgery Open Reports
1–5

DOI: 10.1177/2055116918774469
journals.sagepub.com/home/jfmsopenreports

This paper was handled and processed by the European Editorial Office (ISFM) for publication in *JFMS Open Reports*

SAGE

Morel-Lavallée lesions: a phenomenon in cats? Case report and review of the literature

Jayne A McGhie, Ian D Gibson and Aaron M Herndon

Abstract

Case summary A 3-year-old male neutered domestic shorthair cat sustained a severe sacrococcygeal luxation post-motor vehicle trauma. Six days post-trauma, a fluid-filled swelling was noticed over the caudoventral abdomen and inguinal regions. Needle aspiration, closed suction drain placement and debridement with subcutaneous tacking were all attempted but failed to resolve the continued accumulation of serosanguinous lymphocyte-rich fluid in the subcutaneous pocket. Clinical resolution was ultimately achieved after surgical debridement and omentalisation of the lesion.

Relevance and novel information Morel-Lavallée lesions are post-trauma closed soft tissue degloving injuries described infrequently in people. The avulsion of subcutaneous tissue from deep muscle fascia results in the accumulation of haemolymph and necrotic fat, which can persist for several days to months after the inciting incident. In people, they are commonly seen in the proximal thigh. This article proposes the existence of Morel-Lavallée lesions in cats.

Accepted: 14 March 2018

Introduction

Morel-Lavallée lesions (MLLs) were first described by French physician Maurice Morel-Lavallée in 1863.[1] The lesions are characterised as haemolymphatic fluid accumulation between the fascial planes of the proximal thigh that develops post-soft tissue injury.[2–4] Uncommon in people, MLLs are described as a closed degloving injury commonly associated with high-energy trauma and shearing forces.[3–5] MLLs are also described as post-traumatic cyst or pseudocyst, or chronic expanding haematomas.[2,6] The lesion typically originates from shearing injuries involving separation of the hypodermis from the deeper fascial layers, disrupting capillary and lymphatic vessels, and creating a hypovascular suprafascial space in which haemolymph or blood readily accumulates. Chronic inflammation results in the formation of a fluid-filled fibrous capsule that can persist for weeks to months.[2]

In the veterinary literature, references to Morel-Lavallée-like lesions are limited to a single case report. Togni et al made reference to MLLs in connection to a chronic expanding haematoma in a cat following a traumatic intramuscular injection into the proximal right pelvic limb.[7] Post-traumatic inguinal seromas have been described in a case series in cats, involving surgical intervention in four cases,[8] but reference to MLLs was not made. Herein, we describe a Morel-Lavallée-like lesion in a cat and hypothesise that these lesions occur in cats post-traumatic soft tissue injury.

Case description

A 3-year-old male neutered domestic shorthair cat was referred to The University of Queensland Small Animal Hospital within 24 h of a crushing injury from a

School of Veterinary Science, The University of Queensland, Gatton, QLD, Australia

Corresponding author:
Jayne A McGhie BVSc, MANZCVS, DACVS-SA, Senior Lecturer – Small Animal Surgery, School of Veterinary Science, Building 8114, University of Queensland Gatton Campus, Gatton, QLD 4343, Australia
Email: j.mcghie@uq.edu.au

Table 1 Subcutaneous fluid analysis

	Days post-trauma			
	6	9	13	42
Red blood cells ($\times 10^{12}$/l)	57	30.9	<0.1	<0.1
Protein (g/l)	34	33	26	26
Nucleated cells ($\times 10^{12}$/l)	13.5	5.8	<0.01	<0.01
Segmented neutrophils (%)	69	34	10	8
Macrophages (%)	10	Rare	10	8
Lymphocytes (%)	21	64	80	84

slow-moving motor vehicle. Severe bruising and oedema was evident over the caudoventral abdomen and inguinal regions. Pelvic radiographs revealed a severe sacrococcygeal luxation. A mildly regenerative but significant anaemia (haematocrit 17%; red blood cell count 3.54 $\times 10^{12}$/l [reference interval 5.00–10.0 $\times 10^{12}$/l]; haemaglobin 54 g/l (reference interval 80–150 g/l) was identified and treated successfully with two units of whole blood. Once clinically stable, the cat underwent tail amputation at the level of the tail base. Evidence of a lower motor neuron bladder persisted postoperatively and was managed by bladder expression. By day 6 post-admission, subcutaneous bruising had progressed on the ventral abdomen and evidence of free fluid accumulation in the ventral abdominal and inguinal regions became apparent. Ultrasound revealed a large volume of free, mildly echogenic fluid in the caudoventral, inguinal and perineal regions. The subcutaneous fat was irregular and mildly hyperechoic. Aspiration of the subcutaneous fluid revealed suppurative inflammation with rare intracellular and extracellular bacterial rods, and a disproportionately high percentage of lymphocytes (Table 1). The cat was bright and afebrile. Amoxicillin clavulanate at 15 mg/kg q12h was commenced pending aerobic and anaerobic culture, which failed to yield bacterial growth.

A 10 Fr silicone closed-suction drain (Cardinal Health Jackson-Pratt Hemaduct JP-HUR101) was placed via percutaneous stab incision into the fluid pocket and >250 ml serosanguinous fluid was removed. Over the next 10 days, fluid production in the caudoventral abdomen and inguinal region remained persistent at 10–15 ml/kg/day. Repeat cytology and aerobic and anaerobic culture of the fluid was performed at 3 and 10 days post-drain placement (Table 1). The fluid was repeatedly characterised as a modified transudate consistent with lymphatic effusion. No microorganisms were observed and cultures were negative. Production from the closed-suction drain continued at 10–15 ml/kg/day until day 19, when accidental drain removal occurred. Ultrasound of the right inguinal region identified heterogeneous fat and a mildly enlarged inguinal lymph node. Fluid accumulated in the inguinal area over the following 2 days. Surgical exploration of the right inguinal region identified an inguinal hernia with inflamed omentum and yellow swollen vaginal process remnants identified in the inguinal ring. Non-viable tissue was debrided and the inguinal hernia repaired with 2/0 polydioxanone suture in a cruciate pattern. A 10 Fr haemaduct closed-suction drain (Cardinal Health Jackson-Pratt Hemaduct JP-HUR101) was placed before routine subcutaneous and skin closure. Again, tissue culture was negative for microbial growth.

Serosanguinous lymphocyte-rich fluid production from the region continued at 10–15 ml/kg/day over the next 7 days until the cat dislodged the drain. Over the next 2 days, fluid again began to accumulate in the caudoventral abdomen and inguinal areas. A firm, non-painful tubular mass was evident in the right inguinal area. On ultrasound, this mass was consistent with inflamed fat. Surgical exploration of the caudoventral abdominal region was performed on day 30 post-initial trauma. A large, open pocket with a smooth, shiny capsule lining extended over the entire caudoventral abdominal wall, down both inguinal areas, extending past the level of the stifle on the right. The lining was meticulously debrided. There was evidence of re-herniation of fat through the right inguinal ring. A caudal coeliotomy was performed to identify bladder and ureters. The herniated right lateral ligament of the bladder was examined for viability and reduced into the abdomen. The hernia was repaired with 2/0 non-absorbable nylon in a horizontal mattress pattern. Tacking sutures of 3/0 polydioxanone were used throughout the caudal abdominal and inguinal subcutaneous pocket to reduce dead space and a 10 Fr haemaduct closed-suction drain was placed (Cardinal Health Jackson-Pratt Hemaduct JP-HUR101).

Histopathology from the capsular lining revealed dense bands of connective tissue with extensive areas of granulomatous and lymphoplasmacytic inflammation (aggregates of neutrophils, epithelioid macrophages, lymphocytes and plasma cells often rimmed by dense bands of fibrocytes). No microorganisms, mesothelial or neoplastic cells were identified.

Lymphocyte-rich serosanguinous fluid production continued until inadvertent drain removal 2 days post-operatively. Repeated application of light-compression bandages over the pelvic limbs and caudal abdomen were attempted to prevent re-accumulation of subcutaneous fluid; however, they were not tolerated well by the cat and were difficult to maintain in position. Fluid accumulation persisted and was managed with intermittent percutaneous aspiration using a standard aseptic technique.

Forty-four days post-admission to hospital, the cat was returned for surgery owing to persistent fluid accumulation. The capsule lining of the subcutaneous pocket had reformed and was again meticulously debrided. The inguinal lymph node and all remaining subcutaneous fat in the right inguinal area were excised. An omental flap was created and passed through the right caudal abdominal wall into the caudal abdominal and inguinal regions of the subcutaneous pocket and secured in situ with 3/0 polydioxanone tacking sutures before routine skin and subcutaneous closure. Histopathology on the capsule lining was again consistent with granulomatous and lymphoplasmacytic inflammation with aggregates of lymphocytes and plasma cells. Small granulomas of multinucleated giant cells occasionally contained irregular shards of blue–grey-to-clear foreign material, 20–100 µmin length, identified as suture fragments.

Immediately postoperatively, a moderate accumulation of fluid was identified over the ventral abdomen and right inguinal region. This resolved over the following week without further intervention. Medical management after each surgery included a combination of methadone (0.3 mg/kg SC q6h), buprenorphine (5 µg/h transdermal patch), gabapentin (10 µg/kg PO q8h) and meloxicam (0.1 mg/kg PO q24h).

The cat was discharged from hospital on day 65 post-admission. Six months after discharge from hospital, the owner reported the cat to have normal activity levels with no evidence of recurrence of ventral abdominal swelling or discomfort.

Discussion

MLLs are post-trauma, closed, soft-tissue degloving injuries described infrequently in people and, as a result, are often not diagnosed in the acute phase of development.[4] Lesions are the result of low- or high-energy shearing injuries that cause separation of the more mobile hypodermis from the immobile deep fascia. Separation of the tissues results in a potential space that initially fills with blood, fat and necrotic debris. Untreated, the blood is reabsorbed and replaced by serosanguinous lymphatic fluid (haemolymph) resulting in a sustained inflammatory reaction, leading to formation of a fibrinous capsule around the fluid.[4,6] Diagnosis is made based on a history of trauma, physical examination, lesion distribution and diagnostic imaging (ultrasound, CT and MRI). Lesions in people have been well characterised on MRI, based on shape and signal intensity.[9]

MLLs occur predominantly in people in their thirties and forties, but they are also reported in children and older adults.[10–12] They are frequently reported in conjunction with sporting injuries.[13–19] The true incidence of MLLs in people is unknown, with a reported 1.7% of patients with pelvic fractures found to have concomitant MLLs.[20]

The diagnosis in humans is often missed or delayed, which can lead to persistent pain, infection, haemorrhage and patient morbidity.[5] Various treatments have been proven successful in human cases, with treatment choice often dependent upon lesion chronicity and patient compliance.[6,21] Conservative treatment options for acute lesions include compression bandaging and rest, with or without repeat aspiration.[6,22] Surgical options include debridement of necrotic fat and capsular resection (via open or minimally invasive techniques,[23–27] with adjunctive use of quilting sutures,[28] sclerosing agents,[2,29,30] or synthetic or fibrin glue application[12,31,32]). In chronic cases, surgical intervention has been shown to be more successful than conservative therapy, with recurrence related to non-compliance with compressive dressings post-treatment.[33] In all reported human cases in the literature, compressive bandaging post-treatment was utilised.

In this cat, the lesion was not detected for 6 days. Ultrasound was performed to characterise the lesion, and supported by repeat fluid analysis. Percutaneous aspiration and repeated closed-suction drain placement were not successful. Surgical debridement and tacking suture placement to eliminate dead space was also unsuccessful. Compressive bandage applications post-drain removal and surgery were unsuccessful owing to the anatomical location and poor tolerance by the cat. The use of an omental flap to provide drainage, vascular supply and promote adhesion formation is well recognised in veterinary medicine for use in chronic 'non-healing' cutaneous wounds in cats.[34,35]

In this case, an inguinal hernia was noted during the first surgery and repaired. Re-herniation was evident during the second surgery (9 days after the first) and was again repaired. While we are unable to state that the presence of the inguinal hernia did not contribute to the persistent lymph-rich fluid accumulation, definitive repair of the hernia in the second surgery did not impact or resolve the constant inguinal fluid production. In this cat, open debridement of the capsule, necrotic fat and removal of the lymph node in combination with omentalisation resulted in resolution of the persistent accumulation of haemolymph. Removal of the lymph node itself may have contributed significantly to reduction of the lymph rich effusion.

The subdermal plexus is the major vascular supply to the skin, but the orientation of the vessels is notably different between people and dogs and cats.[36] Humans have perforator musculocutaneous and direct cutaneous vessels running perpendicular to the skin. This may make them more prone to damage by shearing forces, in comparison to cats and dogs, where the direct cutaneous arteries of the hypodermis travel parallel to the skin surface.[36] Indolent pockets (collagen-lined pockets that accumulate modified transudate) are recorded to occur postoperatively in cats where the subcutis has been damaged or extensively resected. Deficits in the subcutis result in delayed wound healing in cats.[37] Cats are reported to have a higher percentage of perforate arteries than dogs, as well as the absence of a panniculus muscle and minimal subcuticular tissue in the region of the inguinal area. This combined with the fact that cats' skin is, in general, more mobile than in dogs, may make them more prone to this type of injury.[7,37]

The Charlesworth and Moores case series of seven cats with post-trauma inguinal seroma formation provides a very similar clinical presentation to the cat in this report.[8] Locations reported included cadoventral abdominal wall (1/7) and inguinal regions (6/7). This is not dissimilar to people, where 86% are associated with the greater trochanter/hip, pelvis, thigh or knee.[2] In the cases of Charlesworth and Moores,[8] complete fluid analysis (including cytological evaluation) and histopathology were not recorded in each case. In 2/7 cases, histopathology on the inguinal fat revealed lipogranulomatous inflammation and fibrosis or steatitis. It is therefore difficult to know if these represent similar lesions to the one described in this report. In the case reported here, repeated fluid analysis confirmed lymph-rich, modified transudate accumulation, and histopathology confirmed a fibrous inflammatory capsule lining the caudoventral and inguinal fluid pocket. These findings are consistent with MLLs in people.

The reported rare intracellular and extracellular bacterial rods were only observed in the first aspirated fluid sample from this cat. Microbacterial involvement was not supported at any time point by positive bacterial culture. It is possible that the bacteria may have been sequestered within the spermatic cord remnant post-castration in this young male cat, subsequently being released at the time of trauma.[38,39] Alternatively, they may have been present as a result of haematogenous spread as no penetrating wounds were present in the vicinity of the fluid pocket.

Conclusions

MLLs are a recognised post-trauma clinical presentation in people, characterised by a protracted period of haemolymph accumulation within a subcuticular space created by traumatic avulsion of the skin and subcutis from the underlying deep fascia. These lesions are commonly reported in the pelvic and upper-leg regions. Herein, we report a cat with a non-resolving serosanguinous lymph-rich fluid accumulation below the hypodermis in the caudal abdomen and inguinal region post-trauma requiring multiple interventions prior to resolution. The findings of this case are supportive of the hypothesis that MLLs may be a clinical syndrome in cats.

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

Funding The authors received no financial support for the research, authorship, and/or publication of this article.

References

1 Morel-Lavallee M. **Decollements traumatiques de la peau et des couches sousjacentes**. *Arch Gen Med* 1963; 1: 30–38.
2 Bonilla-Yoon I, Masih S, Patel DB, et al. **The Morel-Lavallee lesion: pathophysiology, clinical presentation, imaging features, and treatment options**. *Emerg Radiol* 2014; 21: 35–43.
3 Scolaro JA, Chao T and Zamorano DP. **The Morel-Lavallée lesion: diagnosis and management**. *J Am Acad Orthop Surg* 2016; 24: 667–672.
4 Diviti S, Gupta N, Hooda K, et al. **Morel-Lavallee lesions – review of pathophysiology, clinical findings, imaging findings and management**. *J Clin Diagn Res* 2017; 11: TE01–TE04.
5 Jalota L, Ukaigwe A and Jain S. **Diagnosis and management of closed internal degloving injuries: the Morel-Lavallee lesion**. *J Emerg Med* 2015; 49: e1–e4.
6 Greenhill D, Haydel C and Rehman S. **Management of the Morel-Lavallée lesion**. *Orthop Clin North Am* 2016; 47: 115–125.
7 Togni A, Sievert C, Hurter K, et al. **Chronic expanding haematoma in a cat**. *J Feline Med Surg* 2015; 17: 733–736.
8 Charlesworth TM and Moores AL. **Post-trauma inguinal seroma formation in the cat**. *J Small Anim Pract* 2012; 53: 301–303.
9 Mellado JM and Bencardino JT. **Morel-Lavallée lesion: review with emphasis on MR imaging**. *Magn Reson Imaging Clin N Am* 2005; 13: 775–782.
10 Rha EY, Kim DH, Kwon H, et al. **Morel-Lavallée lesion in children**. *World J Emerg Surg* 2013; 8: 60.
11 Shelley J, Noritake A, Ortiz K, et al. **Morel-Lavallee lesion in pediatric trauma**. *Pediatr Surg Int* 2017; 33: 921–924.
12 Jones RM and Hart AM. **Surgical treatment of a Morel-Lavallée lesion of the distal thigh with the use of lymphatic mapping and fibrin sealant**. *J Plast Reconstr Aesthet Surg* 2012; 65: 1589–1591.
13 Kumar Y, Hooda K, Lo L, et al. **Morel-Lavallée lesion: a case of an American football injury**. *Conn Med* 2015; 79: 477–478.
14 Khodaee M, Deu RS, Mathern S, et al. **Morel-Lavallée lesion in sports**. *Curr Sports Med Rep* 2016; 15: 417–422.
15 Anakwenze OA, Trivedi V, Goodman AM, et al. **Concealed degloving injury (the Morel-Lavallée lesion) in child-**

hood sports: a case report. *J Bone Joint Surg Am* 2011; 93: e148.
16 Matava MJ, Ellis E, Shah NR, et al. **Morel-lavallée lesion in a professional american football player**. *Am J Orthop (Belle Mead NJ)* 2010; 39: 144–147.
17 Tejwani SG, Cohen SB and Bradley JP. **Management of Morel-Lavallee lesion of the knee: twenty-seven cases in the national football league**. *Am J Sports Med* 2007; 35: 1162–1167.
18 Vopat BG, Wong JE, Hazzard S, et al. **Encapsulated fat necrosis lesion caused by Morel-Lavallée lesion in a professional ice hockey player**. *Am J Orthop (Belle Mead, NJ)* 2017; 46: E144–e7.
19 Depaoli R, Canepari E, Bortolotto C, et al. **Morel-Lavallée lesion of the knee in a soccer player**. *J Ultrasound* 2015; 18: 87–89.
20 Tseng S and Tornetta P, 3rd. **Percutaneous management of Morel-Lavallee lesions**. *J Bone Joint Surg Am* 2006; 88: 92–96.
21 Dawre S, Lamba S, Sreekar H, et al. **The Morel-Lavallee lesion: a review and a proposed algorithmic approach**. *Eur J Plast Surg* 2012; 35: 489–494.
22 Costopoulos CL, Sachs IC, Graf KW, et al. **Lower limb Morel-Lavallée lesion treated with short-stretch compression bandaging**. *Am J Orthop (Belle Mead, NJ)* 2017; 46: E213–E218.
23 Gardner P, Flis D and Chaiyasate K. **Utilization of liposuction for delayed Morel-Lavallée lesion: a case report and review**. *Case Rep Surg* 2017; 2017: 8120587.
24 Kim S. **Endoscopic treatment of Morel-Lavallee lesion**. *Injury* 2016; 47: 1064–1066.
25 Shook J, Riester J, Neltner K, et al. **The case files: endoscopic management of Morel-Lavallée lesion**. *Emerg Med News* 2013; 35.
26 Walls A, McMahon SE, MacDonald J, et al. **Endoscopic surgical management of a large Morel-Lavallée lesion.** *BMJ Case Rep* 2017; 2017: DOI: 10.1136/bcr-2017-221343.
27 Mettu R, Surath HV, Chayam HR, et al. **Chronic Morel-Lavallée lesion: a novel minimally invasive method of treatment**. *Wounds* 2016; 28: 404–407.
28 Seo BF, Kang IS, Jeong YJ, et al. **A huge Morel-Lavallée lesion treated using a quilting suture method: a case report and review of the literature**. *Int J Low Extrem Wounds* 2014; 13: 147–151.
29 Bansal A, Bhatia N, Singh A, et al. **Doxycycline sclerodesis as a treatment option for persistent Morel-Lavallée lesions**. *Injury* 2013; 44: 66–69.
30 Isaacson AJ and Stavas JM. **Image-guided drainage and sclerodesis of a Morel-Lavallee lesion**. *J Vasc Interv Radiol* 2013; 24: 605–606.
31 Demirel M, Dereboy F, Ozturk A, et al. **Morel-Lavallee lesion. Results of surgical drainage with the use of synthetic glue**. *Saudi Med J* 2007; 28: 65–67.
32 Koc BB, Somorjai N, P M Kiesouw E, et al. **Endoscopic debridement and fibrin glue injection of a chronic Morel-Lavallée lesion of the knee in a professional soccer player: a case report and literature review**. *Knee* 2017; 24: 144–148.
33 Shen C, Peng JP and Chen XD. **Efficacy of treatment in peri-pelvic Morel-Lavallee lesion: a systematic review of the literature**. *Arch Orthop Trauma Surg* 2013; 133: 635–640.
34 Lascelles DBX, Davison L, Dunning M, et al. **Use of omental pedicle grafts in the management of non-healing axillary wound in 10 cats**. *J Small Anim Pract* 1998; 39: 475–480.
35 Gray MG. **Chronic axillary wound repair in a cat with omentalisation and omocervical skin flap**. *J Small Anim Pract* 2005; 46: 499–503.
36 Pavletic M. Atlas of small animal wound management and reconstructive surgery. 3rd ed. St Louis, MO: WB Saunders, 2010.
37 Bohling MW. **Wound Healing**. In: Langley-Hobbs SJ, Demetriou J and Ladlow J (eds). *Feline solft tissue and general surgery*. UK: Elsevier-Saunders, 2014.
38 Smeak DD. **Spay and castration complications – all preventable!** http://www.spayneuterconference.com/wp-content/uploads/2014/08/spay_neuter_problems_smeak.pdf (2014, accessed April 17, 2018).
39 Pedersen NC. Feline husbandry: diseases and management in the multiple cat environment. Goleta, GA: California American Veterinary Publications, 1991.