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A Giant Atypical Lipomatous Tumor of the Thigh Masquerading as a Sports-Related Muscle Injury: A Case Report

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Abstract: ***Background: Atypical lipomatous tumor/well-differentiated liposarcoma (ALT/WDLPS) is a low-grade adipocytic neoplasm with locally aggressive behaviour and no metastatic potential unless dedifferentiation occurs. It commonly affects deep soft tissues of the limbs, particularly the thigh, and may mimic benign musculoskeletal conditions. This often leads to delayed diagnosis, especially in physically active individuals presenting in Sports Medicine settings. Case Presentation: A 41-year-old recreational badminton player presented with a gradually enlarging, painless swelling over the anterior right thigh for one year, initially perceived as a muscle strain. Clinical examination revealed a large, firm, non-tender mass measuring approximately 25 × 30 cm with preserved joint function. Imaging with ultrasonography and MRI demonstrated a large intermuscular adipocytic lesion suggestive of ALT/WDLPS. Fine needle aspiration cytology (FNAC) supported the diagnosis. The patient underwent complete surgical excision without complications. Histopathological findings confirmed atypical lipomatous tumor. No adjuvant therapy was advised. At 3-month follow-up, the patient showed complete functional recovery with no evidence of recurrence. Conclusion: This case highlights the diagnostic challenge of differentiating soft tissue tumors from common sports-related injuries. Persistent or progressively enlarging soft tissue swellings unresponsive to conservative management should raise suspicion for neoplastic conditions. Early imaging, histopathological confirmation, and multidisciplinary management are essential for optimal outcomes. Complete surgical excision remains the mainstay of treatment, with long-term follow-up necessary to monitor recurrence.***

Keywords: Atypical lipomatous tumor, well-differentiated liposarcoma, Fine needle aspiration cytology, thigh swelling, soft tissue tumor, Sports Medicine, surgical excision

1. Introduction

Soft tissue sarcoma is a heterogeneous disease comprising more than 50 histological subtypes with different biological behaviors.[1] Liposarcomas are the most common subtype which accounts for ~ 20% of all soft tissue sarcomas and ~ 5% of all sarcomas in adults.[2,3]

Liposarcomas are histologically heterogeneous malignant tumour of mesenchymal origin. Mesenchymal tumours often present diagnostic challenges due to complex imaging features, necessitating histopathological confirmation for definitive management and hence, refinement of classification schemes plays a key role in improving the quality of pathologic diagnosis and, as a consequence, of

therapeutic options.[2] A recently updated WHO classification of soft tissue and bone tumors identified the following 4 major liposarcoma subtypes: atypical lipomatous tumor/well-differentiated liposarcoma (ALT/WDLPS), dedifferentiated liposarcoma (DDLPS), myxoid liposarcoma, and pleomorphic liposarcoma.[1] Also importantly, the 2020 WHO Classification of Soft Tissue Tumors categorise the adipocytic tumors or differentiations as benign, Intermediate (locally aggressive) and Malignant adipocytic tumors. Atypical lipomatous tumor falls in the intermediate category.[2]

ALT/WDLPS are the most common adipocytic tumors accounting for 40–45% of all liposarcomas. ALT/WDLPS can occur at any age, but its peak incidence is observed during the fifth to seventh decades of life (middle aged or elderly people) with no sex predilection.[4] ALT/WDLPS is a locally invasive, nonmetastatic cancer. ALT is synonymous with WDLPS, and the use of the term ALT is determined principally by tumour location and resectability.[5] WDLPS occurring in a limb is often referred to as ALT because it does not metastasize and is easily cured. In contrast, WDLPS occurring in the retroperitoneum is more likely to recur or dedifferentiate; thus, the term WDLPS is used to emphasize its malignant features.[6] The most common site for ALT/WDLPS to occur is in deep soft tissues of the limbs, such as the thigh, retroperitoneum, mediastinum, and para-testicular tissues, and subcutaneous tissues.[7]

ALT/WDLPS is histologically characterized by atypical stromal cells and lipoblasts in mature fat, usually with prominent sclerotic components.[8] ALT/WDL can have a variety of histologic forms, including the most common classic lipoma-like form, a sclerosing form, and a rare inflammatory form, and features of more than one pattern may be seen in a single tumor.[9] The diagnosis of ALT/WDL can often be made by histologic features alone. In difficult cases, MDM2 immunostaining may be performed but is less sensitive than fluorescence in situ hybridization studies for MDM2 gene rearrangement.[10]

In general, ALT/WDLPS is not a malignant transformation of a lipoma and there is no risk of metastasis unless dedifferentiation occurs.[11] However, a delay in treating liposarcoma can result in an increase in the tumour size, which would ultimately affect the lower limb activity. Reports on giant ALT/WDLPS are relatively rare and reports describing complete patient data, as this report does, are even more rare. Here, we present a case of giant Atypical lipomatous tumor presenting as chronic anterior right thigh swelling in a recreational badminton player which serves as a diagnostic challenge in Sports Medicine.

2. Case Presentation

A 41-year-old recreational badminton player presented in the OPD of Sports Medicine, RIMS hospital, Imphal, Manipur on 15th July, 2025 with chief complaint of swelling or mass over the anterior aspect of right thigh for 1 year. He initially perceived the swelling as a result of muscle strain which occurred during a practice match. During the subsequent day following the muscle strain of the right anterior thigh, he had experienced some degree of pain which he ignored and treated self and got improved, yet the pain reappeared during playing. He was able to feel the mass 1 year prior when it was small (egg sized). In the ensuing 1 year, the mass continued to increase in size gradually and began to doubt himself that there could be the need for consultation with experts. The patient had no significant chronic medical history or family history of major diseases. No systemic symptoms (fever, weight loss, malaise) were noted.

Physical examination revealed a 25 cm × 30 cm mass located over the anterior aspect of right thigh, characterized by normal overlying skin color and temperature. It was non-tender and had a firm consistency with clear boundary and no associated induration. Resisted knee extension did not elicit any pain. Local lymph nodes were not palpable. Both the right hip and knee joints have good range of motion and no abnormal sensations or activity or oedema were noted, distal pulses were felt in the right lower limb.

X-ray of the right thigh could be reported as no abnormality detected. Ultrasonography (USG) of right thigh revealed a heterogeneous mass over the quadriceps plane, appearing at the muscle–fat interface. Magnetic Resonance Imaging (MRI) of the right thigh showed a large intermuscular soft tissue mass lesion in the anterior compartment of right thigh between the vastus lateralis and rectus femoris muscle. It has a craniocaudal extension of 29cm, transverse diameter of 11cm and anteroposterior diameter of 9cm, showing intensitometric characteristics compatible with adipose tumour having internal enhancing septations suggestive of ALT/WDL and advised HPE correlation. On doing the ultrasound guided FNAC of the swelling right thigh showed scattered lobules of mature adipocytes with occasional stromal cells which exhibit mild nuclear atypia, yet no lipoblasts are identified, and scattered lymphocytes and histiocytes are noted, overall features being suggestive of an atypical lipomatous tumour. FNAC of the right inguinal lymph node showed heterogenous population of lymphoid series of cells at various stages of maturation with no atypical cells or granulomas, suggestive of non-specific reactive lymphadenitis.

He underwent excision under spinal anaesthesia on 16/08/2025. The operation was uneventful. He was discharged 12 days after the surgery. No adjuvant chemotherapy or radiation therapy was administered. Regular oncological follow-up was advised and scheduled every 3 months.

At the 3-month follow-up, the patient's incision had healed well, there was no pain or discomfort in the right thigh, and the lower extremity functions was normal. This study was approved and written informed consent was obtained from the patient for publication of this case report and accompanying images.

3. Discussion

Atypical lipomatous tumor (ALT) is a low-grade adipocytic neoplasm with locally aggressive behaviour and most commonly affecting deep soft tissues of the limbs such as thigh. From Sports Medicine point of view, this case is noteworthy because its clinical presentation is closely mimicking a benign sports-related musculoskeletal condition,

leading to delayed recognition. Recreational and competitive athletes frequently present with pain and swelling attributed to muscle strain, or acute or overuse injury, especially in the thigh region which make early suspicion of neoplastic pathology challenging.

Although rare, ALT/WDLPS can attain large sizes. Most deep, giant, fat-derived tumors are liposarcomas; however, in some cases, lipomas can reach comparable sizes.[12] It is difficult to differentiate between benign lipoma and liposarcoma based solely on clinical or imaging findings, especially for deep intermuscular lesions. Definitive diagnosis relies on histopathological evaluation, immunohistochemical and molecular analyses.[13,14] Immunohistochemical markers such as MDM2 and CDK4, and molecular techniques including fluorescence in situ hybridization (FISH) for MDM2 amplification, have high sensitivity and specificity for detection of the MDM2 gene. They are of great value in confirming ALT/WDLPS in diagnostically challenging cases. However, FISH has higher sensitivity and specificity for detecting the MDM2 gene. Therefore, FISH can be used to identify ALT/WDLPS that is difficult to diagnose.[15] In the present case, core needle biopsy along with the clinical examinations and imaging findings were utilized in establishing the diagnosis, and additional immunohistochemical analysis was not done.

The gradual onset of anterior thigh swelling following badminton activity with minimal degree of pain, absence of systemic symptoms, and preserved functional capacity contributed to diagnostic delay. This highlights the fact–persistence or progressively enlarging deep soft-tissue swelling which do not respond to conservative treatment and which do not subside upon rest, should prompt further evaluation to exclude soft-tissue tumors. While ultrasound is commonly used as a first-line investigation for soft tissue swelling evaluation, MRI remains the imaging modality of choice for characterizing deep or atypical soft-tissue lesions.

Functionally, ALT/WDLPS may allow athletic activity to continue due to minimal early symptoms. However, progressively enlarging mass can impair muscle mechanics, reduce strength, alter biomechanics, and predispose to secondary. Studies have reported intermittent claudication caused by giant lipomas due to compression of blood vessels.[19] This complication was not observed in our case even though the intermuscular soft tissue mass lesion was found in the anterior compartment of right thigh between the vastus lateralis and rectus femoris muscle. Therefore, early diagnosis and complete surgical excision, as in this case, are crucial not only for oncological control but also for optimal functional recovery and return to sport. Post-operative rehabilitation in Sports Medicine will balance the tissue healing with gradual and progressive restoration of strength, flexibility, and neuromuscular control. Although adjuvant therapy was not required due to complete excision, long-term follow-up is essential because of the risk of local recurrence. Since, Sports Medicine physicians are often the first point of contact for athletes and physically active individuals, Sports Medicine physicians play a crucial role in early recognition, timely referral, post-operative rehabilitation, long-term surveillance and patient education to ensure safe return to sport and early detection of local recurrence.

There are some limitations to this study. Molecular testing for MDM2andCDK4 expression via immunohistochemistry and/or FISH were not performed. Additionally, a 10–11-month follow-up period so far is not ideal. To affirm the absence of local recurrence, a follow-up period of 5 years would be necessary.[11]

4. Conclusion

For any deep soft tissue swelling, as in this case, optimal care is achieved through a multidisciplinary approach, often involving Physicians, surgeons, radiologists, pathologists, and oncologists, to improve long-term outcomes. Careful preoperative evaluation with clinical examination, USG, MRI and biopsies is critical for adequate diagnosis and planning of the best treatment possible for the patient. We believe that extensive surgical resection of tumor tissue is a suitable treatment for all ALT/WDLPS to minimize the chance of local recurrence. In cases where extensive tumor excision is difficult, continuous follow-up is required because of the possibility that at least 10% of well-differentiated liposarcomas can dedifferentiate. Postsurgical surveillance with periodic imaging—for example, MRI of the primary site and CT of the chest—is key to early detection of local recurrence or distant metastasis and prompt intervention. This case underlines the importance of combining thorough diagnostic workup, effective surgical management, and vigilant follow-up to achieve favorable results in patients with ALT/WDLPS.

Declaration by Authors

Ethical Approval: The study was approved by the Institutional Ethics Committee.

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Conflict of Interest: The authors declare no conflict of interest.

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Figures

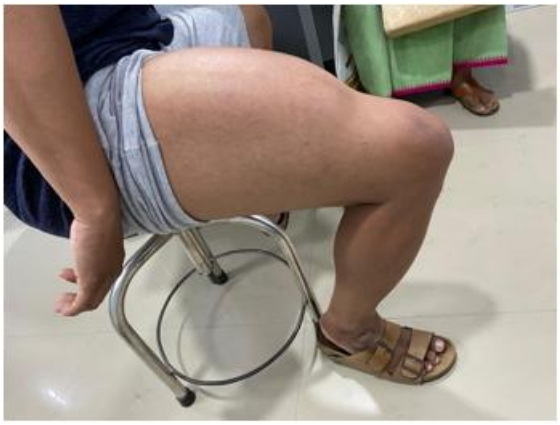

Figure 1: Right thigh swelling lateral view

Figure 2: Right thigh swelling medial view

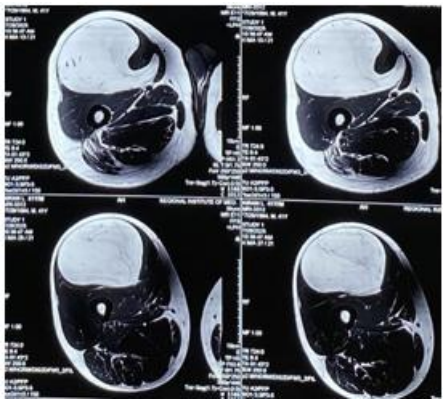

Figure 3: Axial view T1 weighted MRI sequence of right thigh demonstrating a large, well-circumscribed intermuscular lipomatous mass in the anterior compartment

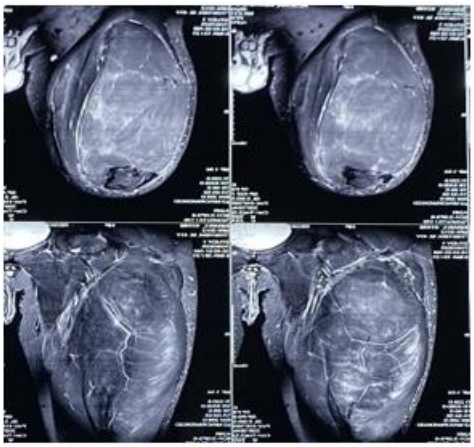

Figure 4: Fat suppressed MRI sequences in coronal view

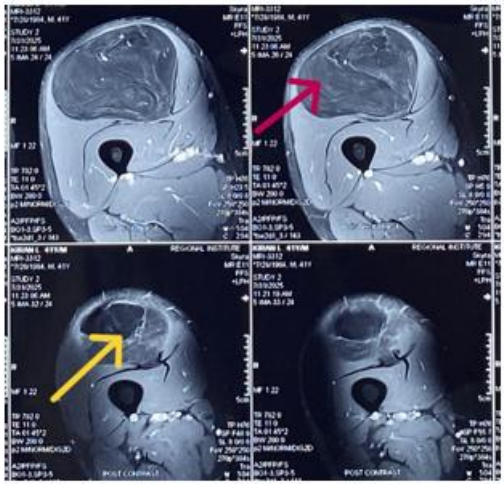

Figure 5: (Red arrow) Fat suppressed MRI sequence in axial view

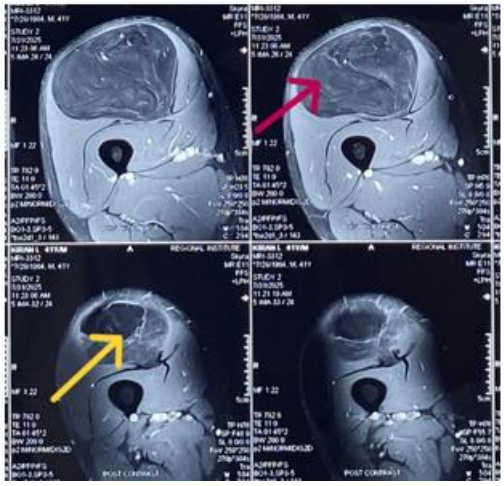

Figure 6: (yellow arrow) Post contrast MRI sequences showing no signficant post contrast enhancement