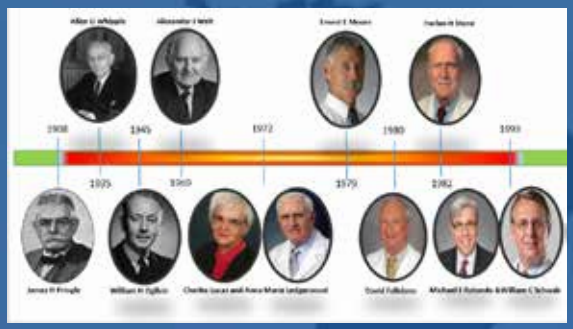
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Milestones and Key Figures in the Development of Damage Control Surgery

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Vastus lateralis intramuscular lipoma incarcerating the lateral femoral cutaneous nerve (LFCN)

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Abstract

Background: Intramuscular lipoma is an uncommon fatty tumor reported in up to 1.8% of all primary tumors of adipose tissue. It can occur at any age and is often found in the large muscles of the arms, legs and trunk. They have a slow growth and usually are asymptomatic. However, pain, paresthesia and decreased range of motion of the affected muscle have been reported.

Case Presentation: A 30-year-old male with a giant mass in the left thigh for 15 years, that had grown rapidly for the past 5 years. He complained of pain and a burning sensation when pressure was applied on the mass. MRI revealed an intra-intermuscular lipoma measuring: 31.6 x 10.3 x 11.6 cm.

Intervention: The patient underwent surgery. A giant a giant, yellow, intramuscular, lobulated mass was exposed. The mass was attached to the vastus lateralis muscle and originated from the periosteal layer of the trochanter. Dissection and cauterization of the capsule were carefully performed in order to prevent recurrences. Total resection of the mass was achieved.

Outcome: The postoperative course was uneventful. Full range of motion in both the hip and knee joints was preserved. The patient remains under continuous follow-up.

Conclusion: Intramuscular lipomas are deep-seated lesions that may resemble well-differentiated liposarcomas. Surgical excision is the treatment of choice in symptomatic patients and is also indicated for cosmetic reasons, particularly for giant lipomas. When sensory peripheral nerves are incorporated within the mass, nerve coagulation with intramuscular rerouting can be performed.

Keywords: Giant intramuscular lipoma, liposarcoma, vastus lateralis, FCLN incarceration.

Introduction

Intramuscular lipomas account for approximately 1.8% of all fatty tumors, with the most commonly reported location being the thigh, followed by the shoulder.[1] Age distribution shows a predominance of middle- to late-adult life, but intramuscular lipomas may occur in all ages.[1] Possible risk

factors linked to the development of intramuscular lipomas have been reported and include trauma, chronic irritation, obesity, developmental disorders, metabolic dysfunction and genetic factors.[2] Clinical presentation is often asymptomatic; patients usually complain of aesthetic discomfort. Pain is a late symptom due to the slow-growing nature of these lesions, often resulting in the compression of the adjacent tissue. Paresthesia and nerve distribution neurologic deficits have also been encountered.[2]

Case Report

We present the case of a 30-year-old male with a large mass in the left thigh for 15 years. A rapid increase in size over the past 5 years was noted. The patient reported pain and a burning sensation when pressure was applied on the mass. His body mass index (BMI) was 21.4. Recent significant weight loss was also reported. The patient is otherwise healthy, with no comorbidities and no history of trauma.

On physical examination a large, firm mass was palpable in the left thigh, without signs of erythema, discoloration, ulceration, or pruritus. No bruit was heard on auscultation, and distal pulses were normal. Neurologic examination revealed no motor deficits; however, meralgia paresthetica was noted upon strong digital pressure of the mass in the antero-lateral region of the left thigh.

MRI revealed a well-defined mass in the left femoral region measuring: 31.6 x 10.3 x 11.6 cm, compressing the quadriceps femoris muscle, with an intramuscular component in the vastus lateralis muscle [Figures 1,2,3]. The lesion was hyperintense on both T1- and T2-weighted images, with fat signal suppression on SAT sequences, and showed

Figure 1: Preoperative gadolinium-enhanced MRI of the thighs. T1-weighted coronal *(left and middle)* and T1-weighted axial *(right)* views demonstrating the maximum craniocaudal, transverse and anteroposterior dimensions of the mass. It displays a homogeneous high signal intensity with no contrast enhancement. Thin intralesional septa are noted.

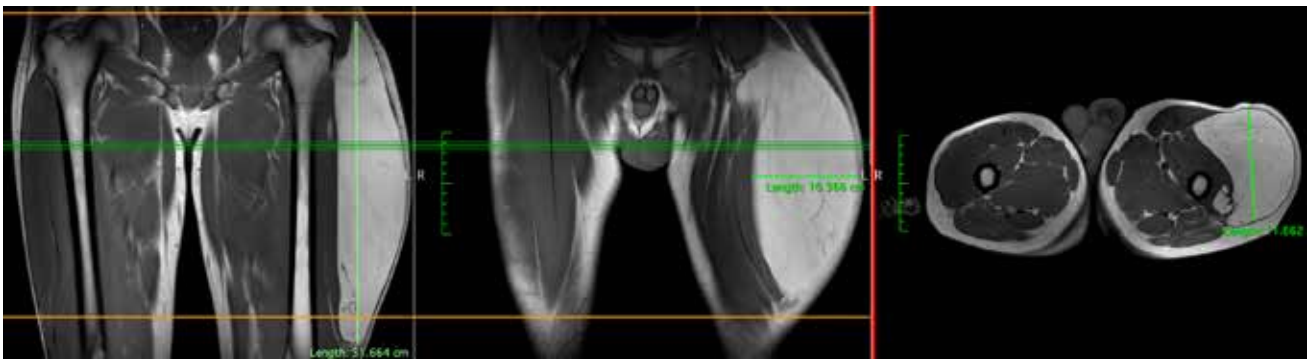
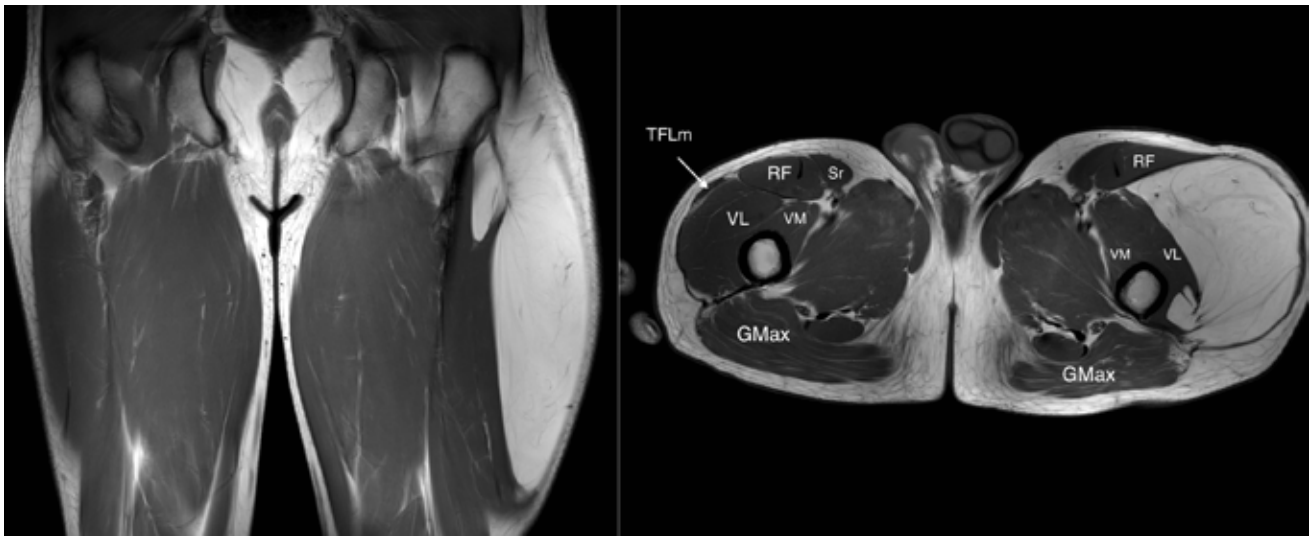


Figure 2: T1-weighted coronal *(left)* and axial *(right)* MRI showing an intermuscular lipoma and intramuscular compartment within the vastus lateralis muscle. VL, vastus lateralis; VM, vastus medialis; TFLm, tensor fascia latae muscle; RF, rectus femoris; Sr, sartorius; GMax, gluteus maximus.



no enhancement after contrast administration. The neurovascular bundle appeared normal; there was no evidence of inguinal adenopathy or bone changes. Radiological features were consistent with a giant intra-intermuscular lipoma.

Taking into consideration the rapid growth during the past years, the deep location, the physical discomfort of the patient and the paresthesia, the decision was made for mass excision.

Under general anesthesia, a curvilinear S-shaped incision over vastus lateralis muscle was performed, followed by subcutaneous dissection. The incision was extended along the entire longitudinal axis of the lesion. Intraoperatively, a giant, yellow, intramuscular, lobulated mass was excised. It was well-encapsulated and firm, with measurements 30.25 x 11.73 x 10.74 cm. [Figure 4]. The neurovascular bundle was preserved. The mass was attached to the vastus lateralis muscle, but no muscle fibres were incorporated within it. The impression was that of a mass originating from the outer periosteal layer of the trochanteric eminence, but osseous reactive changes such as bowing of the bone or erosion were not observed. Macroscopically, the appearance was consistent with a giant lipoma. Meticulous dissection and cauterization were done to reduce the risk of recurrence. The lateral femoral cutaneous nerve (LFCN) was found incarcerated within the mass and could not be safely dissected. The affected branch of the LFCN was coagulated, and an intermuscular re-routing to the vastus medialis muscle was performed. En block surgical resection of the mass was done. Specimens were taken and sent for biopsy.

The postoperative course was uneventful. Full range of motion in both the hip and knee joints was preserved. The patient was discharged the next day of surgery and has remained under continuous follow-up.

Histopathological examination revealed only mature adipose tissue, confirming the diagnosis of a lipoma [Figure 5].

At 6-months post-operative period, no recurrence was detected and the patient experienced a complete relief of symptoms.

Figure 3: T1-weighted axial image of the thighs. Lipomatous mass originating from the outer periosteal layer of the trochanter and near the femoral neck *(arrow).*



Figure 4: Intraoperative view of the giant lipoma.

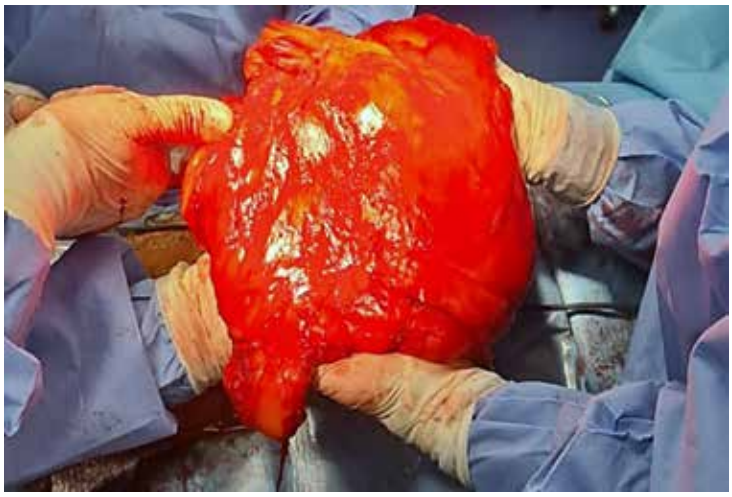
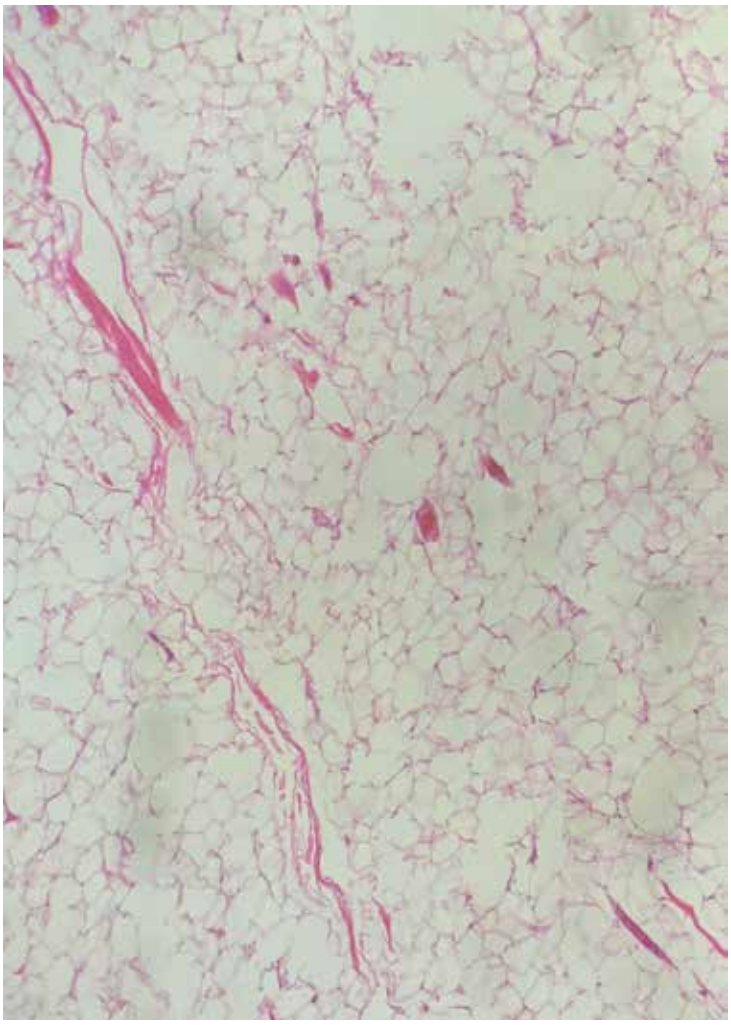


Figure 5: Benign tumor composed of mature adipocytes



Discussion

The main differential diagnoses in deep-seated fatty tumors include intramuscular lipomas and liposarcomas. Although intramuscular lipomas demonstrate their own characteristic radiological features, MRI is sometimes unable to distinguish them from well-differentiated liposarcomas.[3]

Clinically our patient presented with a giant mass that had been growing rapidly in the past five years; however, the lesion appeared spherical and firm with muscle contraction. The presence of a well-defined mass with thin septa on MRI, along with the absence of nodules and globular areas of other tumor tissue, favoured the diagnosis of an intramuscular lipoma. Surgical excision is the treatment of choice in symptomatic patients and is also indicated for cosmetic reasons, particularly for giant lipomas.[2] The mass was well-encapsulated; therefore, a marginal excision with meticulous cauterization at the level of insertions, was performed to prevent recurrences. However, long-term evaluation must be conducted.

Bassett et al. report that out of 55 patients with intramuscular lipoma, only 2 of them recurred after marginal resection and were linked to infiltration of the skeletal muscle.[4] Other studies describe a 0% recurrence rate with well-circumscribed intramuscular lipomas.[1] Lee et al. report a recurrent liposarcoma, previously confirmed as a lipoma, and they hypothesise the possibility of co-existence of both benign and malignant tissues, given that the mass was initially classified as a giant lipoma.[5]

To the best of our knowledge, only 10 cases of giant lipomatous tumors (diameter >10 cm) have been reported in the literature, with just two of these lesions localised in the lower limb.[6] Our case is also noteworthy in that it demonstrates an entrapment and incarceration of the lateral femoral cutaneous nerve (LFCN), necessitating coagulation of the involved branch. LFCN is a purely sensory nerve; therefore, its coagulation will not result in muscle atrophy. The nerve was rerouted intramuscularly to prevent the formation of a painful iatrogenic neuroma.

Conclusion

MRI provides the gold standard imaging modality in distinguishing between lipomatous masses. Surgical excision is the treatment of choice in symptomatic patients and is also indicated for cosmetic reasons, particularly for giant lipomas. Meticulous and complete resection of the capsule prevents recurrence. In cases when sensory peripheral nerves are incorporated within the mass, nerve coagulation is a safe procedure, and its intramuscular rerouting reduces the risk of painful iatrogenic neuroma.

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Author Contributions:

[AM] Responsible for neurologic evaluation of the patient and the follow-up. Literature review. Data collection, interpretation and analysis. Conception and the design of the manuscript. Writing of the draft manuscript.
[KP] Literature review. Data interpretation and analysis. Conception and writing of the introduction and the discussion sections. Editing and rewriting the draft manuscript. Writing of the final manuscript.
[IRr] Was the consultant pathologist. Examination of the specimen. Histological diagnosis and interpretation.
[MQ] Was the anesthesiologist in charge.
[RA] Was the attending surgeon responsible for the patient's care. Concepted the idea. Literature review. Provided data collection, interpretation and analysis. Supervision. Played a significant role by providing valuable critical insights. Editing the draft manuscript. Writing of the final manuscript.

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