

Snapping elbow caused by hypertrophic synovial plica in the radiohumeral joint: a report of three cases and review of literature

Andre F. Steinert · Sascha Goebel · Alexander Rucker · Thomas Barthel

Received: 16 November 2008 / Published online: 17 December 2008
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Abstract The snapping elbow caused by hypertrophic synovial radiohumeral plica is a rare form of lateral elbow impingement. In this article we report on hypertrophic radiohumeral synovial folds in three male patients, aged 54, 65 and 27 years. All three patients suffered isolated lateral elbow pain, painful snapping and unsuccessful conservative treatment over at least 5 months (range 5–9 months, mean 7.7 months) prior to surgical treatment. None of the patients had lateral epicondylitis, instability, osteochondrosis dissecans, loose bodies, arthritis or neurological disorders. Upon clinical examination the range of motion in the respective painful elbows was found to be normal in all three cases, but a painful snapping occurred between 80° and 100° of flexion with the forearm in pronation. While there were no pathologic findings in standard radiographs, magnetic resonance imaging (MRI) revealed hypertrophic synovial plicae in the radiohumeral joints associated with effusion in each of the diseased elbows. Arthroscopic examinations confirmed the presence of a hypertrophic synovial plica in all three radiocapitellar joints, and revealed a tran-

sient interposition and compression of the folds in the articulation from extension until 90°–100° elbow flexion, with replacement beyond 90° elbow flexion with a visible jump. Surgical management in all three cases comprised arthroscopic diagnosis confirmation and removal of the synovial plicae, leading to excellent outcomes at 6–12 months follow-up.

Keywords Elbow impingement · Hypertrophic synovial plica · Snapping elbow · Arthroscopy

Introduction

The most frequent causes of a painful snapping elbow joint are intra-articular loose bodies, instability or subluxation of the medial part of the triceps tendon over the medial epicondyle [1]. The hypertrophic synovial plica as a cause of a painful snapping of the elbow joint was first described by Clarke in 1988 [2], who reported on three patients with symptomatic plicae of the radiohumeral compartment, which underwent successful arthroscopic treatment. After Clarke's first description other authors also reported on hypertrophic synovial plicae in the radiohumeral joint as a cause of a snapping elbow and on its successful resection [3, 4]. Antuna and O'Driscoll [5] published a case series of 14 patients with synovial folds in the radiohumeral joint that underwent arthroscopic treatment, of which in 50% the elbow snapping could be reproduced intra-operatively, and 12 of the 14 patients improved markedly after arthroscopic removal of the folds. Our report highlights three cases of painful snapping elbow caused by hypertrophic synovial folds in the radiocapitellar joint and describes the clinical details, technical aspects of surgery and the outcome 6–36 months postoperatively.

Electronic supplementary material The online version of this article (doi:10.1007/s00402-008-0798-0) contains supplementary material, which is available to authorized users.

A. F. Steinert · S. Goebel · A. Rucker · T. Barthel (✉)
Division of Sports Medicine and Arthroscopy,
Orthopaedic Clinic, König-Ludwig-Haus,
Julius-Maximilians-University Würzburg,
Brettreichstr. 11, 97074 Würzburg, Germany
e-mail: t-barthel.klh@mail.uni-wuerzburg.de

A. F. Steinert
e-mail: a-steinert.klh@mail.uni-wuerzburg.de

Report on three cases

History, physical examination and imaging

Patient one, a 53-year-old male, reported that he had developed a motion-dependent pain in his right elbow after some kind of trauma 9 months before without fracture or ligament rupture. Patient two, a 26-year-old male, and patient three, a 65-year-old male, didn't have any kind of trauma, but were also suffering a painful elbow snapping for 9 or 5 months, respectively, without any improvement by conservative treatment including physical therapy, pain medication and activity modification. None of the patients had undergone previous surgical treatment and none had other concurrent elbow problems such as ligament instability, osteochondrosis dissecans or loose bodies, osteoarthritis, lateral or medial epicondylitis or nerve problems.

Upon inspection the diseased upper extremities appeared without any axis deformity, erythema or swelling. Clinical examination of the respective contralateral elbow was without any pathologic finding in all cases. In contrast, clinical examination of the diseased elbow of patient one revealed an unlimited range of motion in extension, flexion, pronation and supination but an abnormal excursion. By moving the pronated elbow from extension to flexion the elbow showed a visible snapping within a range of 80°–100° flexion, as demonstrated in Supplementary Video 1. In each patient, this painful snapping elbow phenomenon was observed in the respective diseased elbow only, and was not associated with any locking or clicking. Motion of the elbows beyond 90° flexion angle was again normal

(Supplementary Video 1). Further clinical examination showed neither muscle imbalances nor ligament instabilities. Standard radiographs of the painful elbows were without any pathologic signs in all patients, as shown in the anterior–posterior (Fig. 1a) and lateral view (Fig. 1b) of the right elbow of patient one. All patients underwent magnetic resonance imaging (MRI) evaluation with gadolinium-enhanced contrast, which were interpreted as having abnormal thickened synovial plica (Fig. 2) in two patients, whereas in MRI analyses of the third patient no clear thickening of the plica could be resolved. Synovial folds were considered hypertrophic if they measured 3 mm or greater in thickness. For treatment the patients were advised arthroscopic evaluation and removal of the hypertrophic synovial folds.

Intra-operative findings and surgical technique

Arthroscopic examination of the snapping elbows revealed a thickened, hypertrophic synovial plica in the radiohumeral joint in all patients. In extension of the elbow the plica was interpositioned between the radial head and the humeral capitulum, which became even better visible when the arthroscopic fluid inflow was reduced (Fig. 3a). During flexion of the elbow the hypertrophic plica remained dislocated in the gap between radial head and capitulum humeri and flipped back over the radial head out of the joint space at 80°–90° flexion angle (Fig. 3b). This is also visualised in Supplementary Video 2, where the dynamic reposition of the snapping plica of patient one can clearly be seen. Inspection of the humeral and radial articular surfaces

Fig. 1 Standard elbow radiographs of a 54-year-old male patient with snapping elbow due to hypertrophic synovial plica. **a** Anterior–posterior radiograph, **b** lateral radiograph of the symptomatic right elbow indicate absence of osseous loose bodies, progressed osteoarthritis osteonecrosis and joint dislocation



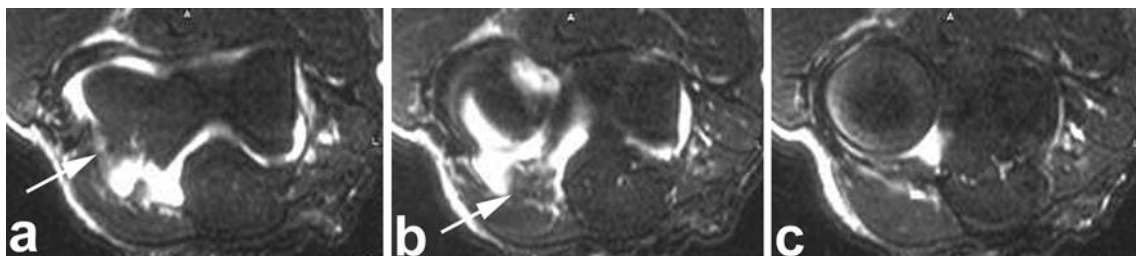
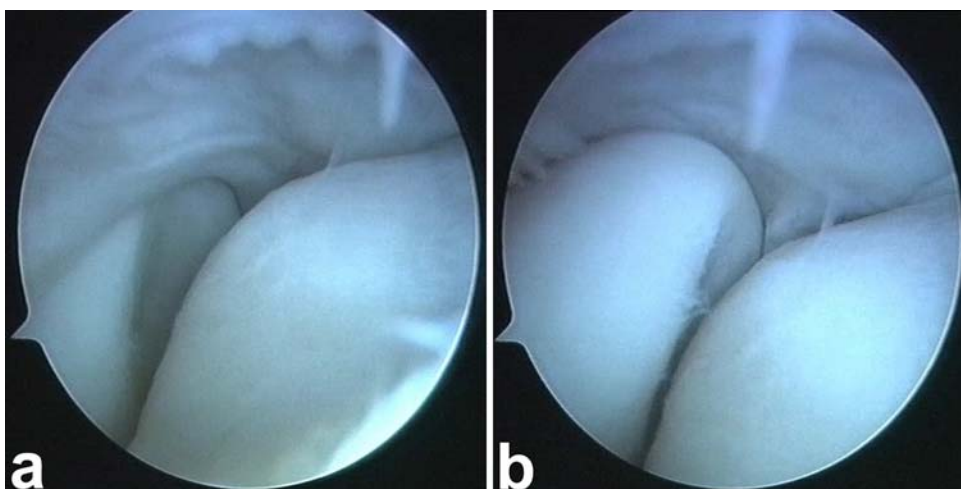


Fig. 2 Magnetic resonance imaging (MRI) of a symptomatic snapping elbow with posterolateral hypertrophic synovial plica. Axial T2-weighted MRIs performed in extension of the elbow revealed the intra-articular appearance of the hypertrophic synovial plica starting proximally from near the capitulum humeri (a), showing his greatest

diameter in the radiocapitellar joint space (b), and fading distally near the radial head (c). The accompanying effusion can also clearly be seen (a–c). The corresponding clinical and arthroscopic examination can be further seen in Supplementary Videos 1 and 2

Fig. 3 Arthroscopic images of hypertrophic folds in the radiocapitellar joint. **a** Interposition of a hypertrophic synovial fold between radial and humeral articular surfaces can be viewed from a posterior portal in extension of the elbow. **b** Upon 90° elbow flexion the hypertrophic synovial plica relocated out of the joint space. A dynamic intra-articular view before and after arthroscopic removal of the plica can be seen in Supplementary Video 3



revealed intact articular cartilages in all patients except patient one who showed chondromalacia stage II–III (International Cartilage Repair Society grading scale) at the anterior part of the radial head. Patient two had some synovitis of adjacent capsular tissue that required additional debridement, but there were no further intra-articular pathologies visible in all patients. All patients then underwent arthroscopic resection of their hypertrophic synovial folds with punch and shaver (Supplementary Video 3). Final dynamic arthroscopic examination confirmed complete removal of the hypertrophic folds and no residual impingement after resection (Supplementary Video 3), and there was also no snapping elbow upon clinical examination after surgery in all patients.

Postoperative care and follow-up

Postoperatively the patients were allowed physical therapy without limitation. There were no direct complications resulting from surgery. All three patients had complete relief of their snapping elbow after surgery with free range of motion. Patients two and three became complete asymptomatic for the time of the respective follow-ups at 3 years

and 6 months. Despite relief from elbow snapping, patient one still had some pain associated with the chondromalacia on the radial head, which persisted at 4 years follow-up, while X-ray control analyses revealed progressed signs degenerative joint disease in the radiocapitellar elbow compartment. The patient was offered arthroscopic reevaluation but refused further surgical measures. At the time of the respective follow-up, all patients were satisfied with having undergone arthroscopic elbow surgery.

Discussion

Synovial plicae are thought to be remnants of embryonic septae that formed during development, and are well known causes of clinical symptoms in the knee joint, especially when these structures hypertrophy and become inflamed [6–8]. Of particular interest in the elbow joint is, that a synovial radiohumeral plica per se is not a pathologic but a physiologic condition [1]. Only in cases where this plica hypertrophies and dislocates into the radiohumeral articulation a painful snapping of the elbow may become evident [1]. Clarke was one of the first to describe synovial plica in

the radiocapitellar compartment as a cause of postero-lateral elbow impingement and reported on successful arthroscopic excision in three cases [2]. In this study all three patients had an area of chondromalacia on the margin of the radial head [2], which was also found in our patient one, but not in our patient two and three. Commandre and colleagues [3] reported on a single case of successful arthroscopic removal of an elbow synovial plica that was causing pain but no mechanical symptoms. Akagi and Nakamura [4] described a case of hypertrophic synovial elbow plica causing pain and snapping with elbow flexion after repetitive microtrauma and performed open resection of the plica. Arthroscopic examination of this patient confirmed the diagnosis and showed cartilage damage of the antero-lateral aspect of the radial head [5]. Antuna and O'Driscoll [5] published a case series including 14 patients with painful snapping elbows caused by synovial hypertrophic plicae, with reproducible snapping in half of the patients (flexion-pronation test) and successful arthroscopic treatment in 12 of the 14 patients. One of the two patients who did not benefit from operation in this study had persistent postero-lateral elbow joint instability, while the causes for persistent pain in the other patient remained obscure despite arthroscopic reevaluation [5]. Notably, all patients in their study except one suffered erosion of the radial head and three patients also of the capitulum humeri [5]. The high incidence of chondromalacia might be due to the long time suffering symptoms before surgery (mean 13 months) where the mechanical snapping of the synovial folds lead to cartilage degeneration [5]. In contrast, the three patients in our study suffered symptoms for a mean time of only 7.8 months (range 5–9 months) before treatment, resulting in chondromalacia of the radial head in only one patient who also suffered a trauma before surgery. This indicates that early diagnosis and surgical treatment of a hypertrophic synovial plica as a cause of snapping elbow are crucial to be able to avoid subsequent mechanical degeneration of the adjacent cartilage. Thus, thinking of hypertrophic synovial fold as a possible cause of a lateral snapping elbow in the first place is of special importance, in order to avoid failures to diagnose it.

Ruch et al. [9] presented a case series of ten patients with symptomatic radiocapitellar plicae who were all initially misdiagnosed with lateral epicondylitis. After failed conservative treatment all patients, including three patients with 7°–20° extension deficit, underwent successful arthroscopic plica-removal, leading excellent results with free range of motion postoperatively in all patients [9]. This study underlines the notion that hypertrophic synovial folds as causes of postero-lateral elbow impingement are frequently under- or misdiagnosed.

A recent study conducted by Kim and colleagues [10], reported on 12 rather young patients (mean age 21.6 years),

throwing athletes and golfers, suffering from postero-lateral elbow impingement caused by synovial plicae. Remarkably, while seven patients suffered mechanical symptoms such as clicking or catching, the flexion-pronation test was only positive in three individuals (25%) [10]. However, all underwent successful arthroscopic debridement of their thickened plica with excellent outcomes postoperatively with a follow-up of 33.8 months except one patient who developed medial elbow instability and underwent subsequent reconstructive surgery [10]. Although all our patients demonstrated a snapping elbow phenomenon, this clinical sign is not a prerequisite for a hypertrophic synovial fold causing postero-lateral elbow impingement, but is a useful additional cue leading to correct diagnosis. The same holds for the diagnostic value of MRI analyses in such cases; in only 2 of our 3 patients (67%) and 9 of the 12 patients included in the study by Kim et al. [10] (75%) revealed abnormal thickened synovial folds in MRI arthrograms with gadolinium-enhanced contrast. Thus, the absence of clear signs of hypertrophic plicae in MRI analyses does not exclude their presence.

Therefore, the most valuable diagnostic tool is the arthroscopic examination of the joint that allows not only direct inspection of the hypertrophic plica [1, 11], but also helps understanding the dynamic impact of the hypertrophic folds in motion (Supplementary Video 2). The distension of the elbow joint during arthroscopy and high inflow pressures of arthroscopy fluid must also be taken in careful consideration when evaluating the synovial folds for their mechanical impact on elbow joint dysfunction [1, 11]. Arthroscopic evaluation sets the stage for the successful treatment of the hypertrophic synovial folds by arthroscopic resection, and only in rare cases, where very large hypertrophic synovial plicae are present open surgery becomes necessary [10].

Conclusions

This study highlights three cases of hypertrophic synovial plicae in the radiocapitellar joint causing lateral elbow impingement. Upon clinical examination a painful elbow snapping was evident in all cases, and visible in MRI analyses of two patients. In agreement with the literature we recommend arthroscopic evaluation of cases where lateral elbow impingement is clinically evident. In particular, arthroscopic intervention should not be delayed by prolonged conservative treatment, as subsequent erosion of the articular cartilage can be prevented by early resection. In such cases as presented here, arthroscopic removal of the hypertrophic folds leads to excellent outcomes as the disease pathology is corrected. However, when the plica identified during arthroscopy appears morphologically normal

and fails to cause any impingement during functional testing intra-operatively, the surgeon should not rely of its presence for being the only possible cause of the impingement, but should look further for other causes.

Acknowledgments The case of one patient included in this study was presented at the 5th Annual Meeting of the German-speaking Association of Arthroscopy (AGA) in Frankfurt 2005, where the senior author (T.B.) received the best oral presentation award.

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