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REVIEW ARTICLE

Imaging bicipitoradial bursitis: a pictorial essay

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Abstract
Although bicipitoradial bursitis is not commonly seen, when it does occur, it can frequently lead to diagnostic difficulty, mimicking either a soft-tissue tumor or infection. Lack of awareness of this uncommon entity can lead to unnecessary anxiety or tissue biopsy. This pictorial essay discusses the normal anatomy of the bicipitoradial bursa and the spectrum of imaging findings of bicipital bursitis.

Keywords Bicipitoradial · Bursitis · Imaging

Introduction

Bicipitoradial bursitis presents as a mass or swelling at the antecubital fossa. Some patients have pain, discomfort or limited elbow movement [1–3]. Motor and sensory symptoms may occasionally occur if the adjacent superficial or deep branches of the radial nerve or, less commonly, the main medial nerve are compressed [4, 5]. Ultrasound and MRI are the two main imaging modalities used to assess bicipital bursitis [4–6].

Anatomy

There are two bursae in the cubital fossa; namely, the bicipitoradial and interosseous bursa, which occasionally communicate with each other. The bicipitoradial bursa is located between the radial tuberosity and the biceps tendon and serves to reduce friction between these two structures. It surrounds the distal biceps tendon, which has no tendon sheath (Fig. 1). It does not communicate with the elbow joint [4]. The normal bursa cannot be seen on imaging and is only seen when distended [6, 7]. The interosseous bursa is located medial to the bicipitoradial bursa and in contact with the interosseous membrane [7]. It is much less commonly inflamed.

Pathology

Inflammation leads to enlargement of the bursa. Bicipitoradial bursitis most commonly results from chronic mechanical friction and is often associated with distal biceps tendinosis or tear (Figs. 2, Figs. 3, and 4) [1–3, 8–10]. Insertional tendinosis of the biceps tendon induces surface bone irregularity at the radial tuberosity insertional area. This bony irregularity can induce a bicipitoradial frictional bursitis. Alternatively, peritendinitis as a feature of distal biceps tendinosis can induce bicipitoradial bursal inflammation. Less frequent causes of bicipitoradial bursitis are low-grade intrinsic infections such as tuberculosis, an inflammatory arthropathy such as rheumatoid arthritis (Fig. 5), tumoral calcinosis (Fig. 6) or synovial (osteo) chondromatosis [1, 11, 12].

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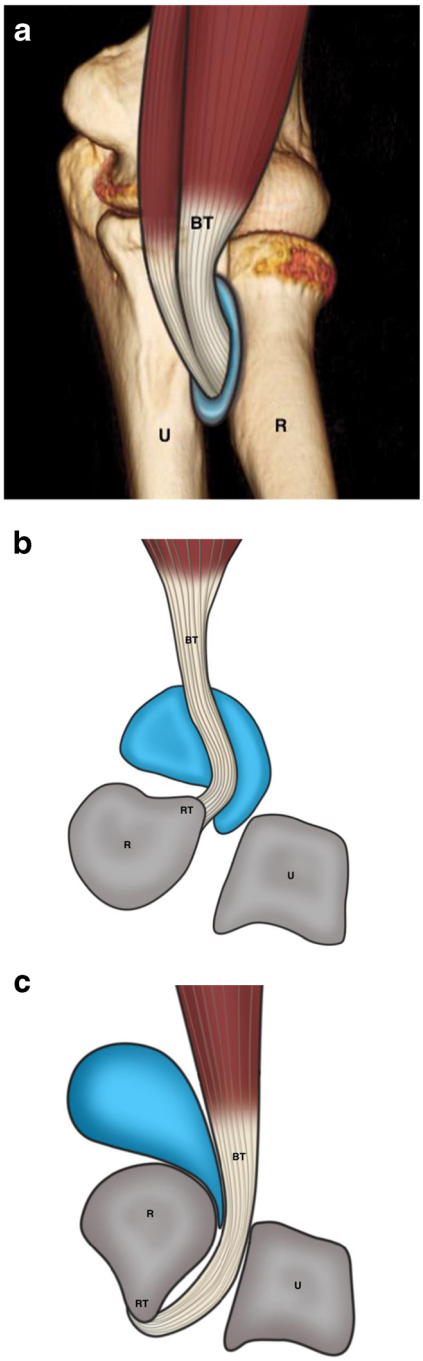

Fig. 1 **a** Diagram demonstrates the normal anatomy of the bicipitoradial bursa (*blue*) in relationship to the biceps tendon (*BT*). **b** In supination, the bicipitoradial bursa surrounds the biceps tendon. **c** In pronation, the bicipitoradial bursa is compressed between the radial cortex and the biceps tendon. *R* radius, *U* ulnar, *RT* radial tuberosity

Summary of imaging techniques and findings

In most cases, radiographs show no abnormality. The most common radiographic abnormality found is either irregularity of the radial tuberosity or faint soft-tissue calcification anterior to the radial tuberosity [8, 9]. A distinct soft-tissue mass or opacity is generally not seen. In all of the cases we have encountered, the radiograph was unremarkable except for one case that showed faint calcification adjacent to the radial tuberosity (Fig. 3a).

Ultrasound is often the first-line imaging test used to evaluate symptoms related to the antecubital fossa [7, 13]. The bicipitoradial bursa is seen when it is inflamed and distended between the distal biceps tendon and the underlying radial neck and head. The distal part of the biceps tendon is best seen in the longitudinal place with the forearm in maximum supination, so that the distal insertion of the biceps tendon can be seen (Figs. 2a, 5a, b) [6, 7, 13].

Uncomplicated inflammatory-type bicipitoradial bursitis appears as a thin-walled anechoic fluid collection with or without septations partially surrounding the distal biceps tendon. It may have a thick or nodular wall and an echogenic content [5, 13]. In most cases, bicipital bursitis is chronic and is thus usually associated with bursal villonodular synovial proliferation, bursal wall thickening, and hyperechoic content. In active inflammation, Doppler imaging may show moderate to marked hyperemia around the distended bursa (Fig. 2b) [1]. When synovial proliferation is severe and there is little or no bursal fluid, bicipitoradial bursitis can misleadingly appear as a hypoechoic solid mass on ultrasound or MRI (Fig. 4) [9, 13]. MRI, in such instances, often leads to better anatomical and lesional characterization.

Bicipitoradial bursitis usually appears as a fusiform low-density mass or cyst on CT, with wall enhancement [11]. CT is particularly good at revealing bursal calcification due to gout, tuberculosis, synovial osteochondromatosis, or tumoral calcinosis (Fig. 6c).

Magnetic resonance imaging is the modality of choice for evaluating the anatomy and tissue composition of bicipitoradial bursitis [4]. The distal end of the biceps tendon is best seen by scanning in the FABS (flexion of elbow, shoulder abduction, and forearm supination) position (Figs. 2e, 5d) [10]. In bicipitoradial bursitis, MRI demonstrates distention of the bursa by fluid or synovial proliferation (Fig. 2c, d). The mass effect of the distended bursa can compress the superficial and deep branches of the radial nerve, which lies deep to the brachioradialis muscle (Fig. 2c) [4, 10]. Bicipitoradial bursitis may occasionally appear as a solid enhancing soft-tissue mass encasing the distal biceps tendon (Fig. 3d). Marrow edema or erosion at the radial tuberosity, in addition to adjacent soft-tissue edema, can all occur mimicking tumor infiltration (Fig. 3c, d) [2, 8]. Understanding the anatomy and

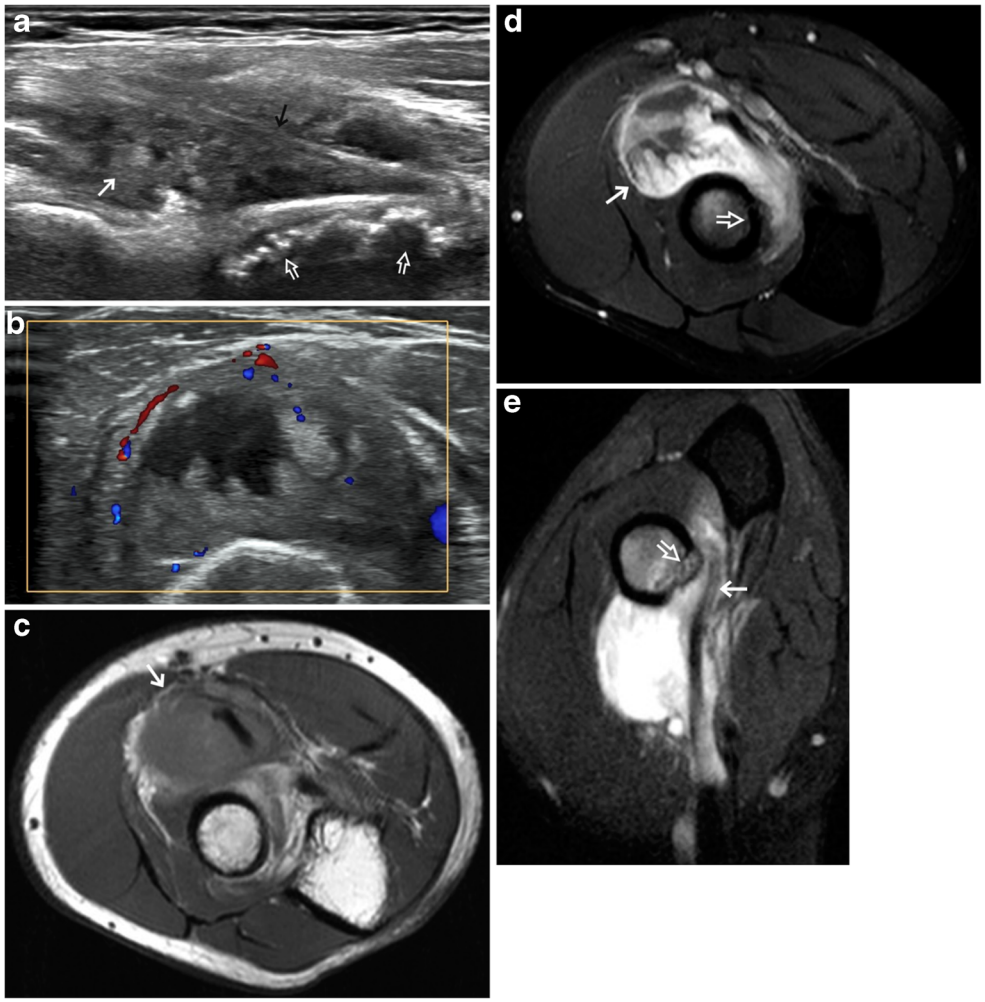

Fig. 2 A 39-year-old woman with an antecubital fossa mass clinically suspected to be a sarcoma. **a** Longitudinal grayscale and **b** transverse color Doppler ultrasound show a large, partially cystic soft-tissue mass with villonodular configuration (*white arrow*) and mild to moderate hyperemia partially surrounding, but mainly deep to, the distal biceps tendon. The biceps tendon is hypoechoic owing to edema (*black arrow*—biceps tendon on the longitudinal image). There is cortical irregularity of the radial tuberosity (*open arrows*). **c** Axial T1-weighted MR image reveals a mildly hyperintense mass abutting the superficial branch of the radial nerve (*white arrow*). **d** Post-contrast T1-weighted fat-suppressed image shows villonodular bursal enhancement (*white arrow*) and cortical irregularity of the radial tuberosity (*open arrow*). **e** Flexion–abduction–supination (FABS) post-contrast T1-weighted fat-suppressed image clearly reveals the slightly thickened hyperintense distal biceps tendon consistent with mild tendinosis (*white arrow*) and cortical irregularity of the radial tuberosity (*open arrow*)

appearances of bicipitoradial bursa and follow-up imaging, either by ultrasound or MRI, helps to avoid unnecessary anxiety or biopsy. In our institution, we usually do ultrasound follow-up 6–8 weeks to rule out a tumor. Biopsy was omitted in two of our cases owing to a reduction in lesional size during follow-up imaging. All of our cases showed a reduction in size or completely resolved in weeks or months. However, radial tuberosity marrow edema may persist for months or even years (Figs. 3, 4) as this is feature of bicipital insertional tendinosis rather than bicipitoradial bursitis per se.

Ganglion cysts need to be differentiated from bicipitoradial bursitis. Ganglion cysts frequently arise from the anterior aspect of the elbow joint. Identification of a pedicle extending from the ganglion cyst toward the anterior elbow joint capsule is the most helpful sign in making this distinction [13]. Bicipitoradial bursitis will also invariably at some point be wedged in between the

Fig. 3 A 53-year-old man presented with anterior elbow swelling for a few months. **a** Lateral radiograph shows faint calcification (*white arrow*) superficial to the radial tuberosity, with no bony erosion. **b** Longitudinal ultrasound shows moderate soft-tissue swelling (*white arrow*) deep to the distal end of the biceps tendon. Moderate biceps tendinosis is present (*arrowheads*) with minimal cortical irregularity of the radial tuberosity (*open arrows*). **c** Axial T2 fat-suppressed and **d** post-contrast T1-weighted MR images showing enhancing mass (*white arrow*) surrounding the biceps tendon (*open arrows*) with moderate marrow edema of the radius. Moderate cortical erosion is also present (*arrowhead*). **e** Follow-up MRI 1 year later shows a largely resolved bicipitoradial fossa mass with moderate bicep tendinosis (*open arrows*), mild residual marrow edema, and persistent cortical erosion

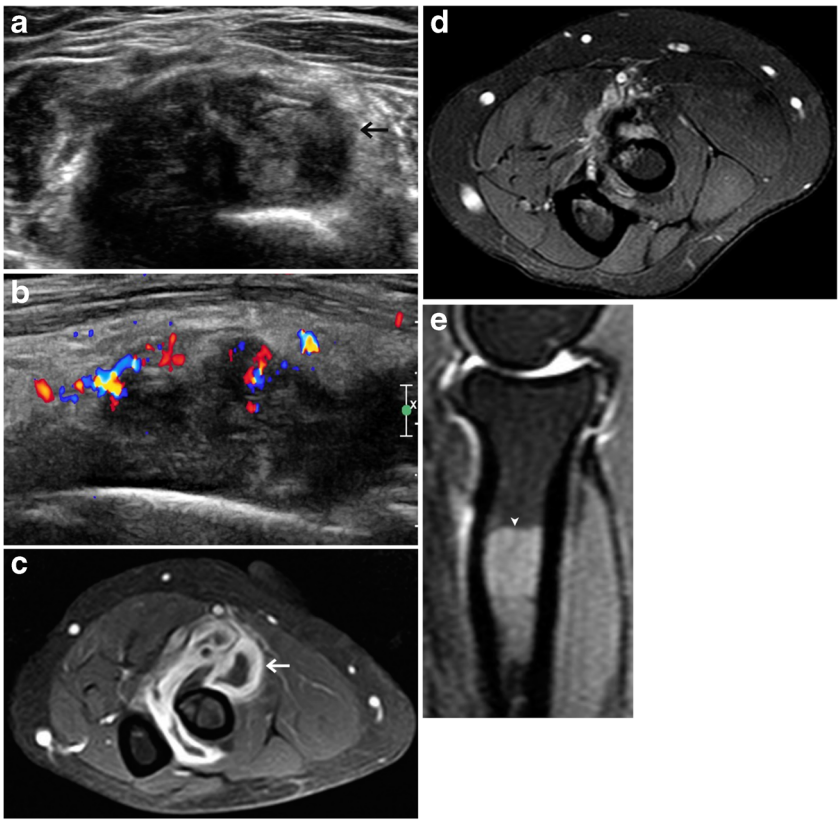

Fig. 4 A 41-year-old woman presented with a left forearm mass. **a** Transverse and **b** color Doppler ultrasound shows a quite large hypoechoic mass (*black arrow*) with moderate marginal vascularity encasing the distal biceps tendon. **c** Post-contrast T1-weighted fat-suppressed image shows the thick enhancing wall of bicipitoradial bursitis (*white arrow*) with mild biceps tendinosis. **d** Axial and **e** sagittal view T2-weighted fat-suppressed images 2 years later show the largely resolved bicipitoradial bursitis with residual soft-tissue edema. The bone marrow edema is still present (*arrowhead*)

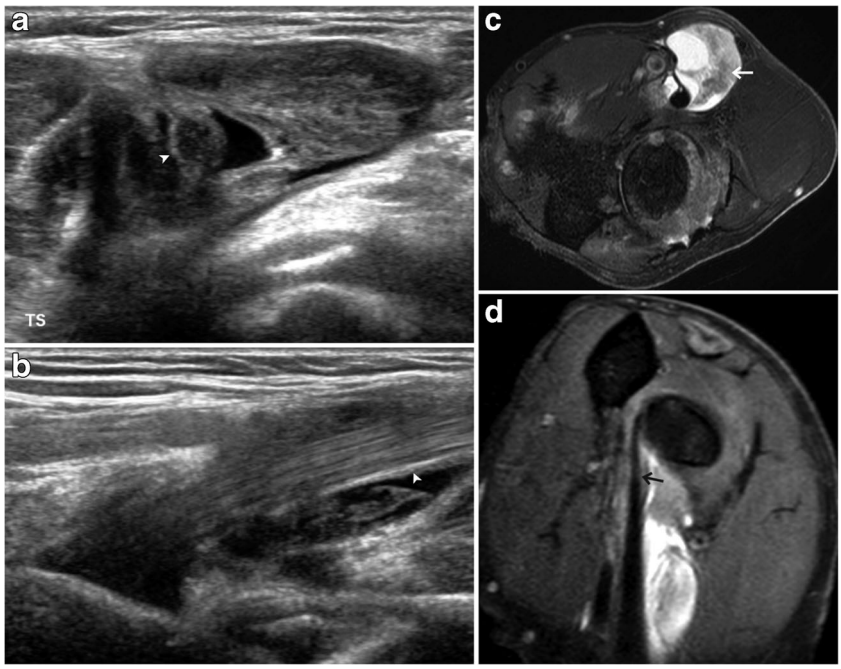

Fig. 5 A 73-year-old man known to have rheumatoid arthritis who presented with an antecubital fossa mass. **a** Transverse and **b** longitudinal ultrasound shows a hypoechoic mass surrounding the distal biceps tendon (*arrowhead*). **c** T2-weighted fat-suppressed axial MR image reveals bicipitoradial bursa distention with severe synovial proliferation (*white arrow*), surrounding the normal distal biceps tendon. **d** T2-weighted fat-suppressed MR image in the FABS position reveals the normal distal biceps tendon and insertion (*black arrow*)

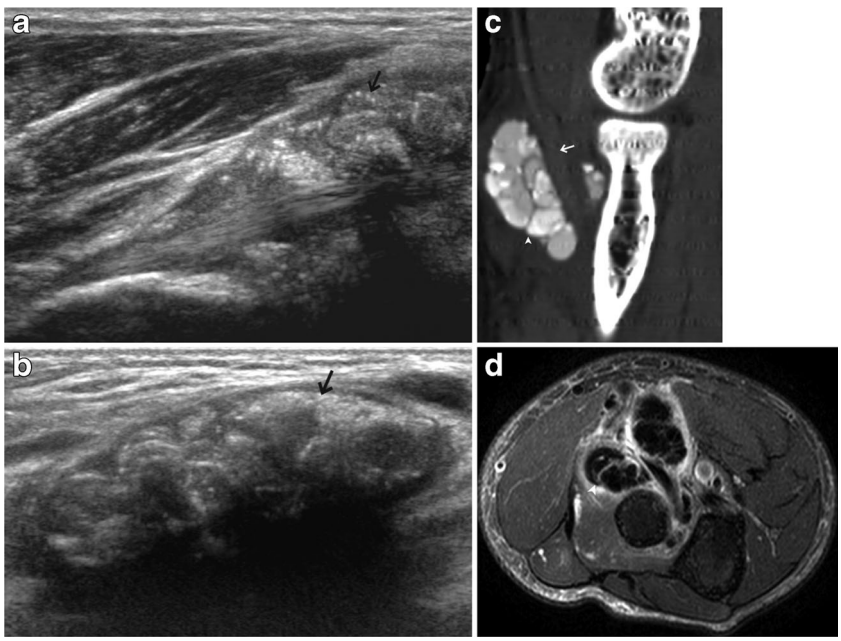

Fig. 6 A 48-year-old woman with end-stage renal failure and tertiary hyperparathyroidism. **a** Longitudinal and **b** transverse ultrasound show multiple small echogenic foci (*black arrow*) within the bicipitoradial bursa. **c** Reconstructed sagittal CT image also reveals the presence of multiple round calcifications (*white arrowhead*) surrounding the distal biceps tendon (*white arrow*). **d** T2-weighted axial MR image showing multiple round calcifications (*white arrowhead*) in the bicipitoradial bursa. Biopsy confirmed bicipitoradial bursal tumoral calcinosis. The lesion resolved completely following resection of the parathyroid adenoma

distal biceps tendon and the radial tuberosity insertion, whereas a ganglion cyst should not become wedged into this location [5].

Conclusion

Awareness of the entity of bicipitoradial bursitis and knowledge of the anatomy and imaging features allow this diagnosis to be made and suggest a likely etiology with a high level of confidence.

Compliance with ethical standards

Conflicts of interest The authors declare that they have no conflicts of interests.

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