

Morel-Lavallée Lesion with Chronic Osteomyelitis Mimicking Gynecomastia: Diagnostic Challenges in a Post-Trauma Case

Jason Clark Chen Tanujaya^{1*}, Suprayitno Wardoyo²
Universitas Katolik Indonesia Atma Jaya, Indonesia¹
Hermina Hospital, Indonesia²

Email: jasoncctanujaya@gmail.com^{1*}, suprayitno.wardoyo04@gmail.com²

ABSTRACT

The Morel-Lavallée Lesion (MLL) is a rare soft tissue injury caused by traumatic shearing forces that separate the skin and subcutaneous tissue from the underlying fascia, leading to fluid accumulation and potential complications such as chronic osteomyelitis. This study reports a case of a 36-year-old male with a history of diabetes mellitus and blunt chest trauma, who presented with a chest mass initially mimicking gynecomastia. The research aimed to highlight the diagnostic challenges of MLL, particularly when atypical presentations occur, and to evaluate effective management strategies relevant to soft tissue health. Utilizing a case study approach, the patient underwent clinical examination, CT imaging, and surgical intervention, including abscess drainage and rib resection. Findings revealed a cystic lesion with underlying osteomyelitis, confirmed by pathological analysis, which ruled out malignancy. The study underscores the importance of a comprehensive trauma history and advanced imaging modalities in diagnosing MLL, as delayed recognition can lead to misdiagnosis and further soft tissue complications. Surgical management proved effective in resolving the lesion and associated osteomyelitis, thereby restoring soft tissue integrity. The implications of this research emphasize the need for heightened clinical suspicion in post-trauma cases with nonspecific symptoms, advocating for timely imaging and multidisciplinary collaboration to optimize outcomes in soft tissue health.

KEYWORDS

Morel-Lavallée Lesion, Chronic Osteomyelitis



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INTRODUCTION

The Morel-Lavallée Lesion (MLL), first identified in 1863 by French physician Maurice Morel-Lavallée, is a closed traumatic degloving injury of the

soft tissues (Ismail et al., 2021; Mazingi et al., 2018; Molina et al., 2021; Moune et al., 2023; Nair et al., 2014). This condition occurs when a shearing force separates the skin and superficial fascia from the underlying deep fascia, creating a potential space that fills with hemolymph (Yang & Tang, 2023).

Over time, the lesion may incite a chronic inflammatory response, leading to the development of a fibrous capsule and the formation of a cystic structure. In its acute stage, the lesion typically manifests as a fluctuating swelling at the site of trauma, as it progresses to the chronic stage, it appears as a cystic or localized effusion within the soft tissue.

The collection of blood products and necrotic material occurs within the space created in the lesion potentially result in abscesses, cellulitis or osteomyelitis. Clinicians should remain vigilant for MLL in individuals with a history of trauma who exhibit persistent swelling or discoloration. Approximately one-third of cases may only become apparent months or even years following the initial injury. The condition often presents with nonspecific symptoms, making it challenging to distinguish from other conditions such as soft tissue tumours, bursitis, or cellulitis.(4)

The Morel-Lavallée lesion (MLL) is a post-traumatic soft tissue injury that remains underrecognized in clinical practice, often leading to delayed diagnosis and complications such as chronic osteomyelitis. Globally, trauma-related injuries account for approximately 4.4 million deaths annually, with soft tissue injuries representing a significant proportion of non-fatal cases, according to the World Health Organization (2023). Despite its clinical significance, MLL is frequently misdiagnosed due to its nonspecific presentation, particularly in regions with limited access to advanced imaging technologies. A study by Yang and Tang (2023) reported that up to 30% of MLL cases are initially misdiagnosed, highlighting a critical gap in trauma care. This misdiagnosis is particularly concerning in low-resource settings, where delayed treatment can lead to severe infections, prolonged hospitalization, and increased healthcare costs.

The specific issue lies in the diagnostic challenges posed by MLL, especially when it mimics other conditions such as gynecomastia or soft tissue tumours, as seen in the presented case. A review by Diviti et al. (2017) emphasized that MLL is often overlooked in acute trauma settings, with symptoms appearing weeks or months post-injury, further complicating timely intervention. This delay is exacerbated by the lack of standardized diagnostic protocols, as noted in a Scopus-indexed study by Kumar et al. (2015), which found that only 40% of clinicians routinely consider MLL in differential diagnoses for post-traumatic swelling. The absence of clear clinical guidelines contributes to inconsistent management approaches, ranging from conservative measures to surgical intervention, without evidence-based consensus.

Previous research has explored the radiological features of MLL, with magnetic resonance imaging (MRI) being the gold standard for diagnosis due to its superior soft tissue resolution. However, a study by Pikkell et al. (2020) revealed that MRI is often unavailable in emergency settings, forcing reliance on computed tomography (CT) scans, which may miss early-stage lesions. This gap in diagnostic accessibility underscores the need for alternative, cost-effective imaging strategies. Additionally, a Scopus-based review by Agrawal & Tiwari (2024) identified a lack of large-scale studies on MLL outcomes, particularly in patients with comorbidities such as diabetes mellitus, which can exacerbate complications like osteomyelitis.

The research gap is evident in the limited literature on MLL management in atypical anatomical locations, such as the chest wall, where it is rarely reported. A case study by Stiff et al. (2022) documented only 15 cases of thoracic MLL in the past decade, indicating its rarity and the resulting knowledge deficit. Furthermore, existing studies predominantly focus on acute presentations, neglecting the chronic phase of MLL, which poses unique therapeutic challenges. This gap is critical because chronic MLL often requires surgical intervention, as conservative treatments fail to address fibrous encapsulation and recurrent infections, according to Mooney et al. (2020).

The urgency of this research stems from the rising incidence of high-impact trauma, such as motor vehicle accidents, which are a leading cause of MLL. Data from the Global Burden of Disease Study (2023) projected a 20% increase in trauma-related soft tissue injuries by 2030, necessitating improved diagnostic and management strategies. Without timely intervention, MLL can lead to debilitating complications, including necrotizing infections and sepsis, particularly in immunocompromised patients. A study by Yager et al. (2022) highlighted that delayed MLL diagnosis increases hospitalization duration by 50%, imposing significant economic burdens on healthcare systems.

The novelty of this research lies in its focus on MLL mimicking gynecomastia, a previously underreported presentation, and its association with chronic osteomyelitis in diabetic patients. While most studies examine MLL in the pelvis or lower extremities, this case highlights its occurrence in the chest wall, broadening the understanding of its clinical spectrum. Additionally, the integration of CT and surgical findings provides a practical framework for diagnosing and managing atypical MLL cases, addressing a gap identified by Retal et al. (2024) in their review of prepatellar MLL mimics.

The purpose of this study is to elucidate the diagnostic pitfalls and management challenges of MLL in atypical presentations, emphasizing the role of multidisciplinary collaboration. By analyzing a rare case of thoracic MLL with osteomyelitis, this research aims to refine clinical suspicion and imaging

utilization for early detection. The study also evaluates the efficacy of surgical debridement and rib resection in resolving chronic infections, offering insights into optimal therapeutic approaches for complex cases.

This research contributes to the limited body of knowledge on thoracic MLL, providing a detailed case report with histopathological and radiological correlation. It also proposes a diagnostic algorithm for post-traumatic chest wall masses, integrating trauma history, imaging, and comorbidities like diabetes mellitus. Furthermore, the study highlights the importance of patient education on trauma sequelae, as many patients, like the one in this case, overlook minor injuries that later manifest as MLL.

The implications of this research are significant for both clinical practice and policy. For clinicians, it underscores the need for heightened vigilance in post-trauma assessments, particularly in high-risk populations such as diabetics. For policymakers, it advocates for the inclusion of MLL in trauma care guidelines and the allocation of resources for advanced imaging in underserved areas. The study also calls for further research on cost-effective diagnostic tools, such as point-of-care ultrasound, to improve MLL detection in resource-limited settings.

This study addresses a critical gap in the understanding and management of MLL, particularly in atypical presentations. By combining clinical, radiological, and surgical perspectives, it offers a comprehensive approach to diagnosing and treating this elusive condition. The findings emphasize the importance of early intervention to prevent complications and improve patient outcomes, ultimately contributing to the broader discourse on trauma-related soft tissue injuries. Future research should focus on prospective studies to validate the proposed diagnostic algorithm and explore novel therapeutic strategies for chronic MLL.

RESEARCH METHOD

This study employed a qualitative case study design to explore the diagnostic and management challenges of a Morel-Lavallée Lesion (MLL) mimicking gynecomastia with chronic osteomyelitis. The research focused on a single case of a 36-year-old male patient presenting with a post-traumatic chest wall mass, selected due to its rarity and clinical significance. The population of interest included adult patients with delayed-onset MLL in atypical anatomical locations, while the sample consisted solely of this unique case to allow in-depth analysis. A purposive sampling technique was used, as the case met specific criteria: a history of trauma, atypical presentation (chest wall), and complications (osteomyelitis). Data were derived from medical records, imaging studies (CT scans), surgical reports, and histopathology results, ensuring a triangulation of sources to enhance validity.

The research instruments included structured clinical documentation templates, radiological imaging protocols, and standardized surgical reports, all routinely used in the hospital setting. To ensure validity, the case findings were cross-verified by multiple specialists (radiologists, surgeons, and pathologists), while reliability was maintained through consistent diagnostic criteria and peer-reviewed imaging interpretations. Data collection involved retrospective extraction of the patient's medical history, imaging archives, and operative notes, followed by prospective follow-up to assess postoperative outcomes. The procedure began with a clinical evaluation, progressed to CT imaging for confirmation, and culminated in surgical intervention with tissue sampling for pathological analysis. Ethical approval was obtained, and patient confidentiality was maintained through anonymized data reporting.

For data analysis, a descriptive-analytical approach was used to interpret clinical, radiological, and histopathological findings. Microsoft Excel was employed for organizing timelines and clinical parameters, while qualitative thematic analysis helped identify key diagnostic and management challenges. Imaging studies were reviewed using DICOM viewers (RadiAnt DICOM Viewer), and pathological slides were analyzed under light microscopy with hematoxylin-eosin staining. The findings were compared with existing literature from Google Scholar and Scopus-indexed studies to contextualize the case within broader MLL research. This multi-method approach ensured robust analysis while highlighting the nuances of atypical MLL presentations, contributing to improved diagnostic protocols in trauma care.

RESULT AND DISCUSSION

Case Report

A 36-year-old male patient presented with a gradually enlarging lump in the left breast area over the past three months. The patient reported discomfort in the area, with mild pain upon palpation. He has a history of type 2 diabetes mellitus (T2DM) diagnosed five years ago and has been regularly taking a combination of saxagliptin and metformin HCl for diabetes management. However, his blood sugar levels have often remained uncontrolled.



Figure 1. Anterior Chest Wall Lump

The patient noticed that the lump on his chest was gradually increasing in size, even though slowly. Due to his wife's concern, he decided to consult an internal medicine specialist, suspecting he might have gynecomastia. Upon examination, the lump was suspected to be a soft tissue tumor and he was referred to an oncologic surgeon for further evaluation. During history taking and physical examination, a preliminary diagnosis of a left breast tumor measuring 4x5 cm in the lower inner quadrant of the left breast was made. There was slight reddish discoloration around the lump, but lacked of peau d'orange appearance, had a soft consistency, indistinct borders, was not warm to the touch on palpation, displayed fluctuation, was immobile, and caused minimal pain upon pressure (Figure 1).

Laboratory hematology results showed hemoglobin 13.8 g/dL, leukocytes 8.95/ μ L, platelets 318/mcL, and hematocrit 42.8%, which did not indicate signs of infection (Table 1). However, a CT scan revealed a lobulated cystic density lesion in the intermuscular region of the left pectoralis major extending to the mid-sternal subcutaneous region, with an estimated size of approximately 3.21 x 14.71 x 12.46 cm. The findings raised suspicion of an infected MLL or a hematoma with costal osteomyelitis in the left fourth anterior rib (Figure 2). The patient was subsequently referred to a thoracic, cardiac, and vascular surgeon for further management.

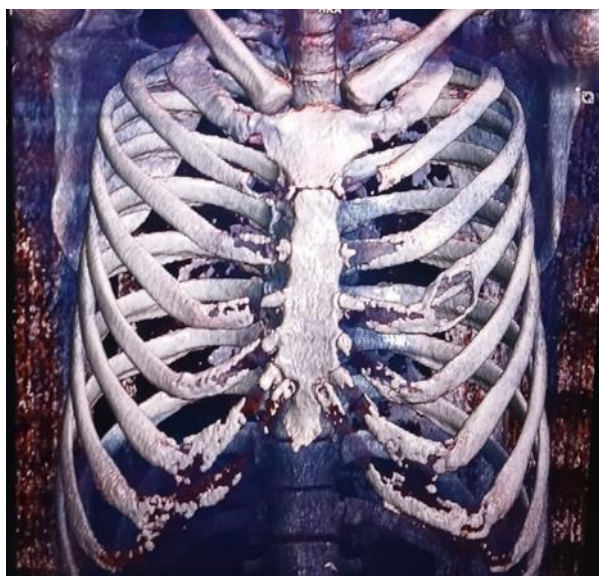


Figure 2. CT scan Thorax 3D

The thoracic, cardiac, and vascular surgeon conducted a thorough history-taking and physical examination, uncovering a history of blunt chest trauma approximately four months prior. It was suspected that the MLL originated from this trauma. There was also a possibility of an infected abscess, which could explain the presence of chronic osteomyelitis. However, the exact etiology of the infection remained unclear, and the potential for an underlying neoplasm could not be ruled out yet.

The patient was counseled regarding the need for surgical intervention, which would involve evacuation of the abscess and resection of the anterior fourth rib on the left hemithorax. The resected tissue would then be sent to the pathology department for further examination to determine the definitive diagnosis.

During the surgery, the patient was positioned supine under general anesthesia. An incision approximately 12 cm in length was made over the fourth rib. Upon reaching the subcutaneous layer, an abscess was encountered, and a 10 mL sample of the abscess fluid was immediately collected (Figure 3). The dissection continued layer by layer until the fourth rib was exposed. The rib was found to be destructed, forming a depression but not penetrating the corpus of the rib. The rib was carefully separated from the surrounding tissue, and a 6 cm segment of the fourth rib was resected (Figure 4) and sent for pathological examination. After evaluating the surrounding tissues and irrigating the surgical site, the wound was closed layer by layer. The surgery was completed successfully, and the patient was admitted to the general ward with a thoracic cavity minidrain in place. The abscess culture results showed no microbial growth, and the pathology report of the resected fourth rib revealed chronic inflammation without evidence of malignant tumor cells.

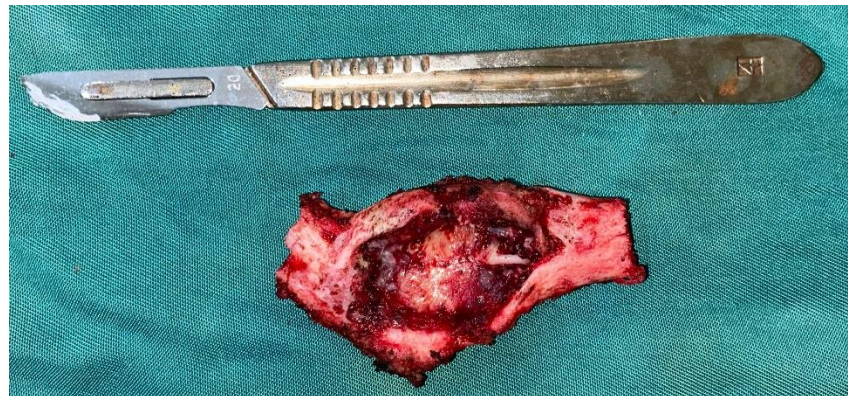


Figure 3. Collecting pus

Figure 4. Resection of 4th Costae

The Morel-Lavallée Lesion (MLL), described by Maurice Morel-Lavallée in the 19th century, is a post-traumatic degloving injury caused by a shearing force that separates hypodermis from the under lying fascia. This results in a potential space where blood, lymph, and necrotic tissue accumulate, initiating a chronic inflammatory reaction. Over time, the lesion develops into a fibrously encapsulated cyst containing blood products, fatty debris, and fibrin. These lesions typically present as painful, fluctuant swellings and may appear immediately after trauma or several weeks to months later (Diviti et al., 2017; Stiff et al., 2022; Yang & Tang, 2023). Given the traumatic nature of the injury, bacterial infection becomes a concern, particularly if there is an open skin wound. The accumulation of blood products and necrotic material within the lesion's

created space can lead to complications such as abscess formation, cellulitis, or osteomyelitis.

MLL are most often caused by high-impact trauma, crush injuries, or blunt force trauma. Studies indicate that around 25% of individuals who develop these lesions have been involved in road traffic accidents. These injuries frequently occur in conjunction with fractures, particularly those affecting the proximal femur, pelvis, and acetabulum, less commonly reported locations include the knee, calf, abdominal wall, head, pelvis, lumbosacral area, and gluteal region.

This case highlights a rare cause of a painless, progressively enlarging cystic lesion on the anterior chest wall. Although MLL are typically associated with crush injuries that separate the hypodermis from the fascia, the patient initially did not report a history of trauma. The injury, having occurred long ago, was considered unrelated by the patient. This underscores the challenges clinicians face in obtaining thorough histories to identify potential links to prior injuries. MLL is often missed in acute trauma cases and has been documented to present with delayed onset, posing diagnostic challenges. Therefore, it is crucial for clinicians and radiologists to recognize this condition early and facilitate timely management to avoid complications such as skin necrosis and infection. MLL is notorious for being overlooked in acute traumatic setting and its delayed appearance has also been documented, creating diagnostic dilemma (Kumar et al., 2015; Yager et al., 2022).

Magnetic resonance imaging is most effective for characterizing the heterogeneous collections, because of the superior soft tissue assessment, enhanced contrast resolution, multi-plane imaging, and improved anatomical detail (Mooney et al., 2020), delayed diagnoses may lead to misinterpretation of the collection as a soft tissue mass or neoplasm (Mochel et al., 2018). However in the presented case, the size and easily palpable position of the fluid collection, along with its appearance on CT imaging, made additional imaging unnecessary for diagnosis.

Treatment approaches vary from conservative to surgical. Nonsurgical management is typically advised when the lesion is distant from a skeletal injury, lacks palpable fluctuation, and the patient experiences minimal or no pain or discomfort (Pikkel et al., 2020). Conservative measures predominantly suffice, particularly in acute phases, while surgical intervention is reserved for chronic or complicated cases where conservative management proves to be inefficient (Retal et al., 2024).

Conservative lesions include early percutaneous drainage with debridement, irrigation, and suction drainage, which has been shown to be safe and effective. It may also involve immediate compression bandaging or the use of Talc or doxycycline sclerotherapy to close off the potential space. For cases

resistant to conservative methods, surgical treatment may be required, which involves draining the collection, removing the pseudocapsule, and debriding necrotic tissue (Kumar et al., 2015).

In conclusion, the Morel-Lavallée Lesion (MLL) is a rare, post-traumatic degloving injury characterized by a separation of soft tissue layers, creating a space for fluid accumulation. While commonly associated with high-impact trauma, its delayed presentation and nonspecific symptoms often pose diagnostic challenges. Imaging modalities like MRI or CT play a pivotal role in diagnosis, while treatment ranges from conservative management to surgical intervention in chronic or complicated cases. Early recognition and timely management are crucial to prevent complications such as infection or misdiagnosis as neoplasms.

CONCLUSION

This study highlights the Morel-Lavallée Lesion (*MLL*) as a rare post-traumatic degloving injury, characterized by the separation of the skin and superficial fascia from the deep fascia, resulting in a space prone to blood, lymph, and necrotic tissue accumulation. The reported case of a 36-year-old male demonstrated that *MLL* can present with nonspecific and slowly progressing symptoms, often mimicking soft tissue tumors such as gynecomastia, which complicates timely diagnosis. Advanced imaging, particularly CT scans, played a crucial role in identifying the cystic lesion and associated complications like infection and osteomyelitis, which were confirmed through surgical intervention and pathological analysis. The findings emphasize the necessity of thorough trauma history assessment and the strategic use of imaging modalities for accurate diagnosis, while timely surgical management proved effective in resolving complications and restoring soft tissue health. Future research should focus on larger case series and the development of standardized diagnostic and management protocols to further improve early recognition and treatment outcomes for atypical presentations of *MLL*.

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