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A meniscus causing painful snapping of the elbow joint: MR imaging with arthroscopic and histologic correlation

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showed a typical presentation of fibrocartilage. A meniscus may exist in the elbow joint and can be a rare cause of painful snapping elbow. MR arthrography is helpful for identifying the snapping tissue in the elbow joint.

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Abstract Snapping of the elbow joint can cause pain. We report a case of painful snapping elbow produced by an interposed meniscus in the radiohumeral joint in a 20-year-old man. The MR arthrogram demonstrated a meniscus-like tissue interposed between the radial head and humeral capitellum. The MR-arthrographic findings were well correlated with surgical findings. The location and appearance of the meniscus-like tissue was similar to that of meniscus in the knee joint. Histologic findings of the excised meniscus-like tissue

Keywords Snapping · Meniscus · Elbow · MR arthrography

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Introduction

Painful snapping of the elbow joint is usually attributed to intra-articular loose bodies, instability, or subluxation of the medial triceps over the medial epicondyle [1, 2]. Interposed synovial fold and loose annular ligament in the radiohumeral joint have been occasionally reported to cause snapping of the elbow [3–6]. We report a rare case of painful snapping of the elbow joint produced by a meniscus, which to our knowledge has not been previously reported. The MR arthrogram clearly demonstrated the location and appearance of the meniscus, which were well correlated with arthroscopic and histologic findings.

Case report

A 20-year-old man came to our orthopedic clinic with a 7-year history of painful snapping and numbness over the lateral aspect of the right elbow joint, which had recently gotten worse. He reported having this snapping sensation during motion of the right elbow joint since his childhood. He had no history of right elbow trauma or involvement with particular sports. His past medical and family histories were unremarkable. On physical examination, snapping was produced when the right elbow was flexed to 120° and again when the elbow was extended to 70°. The right elbow joint had a full range of motion, and forearm su-

pination and pronation were within normal limits. Plain radiographs of the right elbow were non-contributory. Conventional MRI of the right elbow was performed and no remarkable finding except minimal joint fluid was noted in the initial interpretation. Subsequent MR arthrography (Fig. 1a, b) with intra-articular injection of 8 ml of diluted gadolinium-diethylenetriaminepentaacetic acid (Gd-DTPA) showed an interposed tissue of low signal intensity at the anterolateral aspect of the radiohumeral joint on T1-weighted spin-echo images. The interposed tissue had a triangular shape, a free inner edge, a wide outer margin that was attached to the capsule in the sagittal and coronal images, and a bow-tie appearance at the periphery of the coronal and sagittal slices. The location, morphology, and signal intensity of the interposed tissue was similar to that of meniscus in the knee joint. In a retrospective review of

the initial MRI, the interposed tissue of a small, triangular shape of low signal intensity was found in the periphery of anterolateral aspect of the radiohumeral joint on both coronal and sagittal T2-weighted fast-spin-echo images (not shown). Since we did not know at that time that a real meniscus might exist in the elbow joint, we considered the interposed tissue to be a thickened synovial fold or localized nodular synovitis. The patient subsequently underwent arthroscopic surgery through a posterolateral portal. At the time of surgery, a semilunar meniscus-like tissue was found at the anterolateral aspect of the radiohumeral joint. The tissue was white, had a free inner edge, and its base was attached to the anterolateral aspect of the capsule. Intraoperative examination (Fig. 1c, d) showed that the snapping was due to an interposed meniscus-like tissue popping out of the radiohumeral joint when the elbow was

Fig. 1 a-d A 20-year-old man with painful snapping of the right elbow. Sagittal (a) and coronal (b) T1-weighted spin-echo (TR/TE, 379/12) MR-arthrographic images of the right elbow show an interposed triangular meniscus-like tissue (arrow) of hypointense signal intensity in the anterolateral aspect of the radiocapitellar joint. The inner edge of the meniscus tissue is free and the outer margin has a wide base that is attached to the capsule. Intraoperative examination of the flexed (c) and extended (d) right elbow shows a semilunar, white meniscus-like tissue (arrows) slipping out of the radiocapitellar joint when the elbow is passively flexed to 120° (c), and then falling into the radiocapitellar joint when the elbow is passively extended to 70° (d). RH Radial head, HC humeral capitellum, asterisk meniscus



passively flexed to 120°, and the meniscus-like tissue then slipped back into the radiohumeral joint with visible snapping when the elbow was passively extended to 70°. The synovial capsule was normal and the cartilage of the radial head and humeral capitellum was intact. The interposed meniscus-like tissue (Fig. 2a) measured 15×5×3 mm and was excised. On microscopic examination (Fig. 2b, c), the excised tissue showed a pattern of fibrocartilage (cartilaginous and fibrotic tissues) typical of a meniscus in the knee joint. No oriented collagen fiber bundles were noted. Furthermore, there was no synovial layer around this excised tissue.

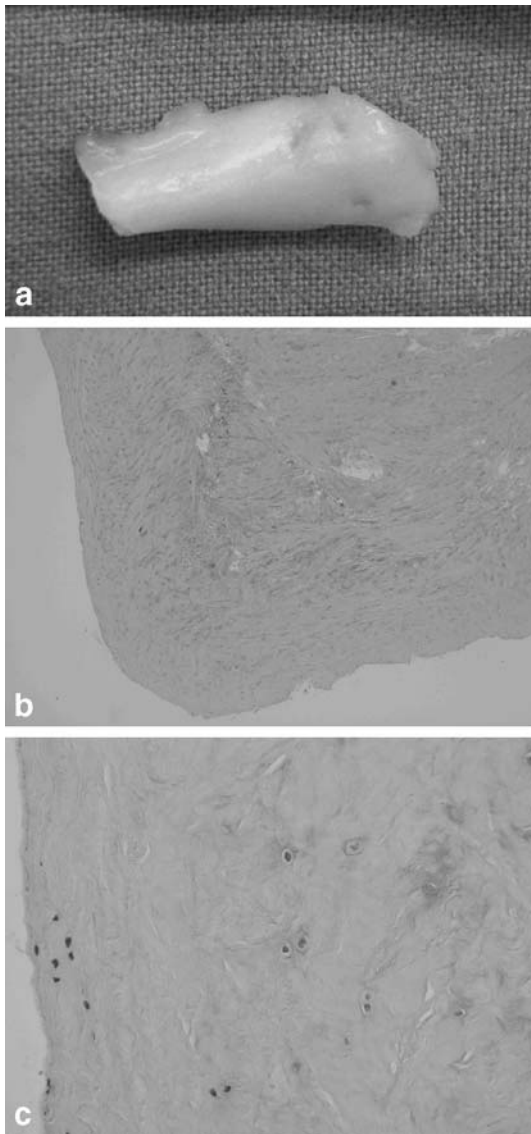


Fig. 2 a Specimen of the removed tissue. b, c Microphotographs demonstrate that the removed tissue is a meniscus, which is characterized as fibrocartilage tissue with radially oriented connective fibers (b) ($\times 40$), with no synovial layer on the tissue surface (c) ($\times 400$) (hematoxylin-eosin stain)

The snapping in the patient's elbow disappeared after surgery, and the symptoms of pain and numbness were relieved three months after surgery.

Discussion

The cause of snapping elbow has been attributed to loose bodies, instability, medial dislocation of the triceps muscle over the medial epicondyle, and impingement of a synovial fold or loose annular ligament [1–6] in the elbow joint. A lateral thickened synovial fold [4] or a loose annular ligament [5] interposed between the radial head and humeral capitellum is the main source of lateral snapping in the elbow joint. Chronic irritation of the synovial fold, which is thought to be the remnant of the embryonic septae [7], may cause inflammation, thickening, and hardening of the fold. The thickened lateral synovial fold and the displaced loose or disrupted band of annular ligament in the radiohumeral joint may slip out and in the radiohumeral joint during a motion of elbow flexion and extension and can cause snapping on the lateral side of the elbow [4–6].

A meniscus in the elbow joint causing painful snapping of the elbow, to the best of our knowledge, has never been reported in the English literature. The mechanism of a meniscus causing snapping elbow in the present case was similar to that of a thickened synovial fold. There has been only one described case of a meniscus in the elbow joint, and in that case, which occurred in a 15-month-old infant, the interposed meniscus in the posterolateral aspect of radiohumeral joint caused painless extension deficit, and the diagnosis was based on histologic examination [8]. However, the meniscus might not have been a real meniscus since a thickened synovial fold, without histologic analysis, sometimes was called a “meniscus” or meniscus-like tissue [8, 9]. Microscopically, the thickened synovial fold is fibrous and adipose connective tissue which is covered to a variable extent by a synovial layer [4, 5]. Rarely does a thickened hardened synovial fold contain small regions of chondroid metaplasia or degenerative fibrocartilage [4], and it usually has no fibrocartilage. In the present case, the interposed tissue was a real meniscus on the basis of histologic findings.

Imaging evaluation of the snapping elbow has not been discussed in detail in the English literature [1, 3, 4, 6]. Air arthrogram showed snapping of the synovial fold located over a radial head in one case report of Akagi and Nakamura [9]. In Antuna and O'Driscoll's report [4], MR images in six patients with painful snapping elbow were normal in five patients and showed mild edema of the annular ligament in one patient. In his report, whether MR arthrograms were used was not clearly stated. MR arthrography has been established as a valuable imaging study for evaluating intra-articular conditions, chondral and osteochondral lesions, loose bodies, synovium, and collateral ligaments, particularly in a joint with no or minimal joint ef-

fusion [10]. Accordingly, MR arthrography of the elbow could be expected to be helpful to identify the intra-articular snapping tissue and associated abnormality for the patients with painful snapping of the elbow joint. In the present case, MR arthrography demonstrated a meniscus-like structure, which turned out to be a true meniscus. The meniscus was missed in the initial reading of the conventional MR imaging study (1) because its presence was not as obvious and patent as in the MR arthrography, (2) because no joint effusion was present, and (3) because author's unfamiliarity with the entity may have been somewhat influential. Synovial plicae or folds of the elbow joints are normal remnants of the normal embryonic development of articular synovial membranes [3]. On MR imaging, the normal synovial folds of the elbow are thin and linear patterns with hypointensity on T1- and T2-weighted images [3]. The thickened synovial folds may present clinically as a snapping or locking elbow [3, 4]. Distinguishing the meniscus from a thickened synovial fold or "plica" in the elbow joint can be difficult on MRI. Nevertheless, excision of the meniscus-like snapping tissue, either meniscus or thickened synovial fold, is the treatment of choice for relieving snapping elbow.

Meniscus-induced stretching of the nerve fibers of the attached capsule during elbow flexion and extension could cause the snapping pain, which was the main complaint. Chronic mechanical irritation of the impinged meniscus resulting from repetitive movements of the joint could be predicted to elicit an inflammatory reaction and localized synovitis adjacent to the meniscus. Chondromalacia of the radial head and capitellum might occur after repetitive abrasion of the cartilage by the impingement of the interposed meniscus. In the present case, these did not happen.

The origin of the meniscus in the present case is unclear. There has been no evidence to show that meniscus in the elbow joint exists during embryonic development [11]. On the basis of embryology and anatomy, we hypothesize that the meniscus in the present case is a developmental anomaly. Furthermore, the case of the 15-month-old infant with an elbow joint meniscus reported by Fabié et al. [8] may support this speculation.

In summary, a meniscus may be a rare cause of painful snapping of the elbow joint. MR arthrography is valuable for detecting a meniscus as a cause of snapping elbow. Knowledge of the disorder and possible causes of snapping elbow may prevent a misdiagnosis.

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