CASE REPORT

Distal biceps brachii tendon repair complicated by a suture granuloma mimicking a soft-tissue sarcoma: a case report and review of the literature

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The incidence of distal biceps brachii rupture is 1.2 per 100,000 persons per year; it most commonly occurs in the dominant elbow of men aged in their 40s.25 The repair, which includes several described techniques, is generally successful in restoring elbow strength, allowing for an early resumption of daily activities.5,25

Foreign-body granulomas have been extensively reported in the literature, occurring in a wide variety of operations and anatomic locations.4,6,9,11,27 Different surgical materials such as surgical sponges and silicone have been associated with the formation of this benign inflammatory lesion.9,14 Nonabsorbable sutures such as Ticron (Tyco, Waltham, MA, USA), FiberWire (Arthrex, Naples, FL, USA), and Ethibond (Ethicon, Somerville, NJ, USA), as in our case, used during tendon repairs can also elicit such a response.3,7,14,18,27 Though rare, these reactions can act as malignant neoplasms.1,9,16,17 However, no cases of suture granulomas after distal biceps brachii tendon repair presenting as a soft-tissue sarcoma (STS) have been reported.

To our knowledge, we report the first case of a patient with a suture granuloma after a distal biceps brachii tendon repair that mimicked the behavior of an STS, and we further review the natural history, approach, and management of this uncommon entity.

Case report

A 58-year-old man was evaluated for a slowly growing mass located in the volar aspect of his proximal right forearm of several years’ duration. He had a history of a right distal biceps brachii tendon repair due to traumatic rupture 7 years prior. There was no history of fever, sweats, chills, or weight loss. The medical history, family history, social history, and complete review of systems were noncontributory. The patient was seen at an outside facility, magnetic resonance imaging (MRI) showed an enhancing soft-tissue mass (STM) (Fig. 1) suggestive of sarcoma, and he was referred to our musculoskeletal oncology service for further evaluation and definitive treatment.

Physical examination showed a transverse scar located on the volar aspect of the proximal right forearm consistent with the patient’s previous operation. Deep and proximal to this incision, there was a 3.9 × 3.4-cm, fixed, nontender mass, with no overlying changes in the skin. The right elbow range of motion was complete and painless. On the basis of the indeterminate MRI findings, an ultrasound-guided core needle biopsy was performed.
Pathologic evaluation showed reactive fibrous tissue with acute and chronic inflammation, associated with reactive connective tissue and blood vessels, consistent with the diagnosis of a foreign-body granuloma (Fig. 3). After a discussion regarding his treatment options, the patient chose observation because the mass was not symptomatic. Seven months later, he returned to our hospital for further evaluation.

**Figure 1** Axial T2 fat-suppressed (A), axial T1 (B), axial T1 fat-suppressed post-contrast (C), and sagittal T1 fat-suppressed post-contrast (D) magnetic resonance images of right elbow at patient’s initial presentation. There is a large heterogeneous STM (straight arrows) arising from the biceps tendon (curved arrows). The lesion is hyperintense to skeletal muscle on T2 imaging, isointense to slightly hyperintense to skeletal muscle on T1 imaging, and shows peripheral solid enhancement with a fluid center. There are subtle low-signal intensity curvilinear lines within the tumor (chevrons), reflecting suture material.

**Figure 2** Transverse grayscale ultrasound images (A, B) show a hypoechoic peripherally solid mass (calipers) with an internal fluid center (star) arising from the biceps tendon (curved arrows). There are subtle echogenic curvilinear lines within the tumor, reflecting suture material (chevrons). The lesion shows increased central and peripheral enhancement on power Doppler (C, D), showing ultrasound-guided STM biopsy tract.
leukotrienes. Macrophages, unable to degrade nonabsorbable sutures, will accumulate into epithelioid macrophages. There are also some acute and chronic inflammatory cells. (Hematoxylin-eosin stain, original magnification ×4).

Figure 3 Fibro-connective tissue with multinucleated giant cells, with haphazardly arranged nuclei. These giant cells are fused macrophages. There are also some acute and chronic inflammatory cells. (Hematoxylin-eosin stain, original magnification ×4).

Discussion

Distal biceps brachii tendon repair is a procedure performed by upper-extremity surgeons and general orthopaedists. Sutures used in these repairs can trigger the formation of a suture foreign-body granuloma, which involves an acute reaction of the tissues to the passage of the needle, as well as a chronic response to the suture material used. Inflammatory reactions can occur in response to both endogenous and exogenous substances and result in the release of interferon γ, colony-stimulating factors, and leukotrienes. Macrophages, unable to degrade nonabsorbable sutures, will accumulate into epithelioid macrophages, and a fibroblastic granuloma can be formed in as little as 24 hours. CD68 immunohistochemical staining will show multinucleated giant cells, and the foreign-body reaction may or may not form a sinus tract to the skin, which can explain the ulceration that presented in our case. The incidence of foreign-body granulomas after orthopaedic surgeries has been described to be 0.61%, and these have been reported as isolated cases. Few articles have reported on suture foreign-body granulomas in the orthopaedic literature (Tables I and II). Morimoto et al. reported a 2-year history of a left buttock mass that rapidly grew over a period of 2 months after nonabsorbable nylon suture was used to surgically repair a hip dislocation 20 years earlier. Marcus et al. reported 2 cases of suture granulomas in the shoulder presenting as infections: 1 patient had symptoms of an STM after Magnuson-Stack repair 9 years earlier, and another patient had shoulder pain and a nontender STM for 10 months after a Putti-Platt shoulder repair 8 years earlier. A Ticron suture granuloma has been described after inferior capsular shift of the shoulder, presenting as a shoulder abscess 4 years after the original operation, as well as after flexor digitorum profundus tendon repair 4 months earlier. Mack et al. reported a series of patients who had foreign-body reactions and sinus tract formation due to FiberWire suture that arose between 5 and 16 months after lower-extremity amputations. Interestingly, this was the only series in which suture granulomas formed sinus tracts to the skin, and this is presentation is similar to the skin ulceration observed in our case.

The clinical presentation of foreign-body granulomas varies. In general, they present as an STM that can appear as early as 1 week after the initial surgical procedure and up to 20 years later. This STM may or may not be painful and grow slowly over a period of a few months to years. As in our case, the diagnosis of STS is often considered given this nonspecific clinical presentation (Table I). In some cases, sinus tracts can develop, and surgical resection is the treatment of choice. STSs are uncommon malignancies, with approximately 50% of the cases located in the extremities. A slowly growing mass warrants high suspicion for this diagnosis, particularly for masses larger than 5 cm, those located deep to the deep fascia, and those associated with rapid growth, progressive symptoms of pain, or ulceration. Patients generally do not present with systemic symptoms such as fever or weight loss. Although, in our case, there was a history of distal biceps brachii tendon repair with Ethibond and granuloma formation was considered in the differential diagnosis, the size and depth, progressive symptoms, and ulceration were concerning for STS.

Non-specific findings on imaging make differentiation between an STS and foreign-body granuloma difficult.
Ultrasound is a useful tool, and as in our case, it may show hypoechoic lesions and hyperechogenic lines, suggestive of suture granulomas. MRI typically shows the nonspecific features of T1-weighted hypointensity and heterogeneous intensity on T2-weighted imaging. Therefore, a histologic evaluation is often needed for definitive diagnosis. In this case, ultrasound imaging and needle biopsy results were compatible with foreign-body granuloma. However, the progressive symptoms, growth, and subsequent ulceration led us to suspect a more aggressive lesion, and for this reason, the biopsy...
was repeated at the time of resection to confirm the benign nature of the STM before we proceeded with marginal excision.

In the evaluation of an STM, a biopsy is recommended before surgical excision if the history, physical examination, and advanced imaging findings suggest that STS is included in the differential diagnosis. The preferred biopsy for an STM occurs under the direction of a surgeon with specialization in sarcoma management and in a sarcoma center with a multidisciplinary sarcoma team. Of the cases reported in which an STS was a concern (Table I), only 2 of 7 underwent a biopsy before surgical treatment. Given the dramatically different surgical management of STS and the frequent need for neoadjuvant management, biopsy should be completed before surgical excision when STS is included in the differential diagnosis. We recommend confirmation of the histologic diagnosis before proceeding with surgical excision because an unplanned excision of an STS can dramatically change the prognosis of the patient and often requires additional aggressive surgical procedures for adequate local control. As found in the reported cases (Tables I and II), surgery provides definitive treatment.

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Sex, Age</th>
<th>History</th>
<th>Preoperative diagnosis</th>
<th>Intraoperative findings</th>
<th>Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current study</td>
<td>2014</td>
<td>M, 58</td>
<td>Several-year history of STM in forearm that progressively grew and eventually ulcerated</td>
<td>STS</td>
<td>Inflammatory substance and Ethibond suture</td>
<td>3 mo, uneventful</td>
</tr>
<tr>
<td>Morimoto et al</td>
<td>2012</td>
<td>M, 80</td>
<td>STM in left buttock expanding over 2-mo period after surgical reduction of dislocated hip</td>
<td>High-grade sarcoma</td>
<td>Encapsulated mass with previous hemorrhage and microscopic nonabsorbable nylon suture</td>
<td>1 y, hip pain (likely osteoarthritis)</td>
</tr>
<tr>
<td>Ando et al</td>
<td>2009</td>
<td>F, 9</td>
<td>Mass and pain in left foot for 1 y after trauma caused by wood 2 y earlier</td>
<td>Hematoma, cold abscess, STS</td>
<td>Two wooden foreign bodies</td>
<td>Unknown</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F, 56</td>
<td>Growing mass in left posterior thigh 4 y after blunt trauma</td>
<td>Unknown</td>
<td>Tile inside cystic tumor lined with granulation tissue</td>
<td>Unknown</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F, 3</td>
<td>Painful mass in right proximal lower leg for 1 wk after penetrating trauma by toothpick</td>
<td>Unknown</td>
<td>3-cm toothpick tip</td>
<td>Unknown</td>
</tr>
<tr>
<td>Iwase et al</td>
<td>2007</td>
<td>F, 72</td>
<td>10-y history of STM after hip hemiarthroplasty for fracture 12 y earlier</td>
<td>False aneurysm, hematoma, STS</td>
<td>Granuloma filled with surgical sponge</td>
<td>Unknown</td>
</tr>
<tr>
<td>Mouhésine et al</td>
<td>2006</td>
<td>M, 58</td>
<td>Painless mass enlarging over 18-mo period 3 y after varicose vein stripping</td>
<td>Tumor of mesenchymal origin</td>
<td>Surgical gauze</td>
<td>Unknown</td>
</tr>
<tr>
<td>Sakayama et al</td>
<td>2005</td>
<td>M, 61</td>
<td>5-y history of left thigh swelling 35 y after external fixation surgery</td>
<td>Soft-tissue malignancy</td>
<td>Elastic mass, rich in vessels, with retained surgical sponge</td>
<td>2 y, uneventful</td>
</tr>
</tbody>
</table>

F, female; M, male.
Table II  Cases reported in orthopaedic literature dealing with formation of foreign-body granuloma in which diagnosis of STS was not suspected

<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Patient Sex, Age (y)</th>
<th>History</th>
<th>Preoperative diagnosis</th>
<th>Intraoperative findings</th>
<th>Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pabari et al18</td>
<td>2011</td>
<td>M, 30</td>
<td>Cystic swelling 4 mo after flexor digitorum profundus tendon repair</td>
<td>Abscess</td>
<td>Ticron suture attached to flexor digitorum profundus tendon</td>
<td>Uneventful</td>
</tr>
<tr>
<td>Bergquist et al2</td>
<td>2010</td>
<td>M, 23</td>
<td>1.5-y history of ankle swelling after stepping on horseshoe crab</td>
<td>Foreign-body pseudotumor, myositis ossificans</td>
<td>Pseudocapsule with purulent fluid and tail of horseshoe crab</td>
<td>Swelling and <em>Pseudomonas</em> growth at 1 mo (treated with vancomycin and Zosyn); 2 mo after original treatment, episode of swelling and repeat operation</td>
</tr>
<tr>
<td>Mack et al14</td>
<td>2009</td>
<td>M, 22; M, 46; M, 23; M, 41; M, 29</td>
<td>Draining sinus tract over suture line 5 to 16 mo after lower-extremity amputation</td>
<td>Unknown</td>
<td>Suture surrounded by soft and amorphous tissue</td>
<td>All returned to walking in prostheses</td>
</tr>
<tr>
<td>Patel et al19</td>
<td>2007</td>
<td>M, 29</td>
<td>Asymptomatic swelling of distal fibula 2 y after Ilizarov and fibular plate repair, as well as open reduction and plating</td>
<td>Unknown</td>
<td>Gauze surrounded by fibrous tissue</td>
<td>Unknown</td>
</tr>
<tr>
<td>Warme et al27</td>
<td>2004</td>
<td>F, 22</td>
<td>Tender axillary mass 4 mo after inferior capsular shift</td>
<td>Shoulder abscess</td>
<td>Two “balls” of Ticron suture</td>
<td>Returned to normal activity within 1 mo</td>
</tr>
<tr>
<td>Kulkarni et al13</td>
<td>2003</td>
<td>M, 60</td>
<td>Briskly growing, tender right volar wrist mass 45 y after being stabbed in wrist by a pencil</td>
<td>Foreign-body graphite fragments</td>
<td>Biopsy-confirmed pencil lead; patient declined further surgery</td>
<td>Asymptomatic</td>
</tr>
<tr>
<td>Kalbermatten et al10</td>
<td>2001</td>
<td>M, 41</td>
<td>Left thigh swelling 20 y after open reduction and fixation of femoral fracture that rapidly grew over next 5 y</td>
<td>Myositis ossificans</td>
<td>Encapsulated mass with cotton sponge</td>
<td>4 wk, uneventful</td>
</tr>
<tr>
<td>Marcus et al15</td>
<td>1997</td>
<td>M, 27</td>
<td>4-wk history of nontender STM of left shoulder after Magnuson-Stack repair 9 y earlier</td>
<td>Tuberculous arthritis, necrobiotic palisading suture granuloma</td>
<td>Black suture material in inflammatory mass</td>
<td>12 y, uneventful</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M, 35</td>
<td>10-mo history of progressive right shoulder pain and 4-mo history of shoulder stiffness after Putti-Platt repair 8 y earlier for recurrent subluxation and dislocation</td>
<td>Necrobiotic palisading suture granuloma</td>
<td>Unknown</td>
<td>9 mo, joint stiffness; otherwise uneventful</td>
</tr>
</tbody>
</table>

_F, female; M, male._
Conclusion

Foreign-body granuloma is a well-described complication after various forms of surgery; however, it has not been previously described after distal biceps brachii tendon repair. In our case, the mass began to rapidly grow and mimicked the behavior of an STS, but histologic findings were compatible with a suture foreign-body granuloma. Although granulomas can remain asymptomatic for many years, they may also behave very aggressively and mimic an STS clinically and radiologically. In these cases, a thorough radiologic and pathologic evaluation is warranted to ensure the appropriate surgical intervention and to avoid the unplanned excision of an STS.

Disclaimer

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References