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Case Report

Upper extremity mass with lipomatous axillary involvement and multiple level encasement of the brachial plexus ☆,☆☆

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ABSTRACT

A 40-year-old female presented for surgical consultation of an upper extremity soft tissue mass. Initial ultrasound report recorded a 5.5 cm mass, consistent with a subcutaneous lipoma. Intra-operative visualization revealed an intramuscular lipoma emerging from brachialis muscle. Post-excision MRI was ordered for continued axillary fullness which revealed lipomatous extension into axilla and posterior arm with multiple level encasement of the brachial plexus. Lipomas with brachial plexus involvement are rare and can present with a range of symptoms and distortion of local anatomy. Surgical debulking is challenging requiring microsurgical expertise for adequate removal and to minimize long-term neurological deficits.

Introduction

Benign, subcutaneous lipomas are the most common soft tissue tumors found in adults. Rarely, lipomas are localized deep to the fascia or originate within muscles, defined as deep-seated and intramuscular lipomas, respectively [1–11]. In other rare occasions, these deep-seated lipomas can be intermuscular, traversing fascial compartments and their associated components [2,4–7]. Patients may experience symptoms such as pressure, pain, or even sensory and motor deficits due to continued lipoma growth and compression of the surrounding neurovascular structures [1,2,7,13]. We describe such a case with an unusual presentation of an irregularly shaped, infiltrating lipoma of the axilla, upper arm, and multiple levels of brachial plexus involvement.

☆ Competing Interests: The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.
☆☆ This case report complies with the Declaration of Helsinki. Informed patient verbal and written consent was obtained for the use of case details and images.

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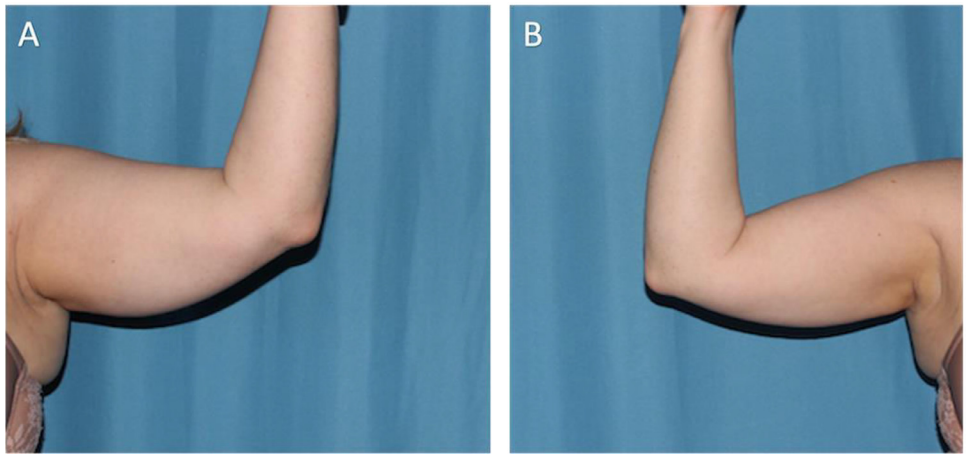

Fig. 1 – Initial consultation photos of right vs left arm in elbow flexion, demonstrating size discrepancy prior to surgery. (A) Left arm. (B) Right arm.

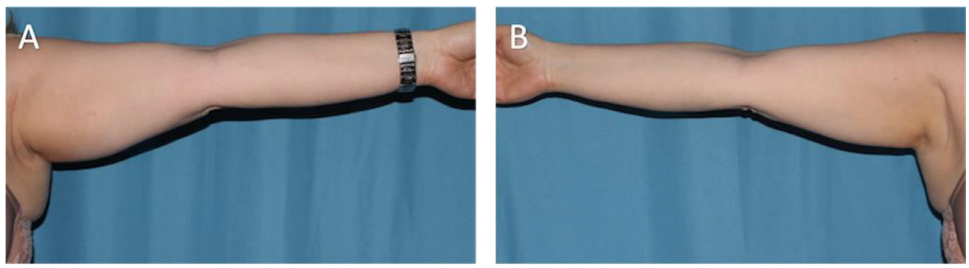

Fig. 2 – Initial consultation photos of right vs left arm in elbow extension, demonstrating size discrepancy prior to surgery. (A) Left arm. (B) Right arm.

Case report

Written, informed consent was obtained from the patient for this case report, including photographs and radiological images. A 40-year-old female, in overall good health, presented for consultation of liposuction-assisted lipoma extraction of the left upper arm after she was diagnosed with a subcutaneous lipoma at an outside facility. Ultrasound impression at the referring facility reported a hypoechoic mass measuring 5.5 × 2.9 cm in the left upper extremity, consistent with a superficial lipoma. She followed up at our office a year later, during which she reported continued growth, as well as the development of upper arm discomfort. She denied associated numbness or paresthesia in the forearm or hand. Physical exam suggested a subfascial, firm and mobile mass. Due to the size and location of the mass, surgical excision was recommended and scheduled for the next month. Photos were taken at time of consultation (Figs. 1 and 2).

On the day of surgery, possible intermuscular or intramuscular lipoma was suspected due to increased prominence with elbow flexion and decreased with extension. A 6 cm longitudinal incision was made down arm, beginning approximately 4 cm below the bicipital groove. The lipoma was not visualized until biceps brachii muscle was retracted. The medial cutaneous nerve of the forearm was identified medially and musculocutaneous nerve laterally. The lipoma was encased in fascia with a distinct capsule and emerging from brachialis muscle (Fig. 3). Dissection was performed using peanut dissectors to ensure the neurovascular bundles were left intact. Proximally, the lipoma appeared to be traveling towards the coracobrachialis tendon and distally, travelling deep towards the intermuscular septum. Final pathology report revealed a 7.0 × 5.5 cm specimen of mature adipose tissue with fragments of benign skeletal muscle, consistent with intramuscular lipoma.

Her immediate postoperative period was insignificant with pain well-controlled and no evidence of seroma, hematoma, or infection (Fig. 4). The patient admitted to initial numbness along the ulnar border of her left forearm and paresthesia, which ultimately improved over the course of her 5 post-op visits. However, at her 6-month post-op visit she reported continued numbness of the posterior arm and axillary fullness, proximal to the surgical site. Due to persistent discomfort, she was referred for upper extremity MRI.

MRI revealed 2 additional, superior lipomatous mass components, laterally and medially. The superior, lateral component extended between the deltoid muscle and the proximal triceps muscle belly. The superior, medial component extended just inferior to the glenoid and immediately

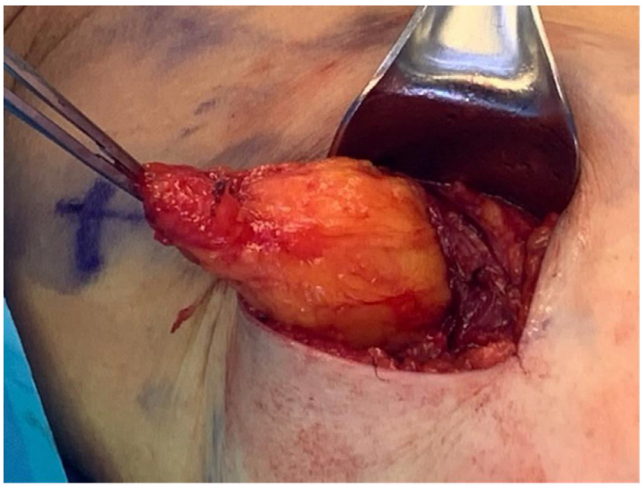

Fig. 3 – Intraoperative photograph. The soft tissue mass was encapsulated and confirmed to be subfascial and deep to biceps brachii muscle, embedded within brachialis muscle.

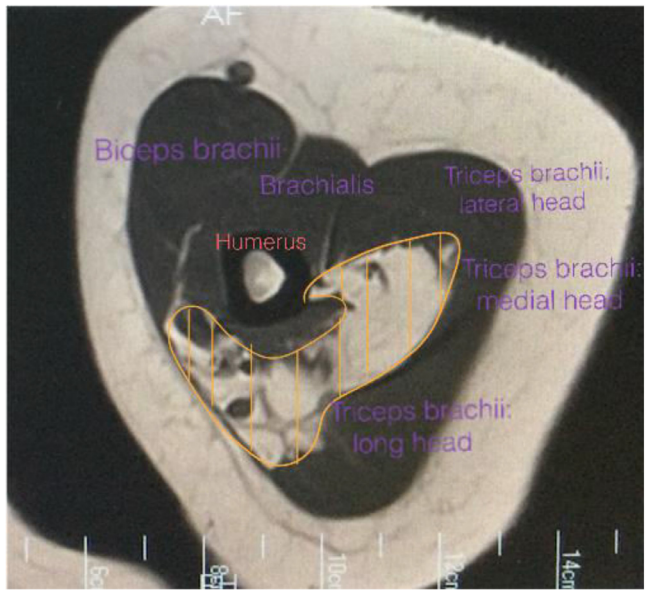

Fig. 5 – The inferior/lateral aspect of the soft tissue mass (highlighted in gold) at the level of the mid humerus visualized on the following axial series images, encircling the arteries and veins, and nerves directed laterally towards the triceps.

posterior to the short head of biceps brachii muscle. The 2 components joined as they wrapped under the teres minor tendon and tracked down the deep, posterior arm, displacing the triceps muscle belly posteriorly. The most anterior/medial margin of the mass was visually inseparable from the neurovascular bundle, appearing to surround the brachial artery and vein, as well as the median and ulnar nerves (Figs. 5 and 6). Overall dimensions were estimated to be approximately 12 × 8 cm with a depth of 4 cm (Fig. 7). Due to extensive brachial plexus involvement, the patient was referred to an upper extremity and hand peripheral nerve surgeon.

We followed up with the patient after her second and final surgery, who reported successful removal of a football-sized mass. The plastic and reconstructive surgery team worked with vascular during a 10-hour surgery. Her incision spans from her collarbone to inner elbow. Due to the size and intercompartmental nature of the mass, the surgeons began with an anterior approach and continued dissection in anteroposterior fashion, increasing depth until the mass could be scooped out. Pathology was consistent with a benign lipoma. She has since returned to work and continues physical therapy with great progress, including full range of motion of the left arm.

Discussion

Lipomas are mature fatty tumors that most commonly are benign and form superficial to the enclosing fascia [1–11]. A deep-seated lipoma is defined as a localization beneath the fascia, and when situated between or within muscle is known as an intermuscular or intramuscular lipoma, respectively [1,2,4–7]. Deep-seated lipomas are much less common with intramuscular lipomas making up only about 1%-2% of all primary adipose tumors and intermuscular lipomas composed of even less than that [1,2,4–6,11]. Intramuscular lipomas can

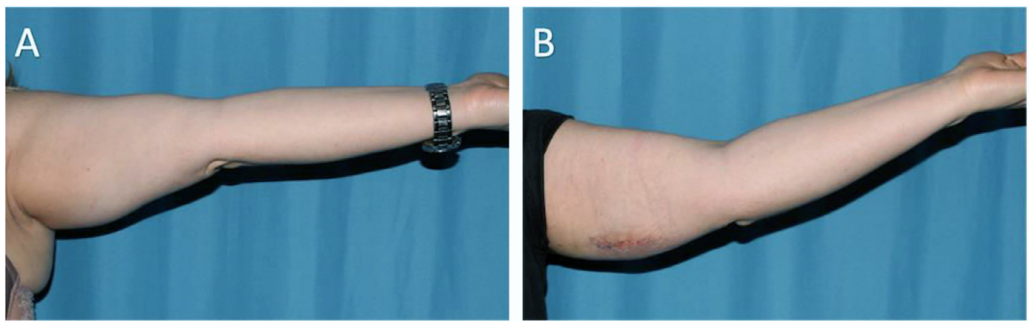

Fig. 4 – Photos comparing left arm at initial consultation versus post-operative visit. (A) Initial consultation. (B) Post-op initial debulking surgery.

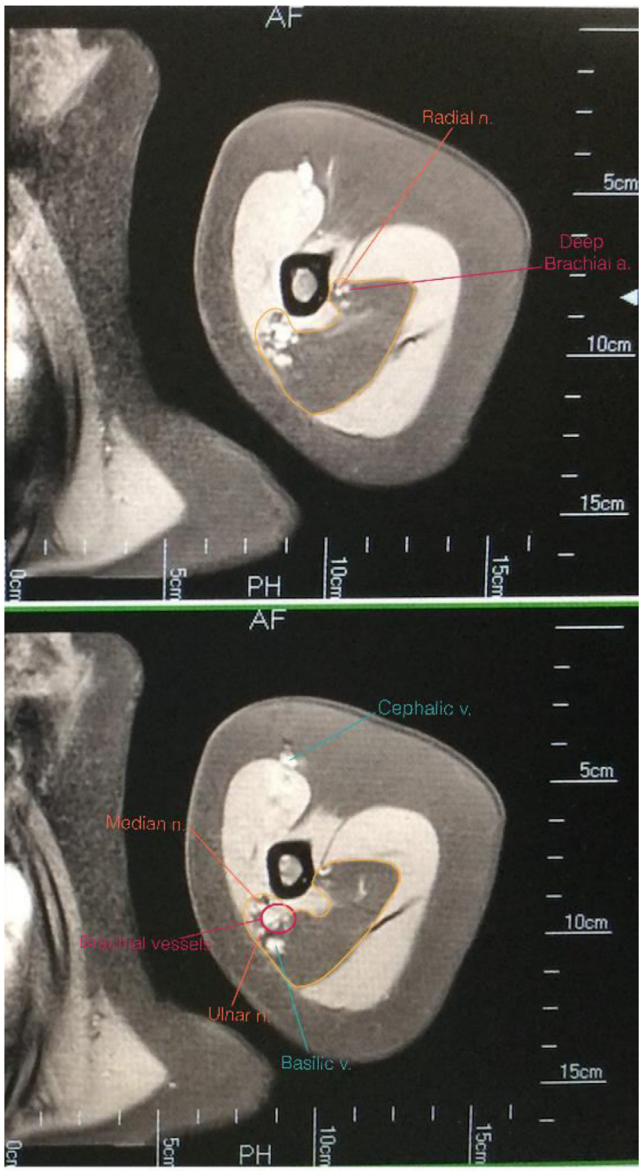

Fig. 6 – Axial T1 FSE Fat Saturation MR of the upper extremity demonstrating lipoma involvement (highlighted in gold) with multiple levels of the brachial plexus including the ulnar, median and radial n., as well as the brachial vessels and deep brachial a.

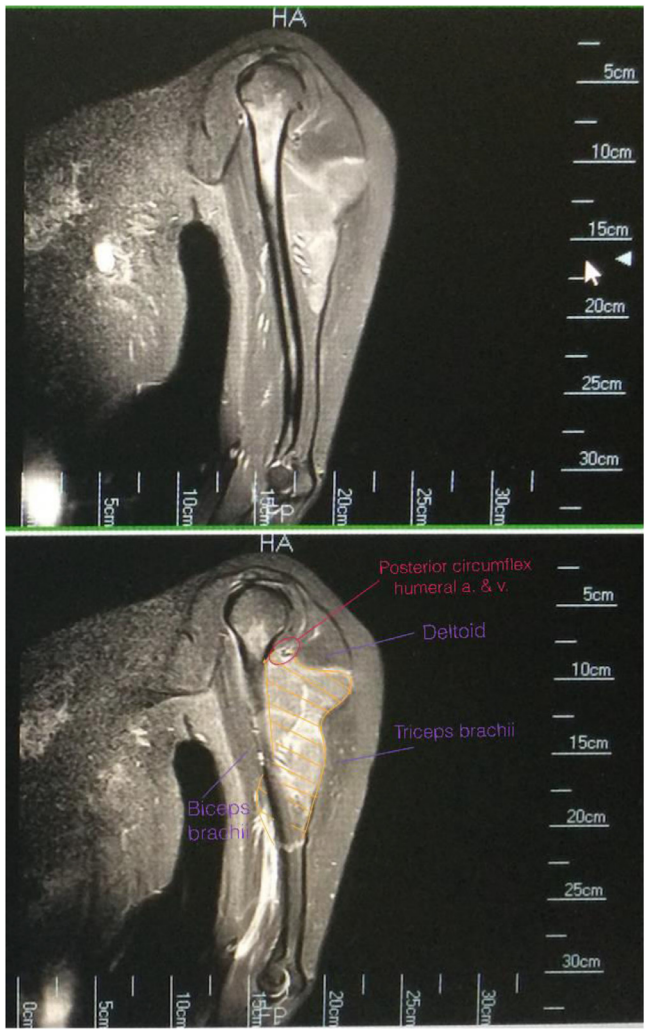

Fig. 7 – Soft tissue mass visualized on sagittal STIR MRI images. Overall dimensions of lipomatous tissue (highlighted in gold) measured approximately 12 cm craniocaudal by 8 cm transverse by 4 cm AP.

grow via expansion making it difficult to discern the exact location of origin once this expansion has occurred [1]. As seen in this case, extensive expansion of the mass not only blurs the origin as it traverses multiple compartments but is also capable of distorting the normal anatomy.

Giant lipomas classified as greater than 5 cm, can become symptomatic due to crowding especially when the lipoma is present in smaller muscle compartments such as the upper arm [2–4,6]. Symptoms include new onset pain, sensory or motor changes from encroachment on neighboring neurovascular structures [1–6]. Radiologic imaging is crucial to first analyze the characteristics of the mass to rule out features suggestive of a liposarcoma or atypical lipomatous tumor (ALT). This can be difficult to discern as the features of intramuscular lipomas can resemble a well-differentiated liposarcoma (WDLS) [1,2,5–7]. Superficial lipomas have high sensitivity and specificity with ultrasound, while deep-seated lipomas have more varied characteristics on ultrasound and physical exam [11]. Most benign lipomas are hyperechoic or isoechoic on ultrasound, though they can be hypoechoic as in this case. With variations outside the norm, other differential diagnoses should be ruled out, including a malignant process.

ALT and WDLS, which are locally aggressive tumors, are often grouped together in the literature and referred to synonymously since they are identical morphologically, only differing by tumor location [12,13]. ALTs are in areas accessible for surgical resection such as the trunk and extremities, where tumors in regions that cannot be resected such as the retroperitoneum, are termed WDLS [12,13]. Both ALT and WDLS are considered low-grade malignancies as they are not known to cause distant metastases, as their aggressive liposarcoma

counterpart [12]. However, surgical resection is still important to confirm pathology, to eliminate the potential for dedifferentiation, although rare especially in the superficial locations, and to minimize persistent local advancement of disease [13].

Imaging also allows for proper preoperative planning to assess the relationship of the lipoma with neighboring anatomical structures. Ultrasonography is typically a good and convenient choice of imaging for initial diagnosis, though MRIs and CT scans are superior diagnostic modalities [1–3,6,11]. This is important to keep in mind because while MRIs aren't considered first-line, with less detailed imaging you won't have a visual of the anatomical relationship to adjacent structures until the day of surgery [1,6,11].

Some authors endorse liposuction as an alternative treatment option to surgical excision, due to its minimal invasiveness, especially in patients concerned with postoperative scarring [8]. However, liposuction can be challenging and dangerous in deep-seated lipomas, especially when situated in small anatomical spaces. Thus, anatomical location and compartment are important pre-operative considerations. Additionally, liposuction has limited visibility making it difficult to ensure complete tumor removal, as they often span in multiple directions [6–8]. Compartment syndrome is also a risk with local trauma, as it occurs due to increased volume within a contained fascial space, such as from bleeding or edema, which are possible side effects of liposuction [9,10]. For these reasons, we prefer surgical excision to prevent excess inflammation and to minimize damage to the surrounding tissues.

Operative treatment of brachial plexus tumors does carry a high risk for intraoperative damage to the network of nerves. Authors report concurrent goals for surgical excision to include gross total resection and preservation of neurological function [14]. Consensus on the best approach to achieve these goals is microsurgical resection with intraoperative electrophysiological monitoring [14,15]. Tumor debulking is often necessary in areas without neural involvement [15]. In our case, initial debulking was performed prior to discovery of inter-compartmental and brachial plexus involvement [15]. Brachial plexus lipoma excision is often necessary to alleviate existing symptoms, prevent further growth and subsequent complications; surgical removal requires microsurgical expertise for adequate tumor removal and to minimize long-term neurological deficits.

Conclusion

Lipoma removal via surgical excision is advantageous as it provides a surgical window for proper assessment of anatomical location and the surrounding structures. This minimizes unnecessary damage to surrounding tissues and increases the likelihood of complete tumor resection and thus, reducing lipoma recurrence [1,4,6–8]. Additionally, visualization is imperative in cases such as this one, where the preoperative radiology impression was inaccurate. As tumor extension is identified in danger zones such as the brachial plexus, microsurgical resection is warranted with intraoperative nerve stimulation to avoid neural compromise. This case stresses the importance of proceeding with a stepwise surgical approach, despite a seemingly simple case.

Patient consent

We certify that both verbal and written, informed consent was obtained from patient for the use of the details of this case report, including photographs and radiological images. This statement has been included in the case report manuscript as well.

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