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Case Report

Recurrence of symptoms may indicate the presence of a Morel-Lavallée lesion of the knee: A case report and literature review☆

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ABSTRACT

Case: An 81 year old male with four failed aspirations presented with recurrent knee swelling following irrigation and debridement, which suggested the presence of a Morel-Lavallée lesion (MLL). This diagnosis was intraoperatively confirmed by separation of the tissue layers forming a space with accumulated fluid. Treatment consisted of doxycycline sclerodesis and tight closure of the tissue layers. The patient had a satisfactory outcome at 4 months.

Conclusion: Resolution of Morel-Lavallée lesions requires prompt recognition and appropriate treatment. In the presence of a different diagnosis, recurrence of symptoms following treatment may indicate an MLL. Surgical treatment with doxycycline sclerodesis resulted in resolution of symptoms.

Introduction

The Morel-Lavallée lesion (MLL) is a rare internal degloving injury which commonly occurs due to high energy mechanisms. Shearing forces create a space between the subdermal adipose and the deep fascia. The vascular and lymphatic vessels which traverse the subcutaneous layers are disrupted which leads to a collection of hemolymphatic fluid within this space. If not promptly identified and treated, there is increased risk of tissue necrosis and bacterial colonization.

Treatment will be determined based on the severity and chronicity of symptoms. If conservative treatment with compressive wrap or cryotherapy is unsuccessful, serial aspiration or sclerodesis can be performed. The intent of surgical treatment is to evacuate the accumulated contents, prevent continued flow, and restore continuity to the tissue layers.

We present a rare case of MLL of the knee resulting from a low energy fall which was treated with doxycycline scleroderma. Additionally, we review the recent literature on MLL of the knee to describe the spectrum of injury mechanisms and novel treatment modalities.

☆ Investigation performed at Larkin Hospital Department of Orthopaedic Surgery.

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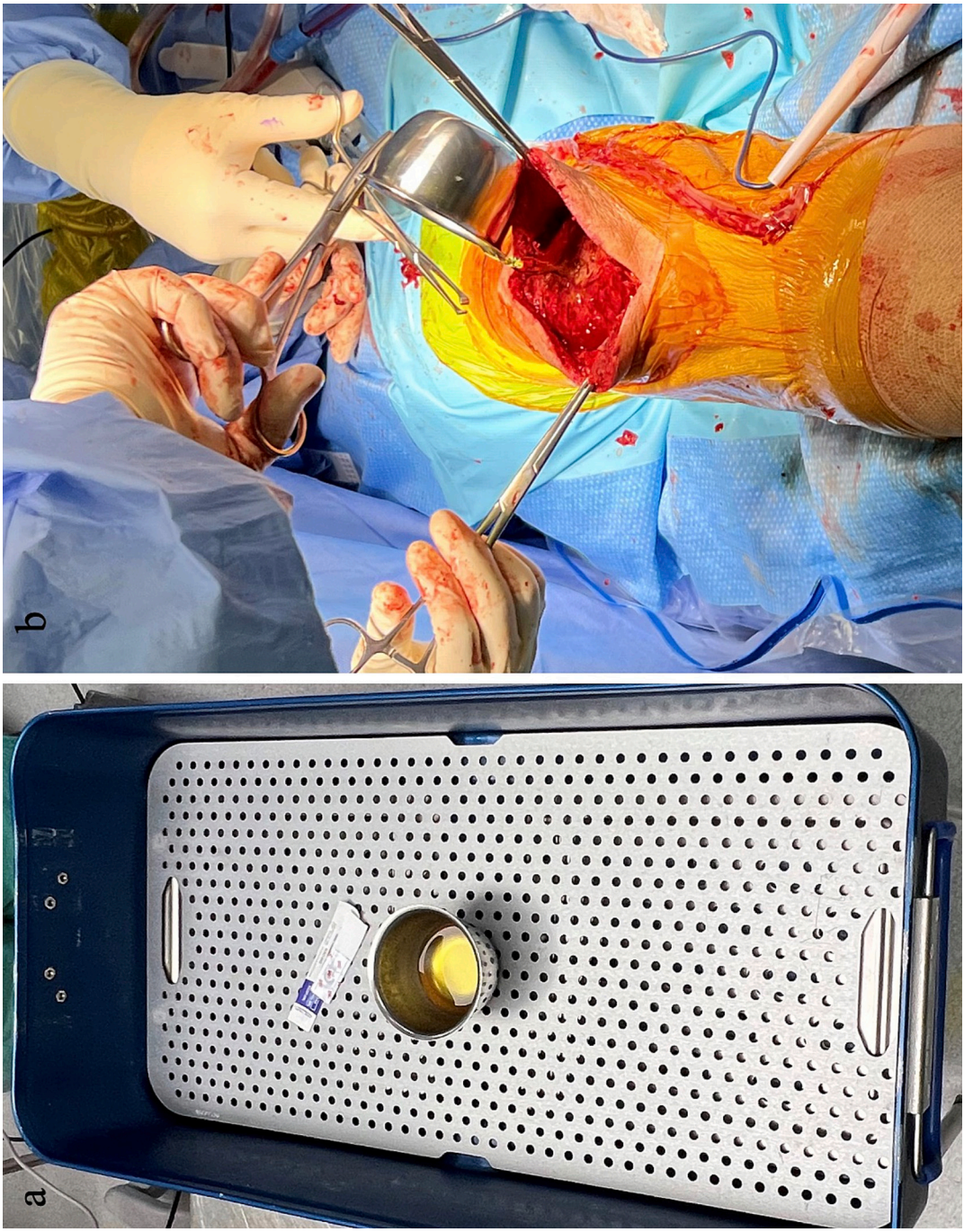

Fig. 1. Autoclave preparation of doxycycline solution for sclerodesis treatment (a) and introduction of the solution into the pathologic space following evacuation of fluid accumulation (b).

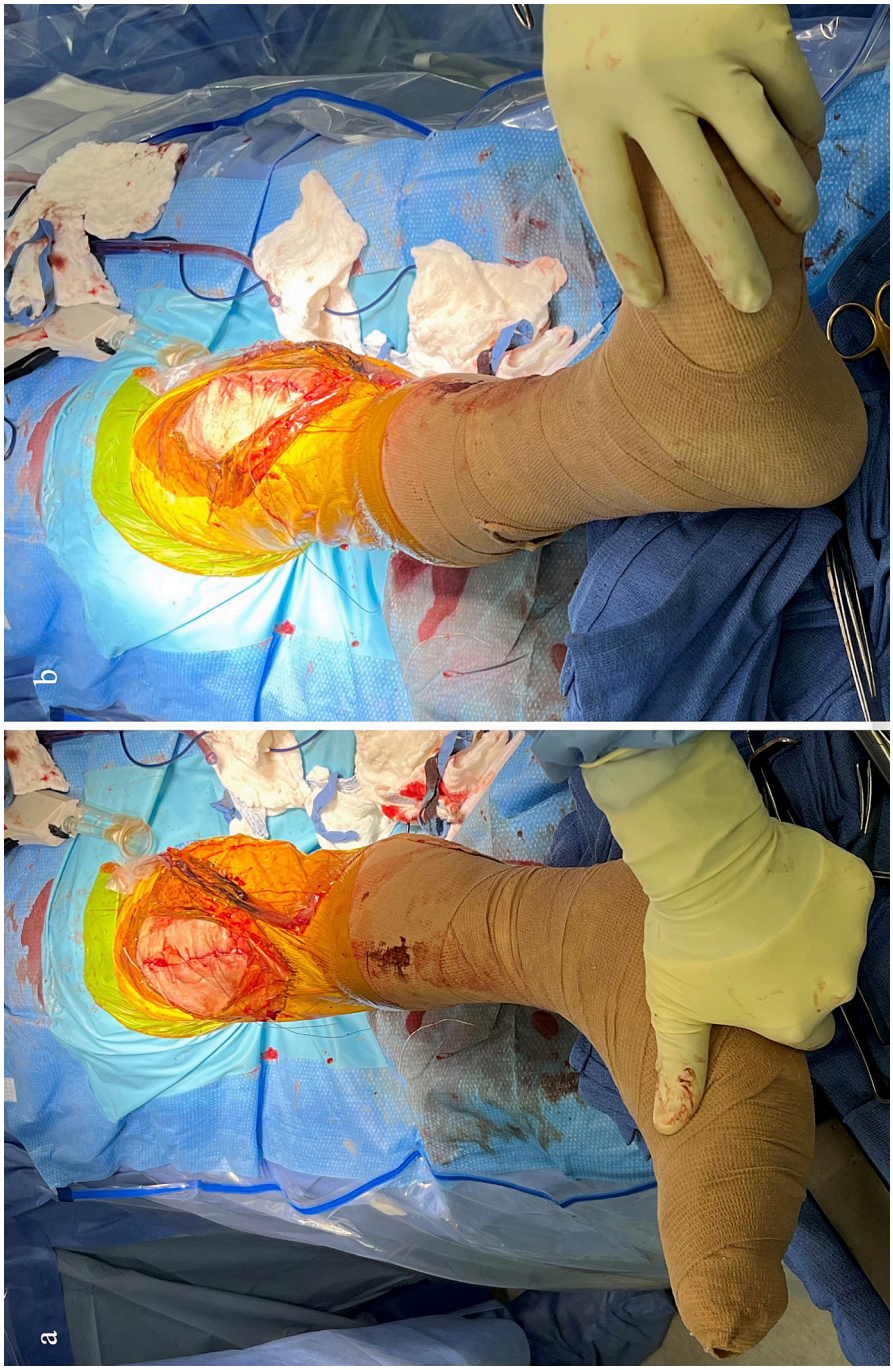

Fig. 2. The solution remained in the wound for 60 min, with position change of the leg every 10 min to maximize solution coverage (a & b).

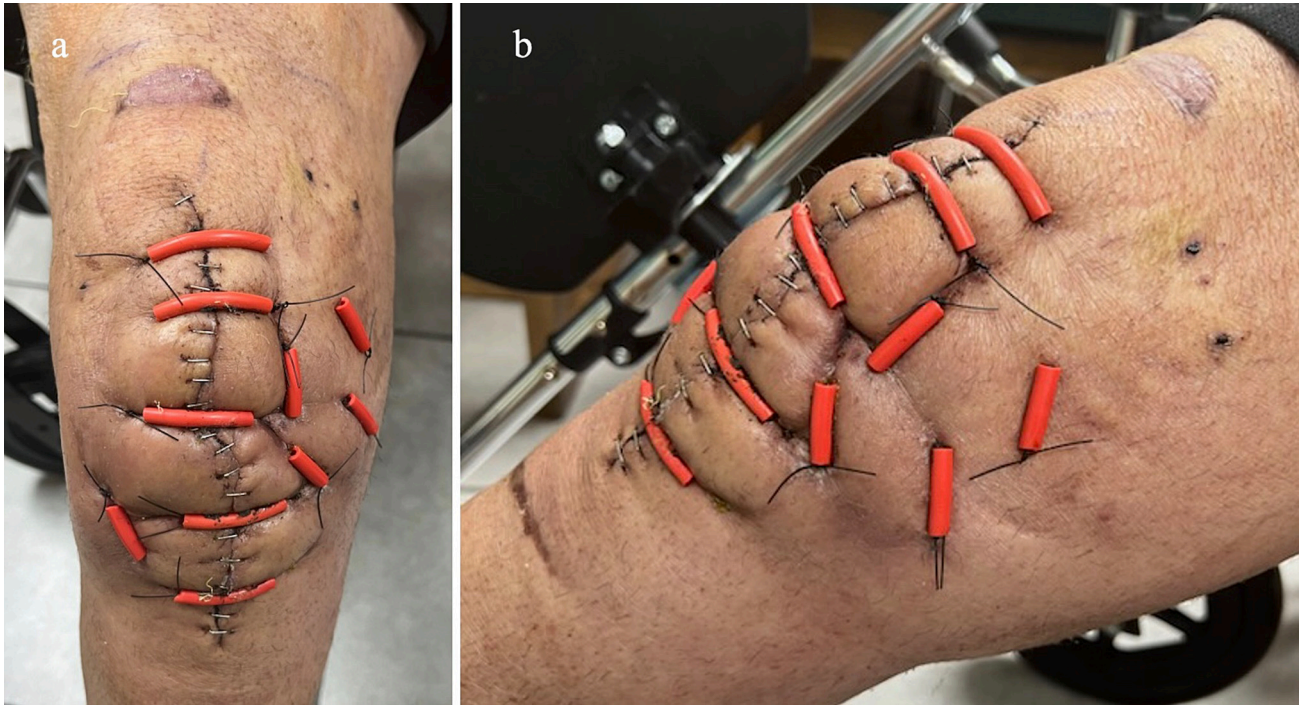

Fig. 3. Tight closure of the pathologic space and wound with no recurrence of swelling at 2 weeks follow up (a & b).

Case report

History and presentation

An 81 year old male suffered a ground level fall approximately 3 months before presentation. Progressive pain and swelling of the right knee limited the patient's ability to ambulate. The patient had undergone four knee aspirations at a different facility, without resolution of symptoms. Clinical examination demonstrated swelling on the anterior aspect of the right knee with reduced range of motion. The patient displayed an antalgic gait pattern and reported a 7/10 on the visual analog scale for pain. There was no evidence of underlying infection including erythema and warmth. Knee radiographs were unremarkable in relation to the clinical presentation. Sclerosis and early degenerative changes about the knee were noted on radiograph. A diagnosis of hematoma was made. Given the prior failed aspirations, the patient was scheduled for surgical treatment with irrigation and debridement. The patient provided consent for the data to be compiled for publication.

Treatment

Intraoperative examination noted the large swelling which was superior to the tibial tubercle. An anterior approach was utilized with consideration for the potential of a future knee arthroplasty. Cultures were taken and an organized hematoma was evacuated from the subcutaneous tissue. A subcutaneous closure was performed with 2–0 vicryl and a wound vac was applied. The knee was placed in extension with a plaster splint. The patient was ambulating on post-operative day 1 with no drainage noted in the vac and was discharged to home health. Culture results were negative. On post-operative day 2, edema returned at approximately 75 % of the original size. The swelling progressively worsened into day 3. Upon further discussion with the team, the prior failed aspirations in addition to the acute recurrent swelling suggested a MLL of the knee.

The plan was made to return to the operative room on postoperative day 4. There continued to be no indication of underlying infection. The same anterior incision was utilized and separation of the subdermal adipose from the underlying fascia was noted. This finding is consistent with a diagnosis of MLL. The decision was made to use doxycycline as an agent for sclerodesis. A mixture of 500 mg of doxycycline powder and 25 ml of 0.9 % saline solution were autoclaved for 17 min at a temperature of 275 degrees Fahrenheit as previously described [1,2] (Fig. 1). The solution was cooled to 250 degrees Fahrenheit and was maintained in the lesion for 60 min. A

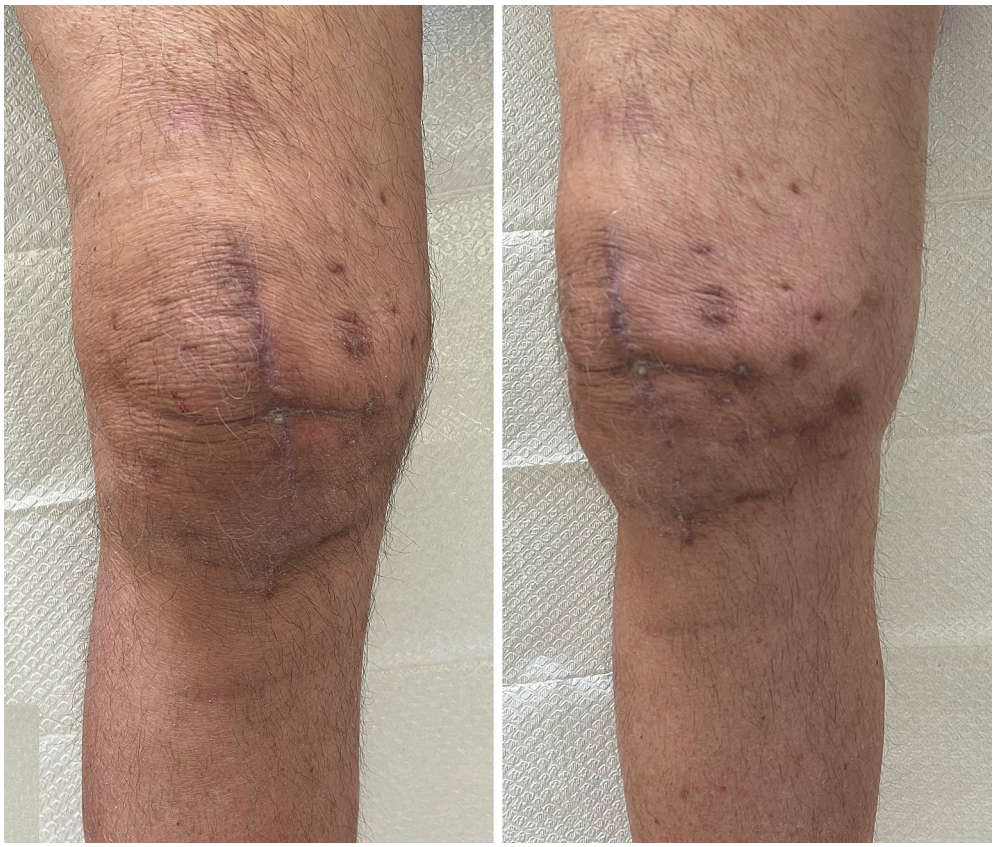

Fig. 4. Clinical follow up at 4 months postoperatively demonstrating appropriate healing and resolution of symptoms (a & b).

change in leg position every 10 min ensured adequate and diffuse coverage of the solution in the lesion (Fig. 2).

The solution was evacuated from the lesion and wound drains were placed. The closure consisted of interrupted simple sutures with 1–0 nylon to tightly compress the lesion. Rubber catheters were added to the exposed sutures across the skin for protection due to the tightness of the sutures (Fig. 3).

Outcome

The patient was ambulatory on postoperative day 1, with minimal accumulation in the drains. On postoperative day 3 the drains were removed, and the patient reported controlled pain levels. The patient was discharged on postoperative day 4. At final follow up of 4 months, the patient demonstrated no signs of recurrent swelling or dysfunction (Fig. 4).

Discussion

Morel-Lavalée lesions were initially described around the hip which is the most commonly reported location [3]. MLL of the knee are rare and often occur in contact sports such as American football or due to ground contact during a fall. The infrequency of these injuries hinders their detection and timely treatment. Differential diagnoses for MLL of the knee include prepatellar bursitis, hematoma and quadricep contusion. The identifiable characteristic that differentiates MLL from other diagnoses is the palpable fluctuance which often extends from the patellar region to the midthigh, medially and/or laterally. Additionally, there can be reduced sensation on the overlying skin due to the loss of vascular irrigation. A missed diagnosis has the potential for substantial morbidity due to septic or ischemic complications.

Mellado and Bencardino provided a magnetic resonance imaging-based classification for Morel-Lavallée lesions [4]. The six levels of classification describe the general organization of the lesion with details on the composition of the accumulated fluid. The current case was a Type III lesion described as a chronic hematoma with granulation tissue, fibrin, and blood clot accumulation.

Table 1
Literature review for Morel-Lavallée lesions of the knee including reported treatment and outcomes.

Study	N	Age	Mechanism of injury	Treatment	Recurrence	Outcome
Case series						
Tejwani, 2019	14	26[a]	Acute sports trauma	Conservative treatment	No	Resolution of symptoms within 11 days[a]
	10			Aspiration	Yes	Resolution of symptoms within 24 days[a]
	3			Doxycycline sclerodesis injection following failed aspiration	No	Resolution of symptoms within 24 days[a]
Case reports						
Garner, 2013	1	30	Acute sports trauma	Conservative treatment	Yes	Recurrence at one year, conservative treatment yielded resolution of symptoms at one month
	1	31	High energy trauma	Conservative treatment, corticosteroid injection.	Yes	Spontaneous resolution
Hogerzeil, 2017	1	59	Low energy trauma	Conservative treatment, aspiration	Yes	Incomplete resolution at 18 months, symptoms recurred following minor trauma, surgical intervention recommended
van Gennip, 2012	1	26	Acute sports trauma	Conservative treatment, corticosteroid injection	No	Returned to full activity at 6 weeks
	1	46	Repetitive sports trauma	Conservative treatment	No	Returned to full activity at 4 months
	1	15	High energy trauma	Arthroscopic exploration and debridement following failed conservative treatment	Yes	Wound healing at 3 weeks
Vanhegan, 2012	1	72	High energy trauma	Surgical closure with quilting suture technique following multiple failed aspirations and corticosteroid injections	Yes	Returned to full range of motion at 2 months
Weiss, 2014	1	22	High energy trauma	Irrigation and debridement with delayed primary closure following failed conservative treatment, aspiration, and irrigation and debridement	Yes	Resolution of symptoms at 1.5 months
Depaoli, 2014	1	18	Acute sports trauma	Conservative treatment	No	Resolution of symptoms at 3 months
Shmerling, 2016	1	26	Acute sports trauma	Repeat aspirations	Yes	Resolution of symptoms at 4 weeks
Koc, 2016	1	33	Acute sports trauma	Capsulectomy and fibrin glue injection following failed conservative treatment and doxycycline sclerodesis.	Yes	Returned to full activity at 6 weeks
Tay, 2020	1	60	Acute trauma	Conservative treatment, multiple aspirations	Yes	Resolution of symptoms at 6 months

[a] Value reported as a mean.

Although high energy mechanisms are most common [3], the literature contains reports of MLL following repetitive microtrauma and low energy trauma. MLL has been reported in long distance runners without preceding acute trauma [5]. The postulated mechanism being repetitive microtrauma which leads to separation of the tissue layers. Low energy falls have also been identified as the mechanism of injury leading to MLL. Cases have been described for patients who were taking and patients who were not taking anticoagulation medication [6,7]. The current case report described a fall from ground level in a patient who was not taking anticoagulation medication.

Sclerodesis has been described as surgical treatment for MLL, utilizing agents including talc, and doxycycline [8]. Sclerodesis is intended to induce an inflammatory response which leads to adhesions and fibrosis. This acute response mitigates the recurrence of fluid accumulation due to vessel blockade which re-routes flow patterns. Doxycycline has been used for many years as an agent of sclerodesis to treat pleural effusion [9], and novel reports describe efficacy in treatment of MLL. Tejwani et al. reported a 0 % rate of recurrence for doxycycline sclerotherapy as treatment for MLL of the knee following failed aspiration [2]. Bansal et al. treated MLL lesions of the thigh and torso with doxycycline sclerotherapy [1]. Results described a 94 % (15/16) rate of resolution with 1 patient requiring a repeat doxycycline sclerodesis prior to achieving resolution. The protocol used in the preceding studies included autoclave heating of the solution, although no rationale was provided for the importance of this process. Notably, doxycycline has demonstrated heat-stable characteristics [10]. Based on prior research and the mechanism of effect of sclerodesis, the current authors postulate that the increased temperature will further hasten the process of adhesions and fibrosis.

Although rarely reported as a treatment for MLL, the use of doxycycline as a sclerodesis agent is not novel. A review by Walker-Renard et al. in 1994 concluded that doxycycline was an efficacious and cost-effective agent for pleurodesis in malignant pleural effusion [11]. It is well documented that induction of the inflammatory response is the critical component of sclerodesis efficacy. An in-vitro study demonstrated that doxycycline application reduced the synthesis of matrix-degrading metalloproteinases which lead to unopposed collagen and fibrin deposition [12]. Additionally, doxycycline-induced adhesion formation was reduced in the presence of concurrent administration of corticosteroids [13]. These data provide evidence for the primary mechanism of action of doxycycline as a sclerodesis agent being the induction of the inflammatory cascade. We autoclaved the doxycycline solution as initially described by Bansal et al. [1] and Singh et al. [14].

The recent literature reinforces the importance of prompt identification and appropriate treatment of MLL of the knee (Table 1). Symptom severity and chronicity are the primary criteria that guide treatment decisions. Although conservative treatment can yield symptom resolution [2,5,15], recurrence of symptoms is commonly reported [2,5,16–19]. Following failed conservative management, surgical treatment may be indicated. Satisfactory outcomes with symptom resolution have been reported across a variety of surgical modalities including doxycycline sclerodesis, suture closure techniques, fibrin glue injection and irrigation and debridement [2,17–19]. Understanding the mechanism of the tissue insult and the subsequent deformity are critical components of effective surgical treatment.

In conclusion, the current result reinforces the importance of prompt recognition and appropriate treatment of Morel-Lavallée lesions of the knee. In the presence of a different diagnosis, recurrence of clinical symptoms following treatment may indicate an MLL. Treatment with doxycycline as a sclerodesis agent has proven efficacy and resulted in resolution of symptoms in the current case. The literature displays the spectrum of presentation for MLL of the knee, from high energy sports trauma to low energy falls from ground level. When indicated, surgical treatment of MLL provides consistent resolution of symptoms.

Informed consent statement

The patient gave informed consent of details of the case to be submitted for publication.

Declaration of competing interest

The authors declare no conflicts of interest related to the current work.

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References

[1] A. Bansal, N. Bhatia, A. Singh, A.K. Singh, Doxycycline sclerodesis as a treatment option for persistent Morel-Lavallée lesions, Injury. 44 (1) (2013) 66–69.
[2] S.G. Tejwani, S.B. Cohen, J.P. Bradley, Management of Morel-Lavallee lesion of the knee: twenty-seven cases in the national football league, Am. J. Sports Med. 35 (7) (2007) 1162–1167.
[3] T.P. Nickerson, M.D. Zielinski, D.H. Jenkins, H.J. Schiller, The Mayo Clinic experience with Morel-Lavallée lesions: establishment of a practice management guideline, J. Trauma Acute Care Surg. 76 (2) (2014) 493–497.
[4] J.M. Mellado, J.T. Bencardino, Morel-Lavallée lesion: review with emphasis on MR imaging, Magn. Reson. Imaging Clin. N. Am. 13 (4) (2005) 775–782.
[5] S. van Gennip, S.C. van Bokhoven, E. van den Eede, Pain at the knee: the Morel-Lavallée lesion, a case series, Clin. J. Sport Med. 22 (2) (2012) 163–166.
[6] D.P. Hogerzeil, J. Jansen, Morel-Lavallée lesion of the proximal tibia in an obese patient after low-energy trauma, BMJ Case Rep. (2017) 2017.
[7] M.R.J. Tay, O.J. Haw, Morel-Lavallée Lesion of the knee after low-energy impact in a healthy non-athlete, J. Back Musculoskelet. Rehabil. 34 (1) (2021) 39–42.
[8] S. Luria, Y. Applbaum, Y. Weil, M. Liebergall, A. Peyser, Talc sclerodhesis of persistent Morel-Lavallée lesions (posttraumatic pseudocysts): case report of 4 patients, J. Orthop. Trauma 20 (6) (2006) 435–438.
[9] A. Dipper, H.E. Jones, R. Bhatnagar, N.J. Preston, N. Maskell, A.O. Clive, Interventions for the management of malignant pleural effusions: a network meta-analysis, Cochrane Database Syst. Rev. 4 (4) (2020), Cd010529.

[10] M. Hassani, R. Lázaro, C. Pérez, S. Condón, R. Pagán, Thermostability of oxytetracycline, tetracycline, and doxycycline at ultrahigh temperatures, J. Agric. Food Chem. 56 (8) (2008) 2676–2680.
[11] P.B. Walker-Renard, L.M. Vaughan, S.A. Sahn, Chemical pleurodesis for malignant pleural effusions, Ann. Intern. Med. 120 (1) (1994) 56–64.
[12] A.N. Hurewitz, C.L. Wu, P. Mancuso, S. Zucker, Tetracycline and doxycycline inhibit pleural fluid metalloproteinases. A possible mechanism for chemical pleurodesis, Chest 103 (4) (1993) 1113–1117.
[13] L.R. Teixeira, W. Wu, D.S. Chang, R.W. Light, The effect of corticosteroids on pleurodesis induced by doxycycline in rabbits, Chest. 121 (1) (2002) 216–219.
[14] Singh A., Anand A., Mittal S., Sonkar A.A. Morel-Lavallee seroma (post-traumatic pseudocyst) of back: a rarity with management conundrum. BMJ Case Rep. 2016 Jul 18;2016:bcr2016216122.
[15] R. Depaoli, E. Canepari, C. Bortolotto, G. Ferrozzi, Morel-Lavallée lesion of the knee in a soccer player, J. Ultrasound 18 (1) (2015) 87–89.
[16] A. Garner, D. Beard, S. Ostlere, A. Price, R. Rout, Morel-Lavallée lesions of the knee: a closed degloving injury: a report of two cases, ANZ J. Surg. 84 (10) (2014) 789–791.
[17] N.A. Weiss, J.J. Johnson, S.B. Anderson, Morel-LAvallee lesion initially diagnosed as quadriceps contusion: ultrasound, MRI, and importance of early intervention, West. J. Emerg. Med. 16 (3) (2015) 438–441.
[18] B.B. Koc, N. Somorjai, E. PMK, 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 24 (1) (2017) 144–148.
[19] I.S. Vanhegan, B. Dala-Ali, L. Verhelst, P. Mallucci, F.S. Haddad, The morel-lavallée lesion as a rare differential diagnosis for recalcitrant bursitis of the knee: case report and literature review, Case Rep. Orthop. 2012 (2012), 593193.