Intramuscular lipoma of the scapular region

Yasmin Khalfe[1] BA, Ida Orengo[2] MD, George Van Buren II[3] MD FACS, Theodore Rosen[2] MD

Affiliations: [1]Baylor College of Medicine, Houston, Texas, USA, [2]Department of Dermatology, Baylor College of Medicine, Houston, Texas, USA, [3]Division of Surgical Oncology, Baylor College of Medicine, Houston, Texas, USA

Corresponding Author: Ida Orengo MD, 1977 Butler Boulevard, Suite E6.200, Houston, TX 77030, Tel: 713-798-6624, Email: iorengo@bcm.edu

Abstract

Intramuscular lipomas are rare, benign soft tissue neoplasms characterized by infiltrative growth into muscle tissue or between muscle fibers. These benign tumors can present similarly to malignant soft tissue neoplasms, such as liposarcomas. Unlike subcutaneous lipomas, intramuscular lipomas require diagnostic imaging to better distinguish the tumor and rule out alternative, malignant etiologies. It is imperative that dermatologists are able to identify this rare lipoma variant and have a thorough understanding of the diagnosis, imaging, and treatment options for this uncommon soft tissue tumor. Our case serves as a reminder for dermatologists to be cognizant of this rare tumor and aware of the importance of diagnostic testing in ruling out similarly-presenting, soft tissue malignancies.

Keywords: atypical lipomatous tumor, diagnostic imaging, intramuscular lipoma, liposarcoma, magnetic resonance, soft tissue malignancy, surgery

Introduction

Intramuscular lipomas are benign soft tissue neoplasms characterized by infiltrative growth into muscle tissue or between muscle fibers. These uncommon tumors account for less than 1% of all lipomas and their exact etiology remains unknown [1]. From a clinical standpoint, intramuscular lipomas can present similarly to malignant soft tissue neoplasms; therefore, it is imperative that dermatologists and surgeons are able to identify this variant and distinguish it definitively through appropriate diagnostic studies. Most importantly, it is crucial to rule out malignant tumors included in the differential diagnosis, such as well and poorly differentiated liposarcoma and other atypical fatty tumors. Herein, we report an unusual presentation of an intramuscular lipoma in an 84-year-old man with the goal of clarifying the diagnosis, imaging, and treatment options for this rare soft tissue tumor and differentiating it from similarly presenting conditions.

Case Synopsis

An 84-year-old man with a history of multiple, treated non-melanoma skin cancers (NMSC) presented with a new, slow-growing mass in the right scapular region (**Figure 1**). The patient's wife had first noticed the mass appear two months prior when she pointed out a large lump on the upper back near the right axilla which she had described as being the size of a tennis ball. The patient stated that since the mass was first noted, it had gradually increased in size over the course of the last two months. He denied any itchiness, pain, bleeding, or drainage at the site and was otherwise asymptomatic. He also denied any additional new skin lesions and had no recent history of travel or new exposures. In addition, he denied any recent history of trauma, weight loss, or previous history of radiation exposure.

On examination, a 5cm×5cm dome-shaped nodule was palpated lateral to the scapula and inferior to the axillary region. The mass was well-circumscribed,

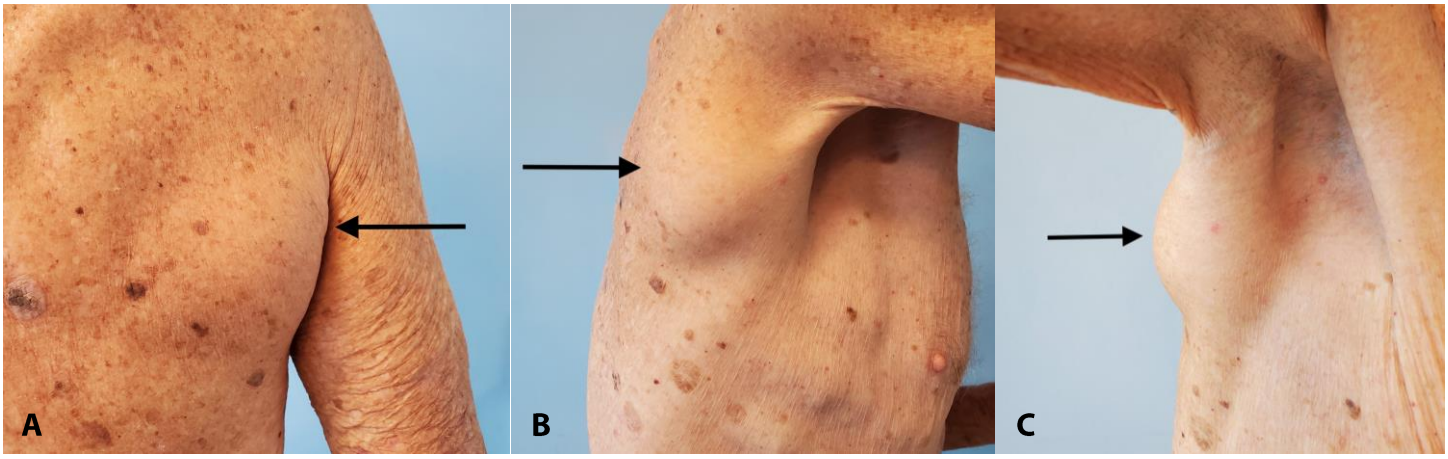

Figure 1. *A well-circumscribed, non-tender and mobile mass lateral to the scapula from the **A)** posterior view, **B)** lateral view, and **C)** anterolateral view.*

non-tender, and freely mobile with a rubbery consistency. There were no overlying skin or mucosal changes and no cervical, axillary, or inguinal lymphadenopathy was discernable. Owing to the inability to rule out malignancy, radiologic imaging was performed. Magnetic resonance imaging (MRI) showed an intramuscular fat signal intensity mass lateral to the scapular body within the latissimus dorsi muscle measuring 4.4cm by 4.0cm by 5.5cm (**Figure 2**). The mass followed fat signal intensity on all sequences and no internal enhancement, nodularity, or adjacent bony destruction were seen.

With this, a diagnosis of a benign intramuscular lipoma was established. After thorough discussion of the diagnosis and treatment options including limited biopsy, the patient declined surgical excision or biopsy and opted to observe the lesion and follow up in one year, or as necessary.

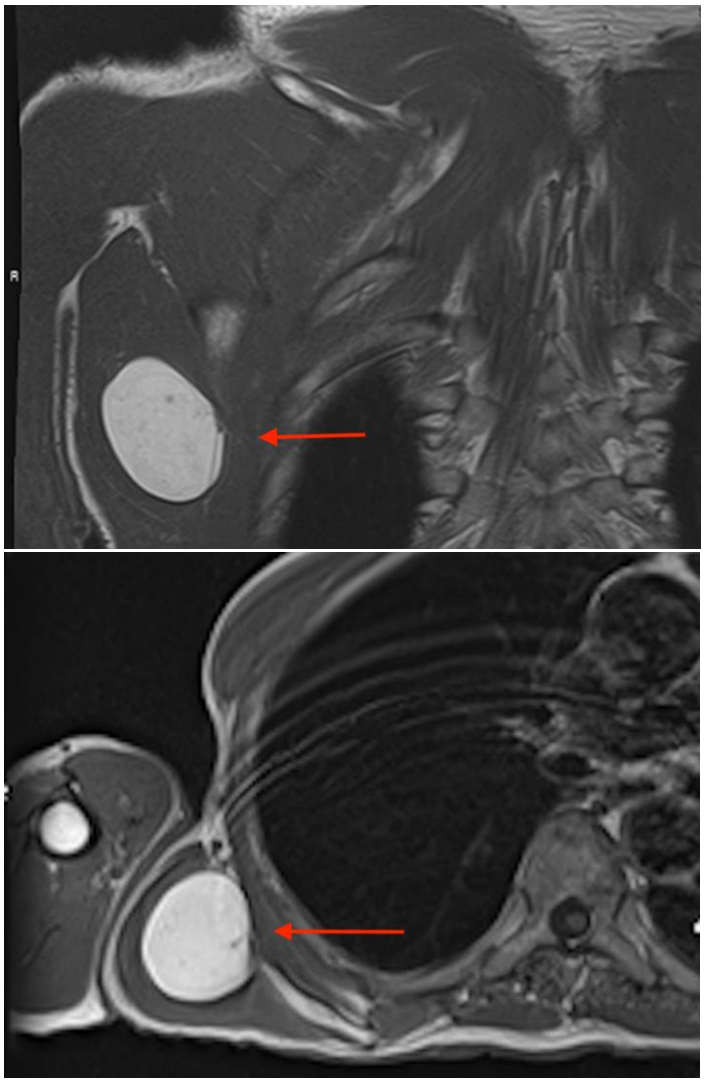

Figure 2. *Magnetic resonance imaging of the chest showing an intramuscular fat signal intensity mass lateral to the scapular body within the latissimus dorsi muscle with no internal enhancement, nodularity or adjacent bony destruction in the **A)** frontal view and **B)** transverse view.*

Case Discussion

Lipomas are the most common benign soft tissue neoplasms. They typically present as painless nodules made up of adipocytes. Lipomas normally arise subcutaneously. However, they can uncommonly present in deeper locations including muscle. Intramuscular lipomas are uncommon, accounting for less than 1% of all lipomas [1]. They are characterized by infiltration into muscle tissue or growth between muscle fibers. Because of their location within muscle, intramuscular lipomas frequently present without symptoms until they can

grow large enough to cause neurovascular compression or pain.

The differential diagnosis for a lipoma in this patient's location includes other soft tissue tumors, such as liposarcoma, atypical lipomatous tumor, and hibernoma. A hibernoma is another rare benign tumor composed of brown fat. It typically presents as a nontender nodule that is commonly found on the back, particularly in the inter-scapular area [2]. Hibernomas can be indistinguishable clinically from lipomas and malignant soft tissue tumors. Therefore, radiographic imaging is utilized to further evaluate suspicious tumors; MRI of a hibernoma will show a well-circumscribed mass slightly hypointense to fat on T1- and T2-weighted images [3]. In contrast, imaging from our case followed fat signal intensity on all sequences, making hibernoma less likely.

Most importantly, it is imperative to rule out malignant tumors in the differential diagnosis, such as liposarcoma and atypical lipomatous tumors/well-differentiated liposarcomas. Atypical lipomatous tumors and well-differentiated liposarcomas are essentially synonymous entities, from both morphologic and karyotypic standpoints [4]. These tumors are low-grade malignancies that rarely metastasize and can be managed with excision and radiation without chemotherapy [5]. Of greatest concern, when investigating soft tissue masses, is the possibility of high-grade, aggressive liposarcoma. Liposarcomas occur anywhere fat is present and have been reported to make up 7% to 27% of all soft tissue sarcomas [6]. The concern for an aggressive malignancy, such as liposarcoma, was particularly high in our patient given the new onset, reported rapid growth, and large size of the mass. Additionally, previous studies have suggested that the possibility of liposarcoma should always be considered, especially if the patient is male and the tumor is larger than 5cm [5].

Although liposarcoma must be ruled out when investigating a soft tissue mass, it may be difficult to distinguish this type of malignant tumor from an intramuscular lipoma. Uncertain diagnosis can further cause issues as complete excision of all masses may not be justified if there is a low risk of malignancy, high cost of surgery, or possibility for complications and patient discomfort [7]. On the other hand, it has been reported that on rare occasions, lesions preoperatively diagnosed as a lipoma based on clinical and imaging findings were later diagnosed as a liposarcoma postoperatively based on pathology [5]. With this, it is important to utilize diagnostic testing to accurately determine the appropriate preoperative diagnosis.

In diagnosing intramuscular lipomas and other soft tissue masses, multiple imaging studies can be utilized for evaluation. Initial assessment of a mass typically begins with radiographic evaluation. Although plain radiographs may be unremarkable, some can demonstrate a radiolucent soft-tissue mass of fat opacity [8]. In fact, in one study of 454 patients with a proven soft tissue mass, 62% showed a positive radiographic finding [9]. Radiographs can reveal skeletal deformities that may be confused with soft tissue masses and may also be show osseous involvement [10]. Limitations to radiographic evaluation include complex areas—in particular the spine, pelvis, and deep soft tissues of the hands and feet [11]. Adjunctive imaging is often necessary. Another initial diagnostic method that is increasingly being used to evaluate soft-tissue masses is ultrasonography. The use of ultrasound is most advantageous for lesions superficial to the deep fascia [11]. Additionally, ultrasonography can be valuable in distinguishing cysts from solid masses [11]. Although ultrasonography can be used for initial diagnostic imaging, limitations exist for confident identification of adipose tissue when diagnosing intramuscular lipomas [8].

After initial diagnostic imaging, CT or MRI can be utilized to further assess soft tissue tumors, as these methods are more accurate at identifying the fatty nature of lipomas [8]. CT can be advantageous in particular for evaluating structures with osseous elements [10]. This method may show osseous remodeling, periosteal reactions, and matrices not seen on initial imaging. Additionally, CT has the benefit of being easily available, fast, and tolerable for patients [11,12]. Intramuscular lipomas appear on CT as a hypodense mass within muscle and attenuation is similar to fatty tissue [8]. Although CT is a beneficial imaging modality, MRI has been

established as the method of choice for both diagnosing and staging musculoskeletal soft-tissue masses [10]. Owing to its multiplanar capability and ability to assess both bone and tissue, MRI is advantageous compared to other imaging modalities [10]. The fatty tissue in intramuscular lipomas demonstrates high signal intensity on both T1- and T2-weighted images [8]. Disadvantages to using MRI include a limited ability to establish soft tissue calcification and the possibility of nonspecific findings [10].

MRI is also the gold standard used for evaluating soft tissue tumors for malignancy. In general, it is understood that the larger the mass, the more likely the probability of malignancy. However, imaging of an intramuscular lipoma may display varied findings from small to large size, as well as homogenous to inhomogeneous signal intensity [13]. In a retrospective comparison of benign intramuscular lipomas and malignant liposarcomas, it was found that intermingled muscle fibers were frequently observed in intramuscular lipomas; this presence of an infiltrative margin is suggestive of benign rather than malignant pathology [14]. Additionally, uninodularity of a mass is a finding indicative of intramuscular lipoma, whereas multinodularity is more common in liposarcomas and may help to distinguish between benign and malignant neoplasms tumors [14].

In terms of biopsies of soft-tissue masses, there is not a set guideline as to when biopsy is indicated. Although biopsy can lead to a more definitive diagnosis, an improper biopsy can disrupt compartmental anatomy and risk tumor seeding [10]. Rougraff et al. propose that a biopsy is indicated in soft tissue masses larger than 3cm and masses that are actively growing or symptomatic [15]. Biopsies can be completed using fine needle aspiration (FNA), trocar, incisional biopsy, or excisional biopsy. Although studies are limited, FNA has been found to have a lower accuracy in diagnosis when compared to core needle biopsy; incisional biopsy has shown to be more accurate than core biopsy [15]. In patients with a non-diagnostic MRI, excisional biopsy can be performed [15]. In evaluating intramuscular lipomas and other soft tissue masses, we suggest initial evaluation with radiographs followed by MRI for further characterization. If the mass is greater than 3cm or evolving, and the patient consents, an image-guided biopsy may be done in coordination with the surgeon performing the resection.

Once malignancy is ruled out, treatment of an intramuscular lipoma is dependent on various factors including tumor location, size, and symptoms. If a lipoma causes functional impairment or cosmetic concern for a patient, surgical excision is the treatment of choice [1]. It is important for dermatologists and surgeons to have a thorough knowledge of the anatomy near the tumor site as intramuscular lipomas require deeper incision onto fascia and muscle which can increase the risk of damage to neurovascular bundles and vital muscle structures [16]. A combination of marginal excision of the well-circumscribed area and wide excision in the infiltrative areas is recommended to prevent recurrences, as an inadequate surgical margin is believed to be the major cause [1,17,18]. Alternatively, observation and reassurance are acceptable management approaches of an intramuscular lipoma given the benign nature of the neoplasm. As seen with our case, a patient may opt to observe their tumor and pursue regular follow up as needed. As previously discussed, distinguishing between benign intramuscular lipomas and malignant liposarcomas may be difficult based solely upon imaging. Therefore, if conservative management is pursued, it is important to educate patients about the necessity of monitoring for growth and other skin-related or systemic changes.

Conclusion

Intramuscular lipomas are rare lipoma variants that present as benign tumors found deep within or between muscle. Unlike subcutaneous lipomas, intramuscular lipomas require diagnostic imaging in order to better characterize the tumor and investigate the possibility of alternative, malignant etiologies. However, intramuscular lipomas and well-differentiated liposarcomas/atypical lipomatous tumors can be difficult to distinguish. Most importantly, liposarcoma must be ruled out when

investigating a soft tissue mass. Therefore, it is imperative that dermatologists and surgical specialists are aware of the distinguishing features and suggestive imaging of each diagnosis. Additionally, a lack of knowledge about intramuscular lipomas may lead to unsuccessful surgical intervention and recurrence. Because intramuscular lipomas are uncommon, there is a lack of extensive literature on the subject and currently there are no universally accepted set of clinical diagnostic standards to follow. Thus, our case serves as a reminder for dermatologists and surgeons to be cognizant of this uncommon tumor, and be aware of the importance of diagnostic testing in ruling out similarly-presenting, soft tissue malignancies.

Potential conflicts of interest

The authors declare no conflicts of interest.

References

1. McTighe S, Chernev I. Intramuscular lipoma: A review of the literature. *Ortho Rev.* 2014;6:156-163. [PMID: 25568733].
2. DeRosa DC, Lim RB, Lin-Hurtubise K, Johnson EA. Symptomatic hibernoma: a rare soft tissue tumor. *Hawai'i J Med Public Health* . 2012;71:342-345. [PMID: 23251871].
3. Daubner D, Spieth S, Pablik J, et al. Hibernoma - two patients with a rare lipoid soft-tissue tumour. *BMC Med Imaging.* 2015;15. [PMID: 25885469].
4. Nagano S, Yokouchi M, Setoguchi T, et al. Differentiation of lipoma and atypical lipomatous tumor by a scoring system: Implication of increased vascularity on pathogenesis of liposarcoma. *BMC Musculoskelet Disord.* 2015;16. [PMID: 25879189].
5. Sato D, Suga H, Takushima A. Liposarcoma Preoperatively Diagnosed as Lipoma: 10-Year Experience at a Single Institution. *Dermatol Surg.* 2018;44:1065-1069. [PMID: 29659409].
6. Terzioglu A, Tuncali D, Yuksel A, Bingul F, Aslan G. Giant Lipomas: A Series of 12 Consecutive Cases and a Giant Liposarcoma of the Thigh. *Dermatol Surg.* 2004;30:463-467. [PMID: 15008886].
7. Yang Y, Damron TA, Cohen H, Hojnowski L. Distinction of well-differentiated liposarcoma from lipoma in two patients with multiple well-differentiated fatty masses. *Skeletal Radiol.* 2001;30:584-589. [PMID: 11685482].
8. McTighe S, Chernev I. Intramuscular lipoma: a review of the literature. *Orthop Rev (Pavia).* 2014;6:5618. [PMID: 25568733].
9. Gartner L, Pearce CJ, Saifuddin A. The role of the plain radiograph in the characterization of soft tissue tumors. *Skeletal Radiol.* 2009;38:549–558. [PMID: 18566812].
10. Knapp EL, Kransdorf MJ, Letson GD. Diagnostic imaging update: soft tissue sarcomas. *Cancer Control.* 2005;12:22-26. [PMID: 15668649].
11. Kransdorf MJ, Murphey MD. Imaging of soft-tissue musculoskeletal masses: fundamental concepts. *Radiographics.* 2016;36:1931-1948. [PMID: 27726739].
12. Subhawong TK, Fishman EK, Swart JE, Carrino JA, Attar S, Fayad LM. Soft-tissue masses and masslike conditions: what does CT add to diagnosis and management? *AJR Am J Roentgenol.* 2010;194:1559-1567. [PMID: 20489097].
13. Sanaa K, Mariame M, Nissrine A, et al. Diffuse intramuscular lipoma responsible for monomelic hypertrophy. *J Dermatol Surg.* 2016;20:78-81. [DOI: 10.1016/j.jdds.2015.07.005].
14. Matsumoto K, Hukuda S, Ishizawa M, Chano T, Okabe H. MRI findings in intramuscular lipomas. *Skeletal Radiol.* 1999;28:145-152. [PMID: 10231912].
15. Rougraff BT, Aboulafia A, Biermann JS, Healey J. Biopsy of soft tissue masses: evidence-based medicine for the musculoskeletal tumor society. *Clin Orthop Relat Res.* 2009;467:2783-2791. [PMID: 19597901].
16. Barde NG, Sacchidanand S, Madura C. Frontalis-associated lipoma: A rare case report. *Indian J Dermatol.* 2014;59:96-98. [PMID: 24470674].
17. Su CH, Hung JK, Chang IL. Surgical treatment of intramuscular, infiltrating lipoma. *Int Surg.* 2011;96:56-59. [PMID: 21675621].
18. Han HH, Choi JY, Seo BF, et al. Treatment for intramuscular lipoma frequently confused with sarcoma: A 6-year restrospective study and literature review. *BioMed Res Int.* 2014;2014. [PMID: 25574469].