Well-circumscribed deep-seated lipomas of the upper extremity. A report of 13 cases

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Summary
Background: The purpose of this study is to determine if giant size is of bad prognosis in deep lipomas of the upper extremity.

Patients and methods: We report a retrospective study of 13 patients with deep-seated lipomas of the upper extremity treated during the period from April 1997 to April 2008. We evaluated the clinical and radiological characteristics, treatment and evolution profile of these patients.

Results: There were 10 women and three men, with an average age of 53 years (range 30–79 years). Seven of these lipomas were in the arm, one in the shoulder, and five in the forearm. Six lipomas were intramuscular, six intermuscular (three of them being attached to bone and labelled parosteal lipoma) and one epivaginal lipoma of the flexor tendon sheath. All patients presented a progressive slow-growing mass that was associated with radial paralysis in one case and carpal tunnel syndrome in one case. Plain radiographs showed a radiolucent soft-tissue image in all cases and an associated osteochondroma in one parosteal lipoma. Computer tomography (CT) or magnetic resonance imaging (MRI) suggested the lipomatous nature and benign characteristics of these deep lipomas that were giant in all cases (mean size: 7 cm). Lipoma marginal excision was performed and histopathological examination demonstrated features consistent with a benign lipoma. There was good function and no clinical recurrence was observed after a mean follow-up of three years.

Discussion: Giant deep-seated lipomas of the upper extremity are uncommon and can be intermuscular or intramuscular. A painless soft-tissue mass is the most frequent chief complaint. MRI with fat suppression suggests the diagnosis and studies the extension of deep lipoma. Marginal excision is the treatment of choice and histopathology eliminates diagnosis of well-differentiated liposarcoma.

Conclusion: Appropriate evaluation of deep lipoma is to rule out malignancy by systematically performing MRI and biopsy. In contrast to deep-seated lipomas of the lower extremity or the
Introduction

Deep soft-tissue lipomas are subfascial benign mesenchymal soft-tissue tumors composed of white mature adipose cells. They are less common than superficial lipomas, and they can be intramuscular or intermuscular [1]. These locations represent 1.8% and 0.3% of fatty tumors respectively [2]. Intramuscular lipomas are classified into infiltrative and well-circumscribed types, which comprised 83 and 17% of cases respectively [2]. Pathologically [1], well-circumscribed lipomas are encapsulated, variable in number, size and shape. Lipomas are often isolated and rarely multiple [3], they may vary in size and some cases reported are giant, defined as greater than 5 cm diameter [4,5], and they may also vary in shape (uni- or multilobulated, round, ovoid, fusiform, or dumbbell-shaped) [6].

Patients and methods

We retrospectively reviewed medical records and images of 13 patients with confirmed deep lipomas of the upper extremity treated surgically during the period from April 1997 to April 2008. Clinical examination, mainly palpation determined the characteristics of the mass or the swelling; and neurological exam investigated deficit of motricity and sensitivity. Electromyography (EMG) was performed in two cases (observations 9 and 13). Radiologic studies performed included conventional radiography (n = 13), CT (n = 7), ultrasoundography (n = 3), and MRI (n = 3).

CT or MRI determined anatomic location and relationship to surrounding structures before surgery better than X-ray. CT or MRI images were assessed for lesion homogeneity, size, border definition, relationship to neurovascular bundle and relationship to bone. CT images were assessed for density and MR images for signal intensity on T1-weighted, T2-weighted, STIR T2, and post-contrast T1 STIR images. In this retrospective series, we did not perform systematic biopsy when the lipomas had specific imaging features on CT or MRI (well- circumscribed homogeneous fatty mass, no or rare thin septation, no post-contrast enhancement). In lipomas that have nonspecific imaging features (cases 6 and 12), open biopsy was performed 10 days and 15 days respectively before the definitive surgery, because atypical lipomatous tumors were suspected (thick septa of 2 mm in case 6 and small nodular mass of high signal adjacent to the tumor on fat-suppressed T1-weighted images in case). However, since may 2008 we follow the current recommended strategy to perform systematically MRI and incisional biopsy for all deep tumors bigger than 5 cm and excisional biopsy for tumors smaller than 5 cm that does not have MRI features of malignity. All patients had undergone surgery with marginal excision (shelling out) because these well-circumscribed lipomas are well encapsulated and are separated easily from the surrounding tissues in contrast to infiltrative lipomas and lipoma-like well-differentiated liposarcomas. Post operatively, histopathologic examination has confirmed the diagnosis of lipomas and the healthy surgical margin of the tumor in all cases. Patients were followed for a minimum of 3 years.

Results

The data are summarised in Table 1. The age of the patients varied between 30 and 79 years, and the mean age at the time of treatment was 53 years. There were 10 women and three men. The most common site was the arm (seven lipomas), followed by the forearm (five: four proximal plus one distal) and the shoulder girdle (one lipoma), that was an enormous dumbbell-shaped lipoma involving the subacromial and subdeltoid space, passing through the great scapular notch to the supraspinatus fossa between trapezius and supraspinatus muscles.

There were six intramuscular lipomas (four triceps, one biceps, one brachialis), six intermuscular lipomas (four forearm, one arm, one shoulder), including three parosteal intermuscular lipomas (two in the forearm and one in the arm), and in the distal forearm there was one epivaginal lipoma outside the flexor tendon sheath. The mean interval between the beginning of symptoms and the surgical treatment was 65 months (range from 12 to 240 months). All patients presented with soft-tissue mass that was painless in 10 cases, and associated with pain and paresthesia of the hand in one case (observation 13). One patient (observation no. 9) presented with forearm mass and complete radial paralysis with drop thumb and fingers. In these two patients the Tinnel sign was positive. The patient with giant shoulder lipoma (observation no. 12) presented an enormous mass with limitation of abduction without brachial plexus deficit. On radiographs, there was radiolucent soft-tissue mass in all cases, and underlying cortical abnormality with exophytic hyperostosis involving the lateral cortex of the humerus in observation no. 2 (Fig. 1). EMG showed prolonged sensory latency in the distribution of the median nerve in case 9 and severe denervation of the muscles innerved by the posterior interosseous nerve in case 13. Ultrasonography demonstrated a homogeneously hyperechogenic mass. Our cases displayed the typical CT aspect of lipomas, consisting of a well-defined mass with Hounsfield attenuation measurements identical to these of subcutaneous fat (between −65 and −100 HU); thin septas were noted in five cases (Fig. 2). On MRI (Fig. 3 and Fig. 4), lipomas showed homogeneity on T1- and T2-weighted images with hyper-signal containing a few strands of low signal intensity with full fat suppression by STIR techniques. All lipomas were extirpated surgically by retroperitoneal space, the prognosis of deep-seated lipomas of the upper extremity is good irrelevant of their size. Recurrence and the degeneration are very rare.

Level of evidence: Level 4.

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Table 1  Summary of data of 13 patients presenting deep-lipomas of the upper extremity.

<table>
<thead>
<tr>
<th>Patient</th>
<th>Age (years)</th>
<th>Gender</th>
<th>Site</th>
<th>Size (cm)</th>
<th>Symptoms</th>
<th>Duration of symptoms (months)</th>
<th>Follow-up (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>45</td>
<td>M</td>
<td>Left arm muscular biceps</td>
<td>6</td>
<td>Painless mass</td>
<td>72</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>35</td>
<td>F</td>
<td>Left arm intermuscular paraosteal</td>
<td>9</td>
<td>Painless mass</td>
<td>24</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>79</td>
<td>M</td>
<td>Left arm muscular triceps</td>
<td>7</td>
<td>Painless mass</td>
<td>58</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>57</td>
<td>F</td>
<td>Left arm muscular triceps</td>
<td>7</td>
<td>Painless mass</td>
<td>60</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>30</td>
<td>F</td>
<td>Right arm muscular triceps</td>
<td>8</td>
<td>Painless mass</td>
<td>70</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>56</td>
<td>F</td>
<td>Right arm muscular triceps</td>
<td>12</td>
<td>Painless mass</td>
<td>80</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>56</td>
<td>F</td>
<td>Right arm muscular brachialis</td>
<td>5</td>
<td>Painless mass</td>
<td>12</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>48</td>
<td>F</td>
<td>Proximal left forearm intermuscular paraosteal</td>
<td>8</td>
<td>Painless mass</td>
<td>72</td>
<td>5</td>
</tr>
<tr>
<td>9</td>
<td>56</td>
<td>F</td>
<td>Proximal left forearm intermuscular paraosteal</td>
<td>5</td>
<td>Mass paresthesia</td>
<td>Mass: 24 radial paralysis</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>55</td>
<td>F</td>
<td>Proximal right forearm intermuscular glass-hour</td>
<td>9</td>
<td>Painless mass</td>
<td>48</td>
<td>2,5</td>
</tr>
<tr>
<td>11</td>
<td>60</td>
<td>F</td>
<td>Proximal right forearm intermuscular</td>
<td>6</td>
<td>Painless mass</td>
<td>48</td>
<td>2,5</td>
</tr>
<tr>
<td>12</td>
<td>50</td>
<td>M</td>
<td>Shoulder intermuscular dumbbell-shaped under trapezius and deltoid</td>
<td>20</td>
<td>Painless mass abduction limitation</td>
<td>240</td>
<td>2</td>
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<tr>
<td>13</td>
<td>62</td>
<td>F</td>
<td>Distal right forearm</td>
<td>9</td>
<td>Mass pain</td>
<td>36</td>
<td>2</td>
</tr>
</tbody>
</table>

Anterior epivaginal lipoma
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Figure 1 Radiograph of humerus shows bone lesion mimicking sessile osteochondroma, a juxtacortical radiolucent mass surrounds the hyperostosis (observation 2).

marginal resection (Fig. 5). Five of the lipomas were adjacent to neurovascular bundle (one with the brachial plexus, one with the median nerve and three with the radial nerve) and needed careful dissection to avoid injuring nearby neurovascular structures. Three paraosteal lipomas were fixed to the bone (two to the radius and one to the humerus). Lipomas had a mean size of 7 cm ranging from 5 to 20 cm. All the lipomas had a well-defined border. Five exhibited lobulation and histologic features were consistent with a benign lipoma constituted by mature univacuolated lipocytes. The patient who had radial nerve paralysis, and motor dysfunction recovered completely at eight weeks after surgery. None had complications or recurrence at a mean of 3 years follow-up (range: 2 to 5 years) after resection.

Discussion

Deep lipomas can be located in any part of the body, and in the upper extremity, the most common sites for intramuscular lipomas are the large muscles especially those of the shoulder and upper arm (mainly the deltoid) [1,6]. Intermuscular lipomas are located mainly in the forearm and upper arm [6]. Lipomas have been identified in all age groups, but in adults deep-seated lipomas are most commonly discovered between the ages of 30 and 60; men, unlike in our series, are more often afflicted than women [1]. Occasionally, beside the predominant lipomatous component, deep lipomas may contain other components that have been attributed to metaplasia of mesenchymal cells (angiolipoma, chondrolipomas, myxolipomas, myolipoma, spindle cell lipoma, hibernoma, etc.) [1]. Parosteal lipoma is a rare subtype of deep lipoma that has a broad attachment to the underlying periosteum that forms an exostose-like bone prominence, and the osteocartilaginous point of attachment is composed

Figure 2 CT scan of the arm shows a well-defined hypodense mass of the triceps with thin septa. The attenuation values within the lesion was equal to those of adipose tissue (observation 3).

Figure 3 MRI of elbow (observation 9). A: Sagittal T1-weighted MRI demonstrates a fatty mass of high signal intensity involving the proximal forearm adhering to periosteum of radial neck and in contact with radial nerve. B: Axial T2-weighted MRI with fat saturated image shows the low signal intensity mass similar to the subcutaneous fat.
of mature hyaline cartilage with endochondral ossification [7,8]. It involves mainly the proximal forearm and the superior arm [9].

Clinically, intramuscular lipomas are most often discovered during investigation of a painless swelling that may have been present for years. Intermuscular lipomas present as a painless slow-growing soft mass that is well-demarcated and not fixed to the skin. The mass becomes more apparent and firm with muscle contraction [1]. Other symptoms depend on the location and the volume of the tumor and are secondary to local pressure on adjacent nerves [10]. These nerve compressions are more common in parosteal lipoma as in observation no. 9, proximal forearm deep lipomas adjacent to the neck of the radius can cause radial nerve compression, mainly of the posterior interosseous branch, with pain, paresthesias and or paralysis of finger extension [9,11—15], rarely of the superficial branch [9], and exceptionally of the median nerve [16]. In the shoulder, deep lipomas can cause pain [17], brachialgia simulating a thoracic outlet syndrome [18,19], impingement syndrome in subacromial lipoma [20] or in lipoma of the supraspinatus muscle [21], symptoms of suprascapular nerve entrapment [22,23], limitation of joint movement [24] as in observation no. 12, and exceptionally subluxation of the glenohumeral joint [25]. In the proximal arm, parosteal lipoma may cause high radial neuropathy [26]. In the wrist, deep lipomas can cause carpal tunnel syndrome [10,15,27,28], and trigger finger [29] in case of lipoma arising from flexor tendonsynovium that cause snapping and extension limitation of the middle finger when the lipoma is caught by the proximal edge of the transverse carpal ligament. Lipoma of the Guyon’s canal is a rare cause of ulnar neuropathy [10,30]. In the hand, deep lipomas may cause mechanical dysfunction, pain and altered sensitivity [4,28,31—33]. When nerve deficit is present, it is essential to perform a preoperative EMG to have thorough lesion work-up; in addition, this helps selecting the best approach in some dangerous locations.

Imaging features of benign lipomatous lesions are often pathognomonic [8]. Plain radiographs of deep lipomas typically show a radiolucent soft-tissue mass [8]. Furthermore, parosteal lipomas are associated with false osteochondroma or irregular thickening of the adjacent cortex [7,8]. Deep lipomas echogenicity is non-specific, they could be homogeneously hyperechogenic and unvascularised, isoechogetic or hypoechogetic [8]. CT and MRI can suggest a preoperative diagnosis of deep lipoma when the mass is homogeneous identical to subcutaneous fat and the septa are thin [34]. Knowing the extent of the mass and the relation to surrounding structures allow surgical excision or percutaneous biopsy to be scheduled when malignancy is suspected [35]. MRI is better than CT in evaluating lipomatous mass extension [6]. As in our cases, CT suspected the diagnosis of deep lipoma showing a well-circumscribed mass, homogeneously hypodense on CT with Hounsfield values typically in the negative range (between −65 and −120) that are similar to subcutaneous fat and do not enhance after intravenous contrast material administration with thin fibrous septa (2 mm) and capsule with attenuation similar to that of muscle,
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without confluent soft-tissue densities [6,8]. The septas are better individualisable on CT [6]. Although some parosteal lipomas present a reactive excrescence of the adjacent cortex without medullary continuity [7,8]. On MRI [8,34], deep lipomas are easily recognized as homogeneous masses with high fat signal (bright) on T1-weighted images and intermediate on T2-weighted images, and low signal (dark) on fat-suppressed T1-weighted sequences; the septas and the rim are thin and present low signal intensity on T1 and there is no enhancement of the lipomatous component with the administration of intravenous gadolinium. Lipomas, mainly those including other components are often difficult to distinguish from liposarcomas on MRI. There are no CT or MRI characteristic features that can differentiate between deep lipomas and liposarcomas, but the most important clues to malignancy [34,36] are tumor heterogeneity, large size (10 cm), septas that are irregular, thick and interrupted, presence of hazy nodular or linear nonadipose mass-like areas, incomplete STIR suppression and decreased percentage fat. The presence of linear or nodular foci of hyperintensities on FS-T2/STIR sequences constitutes a more specific sign of malignancy and must indicate biopsy [36]. These non-lipomatous components exhibit high signal after intravenous gadolinium injection on fat-suppressed T1-weighted images [8]. According to Weiss and Goldblum [37], lipomas must be differentiated from other soft-tissue tumors that include mainly liposarcomas that are the second most common malignancy of soft tissues. The World Health Organization classifies liposarcomas into five histologic subtypes: well-differentiated, dedifferentiated, myxoid/round cells, pleomorphic, and mixed [37]. Lower extremity (paticulary the thigh) and retroperitoneum are the most common location, only 9.6% are located in the upper extremity [38]. Biopsy is very crucial to achieve non specific diagnosis, but sometimes only chromosomal aberrations may confirm the diagnosis [40]. Recent studies [41] have identified specific chromosomal translocations and fusion of genes in adipocytic tumors. The high mobility group A2-lipoma preferred partner (HMGA2-LPP) were specific to lipoma, while the human translocation liposarcoma (T(16)(q)-CCAT/enhancer binding protein (C/EBP) homologous protein (CHOP) and the Ewing sarcoma (EWS)-CHOP in liposarcoma.

Parosteal lipomas with nerve compression must be differentiated from intra-neural lipomas, because treatment and the prognosis are different [42].

Complete surgical marginal excision is the treatment of choice of deep lipomas (shelling out without opening the capsule) [40]. Laparoscopic enucleation of wrist lipoma was reported in selected cases [43]. The treatment of a parosteal lipoma is complete enucleation of the mass with extirpation of the bony excrescence and periosteal attachments in cases that have associated hyperostosis [7].

In case of nerve compression, prompt removal of the compressing lipoma will usually restore normal function to the affected nerve [14,15]. In case of parosteal lipoma adjacent to proximal radius with posterior interosseous nerve compression, Fitzgerald [44] advocates a Henry’s anterior approach as this allows both easier dissection of the lipoma and lessens the risk of trauma to the nerve and its muscular branches. The incision start just lateral to the tendon of the biceps muscle, curve slightly medially in the flexor crease of the elbow and follow distally the medial side of the biceps muscle. After identifying and protecting the lateral antebrachial cutaneous nerve, incise superficial fascia and pass in the plane between brachioradialis laterally and flexor carpi radialis medially. After ligating the brachioradialis vessels, retract the radial artery medially and the brachioradialis muscle with the superficial branch of the radial nerve laterally. The deep plane is constituted by the pronator teres muscle and the supinator muscle through which the posterior interosseous nerve passes around the neck of the radius on its way to the posterior compartment of the forearm. The entrance of the radial tunnel is constituted by the arcade of Frohse, which is the most common site of compression of the radial nerve motor branch [45]. The authors emphasize the importance of mobilizing the nerve after proper exposure of the nerve proximal and distal to the lesion, to ensure safe resection [18]. The attachment of the supinator muscle must be dissected from the radius forearm in full supination [14]. Early surgical exploration and excision of deep seated lipomas in the proximal forearm is recommended, to avoid permanent damage to the posterior interosseous or superficial radial nerves [44].

Unlike infiltrative lipomas and atypical lipomatous tumors, benign circumscribed deep lipomas, even if they are giant, have a low recurrence rate (1%) and no malignant potential [1]. In some dangerous locations deep lipoma may encase the neurovascular bundle, and this feature limits the ability to perform complete resection and increases the likelihood of local recurrence and paralysis [8].

The behavior of liposarcomas is strongly influenced by histologic type and location, with round cell type and retroperitoneal lesion having the worst prognosis [37]. Well-differentiated liposarcoma can recur locally but do not metastasize. Incomplete surgical excision is a bad factor of prognosis [38].

Conflict of interest statement

None.

References


