Ulnar styloid impingement syndrome

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Abstract The tip of an excessively long ulnar styloid can impinge upon the triangular fibrocartilage complex (TFCC) against the triquetrum. The subtleties in biomechanics of the wrist joint and their role in the production of the symptoms are presented as five cases from a retrospective study. The relationship of the symptoms to the patients' job activities is also discussed. The embryological and anatomical studies show that the tip of the ulnar styloid is covered by the TFCC. Therefore, the term "ulnar styloid impingement syndrome" is adopted for the entity in cases in which the TFCC has remained intact.

Introduction

Ulnar styloid impaction against the triquetrum has been recently reported as a distinct cause of ulnar-sided wrist pain [1–4]. Anatomically, the tip of the ulnar styloid is covered by the meniscus homologue [5–8]. When an excessively long ulnar styloid abuts against the triquetrum, in the presence of an intact anatomy, the meniscus homologue will be interposed between the tip of the ulnar styloid and the triquetrum. Therefore, in the early stages of the entity, when the triangular fibrocartilage complex (TFCC) is intact, a soft tissue impingement rather than bone-to-bone impaction is in effect. The previously reported ulnar styloid impaction syndrome occurs only when the TFCC has eroded to the extent of full exposure of

the tip of the ulnar styloid and is in direct contact with the triquetrum [4].

The purpose of this article was to emphasise the need for early detection of the impingement in individuals born with an excessively long ulnar styloid and to prevent the subsequent wear and tear of the TFCC that may occur as a result of the repetitive impaction of the ulnar styloid against it. To define an excessively long ulnar styloid in this study, the ulnar styloid process index (USPI), described by Garcia-Elias, was used [9, 10].

Materials and methods

A retrospective study was performed on five patients diagnosed with ulnar styloid impingement syndrome. The patients suffered from ulnar sided-wrist pain. Their ages ranged from 27 to 49 years. The duration of their symptoms ranged from ten to 32 months. Excessively long ulnar styloids were measured on PA X-ray view of wrist using the USPI [9, 11, 12].

All patients failed to respond to conservative management and underwent partial styloidectomy. The patients were subsequently available for follow-up within a period ranging from 29 to 42 months. No specific injury to the involved wrist was reported by any of the patients. The diagnosis of ulnar styloid impingement syndrome was established through patient history, symptoms, physical findings, provocation tests and radiographic and MRI studies. A pain scoring system was used to quantify the level of symptoms before and after treatment (Table 1). This study focussed on the issue of TFCC impingement due to a long ulnar styloid process rather than the prevalence of unilateral versus a bilateral long ulnar styloid process. No TFCC tear was identified during the surgery.

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Table 1 Pain scoring system

Pain score	Description
0	No pain
1	Mild pain; no pain medication used
2	Slight intermittent pain; occasional use of nonprescription pain medication
3	Slight to moderate intermittent pain; frequent use of nonprescription pain medication
4	Moderate intermittent pain; with use of prescription pain medication
5	Severe constant pain with frequent use of prescription pain medication

Embryological and anatomical considerations

In a 230-mm long (crown–rump) embryo, the initial contact between the ulnar styloid and triquetrum is lost and the two bones are interposed by the formation of a TFCC disc [9, 13]. In the adult anatomy, the interposing section of the TFCC is the meniscus homologue that can be trapped between the tip of an excessively long ulnar styloid and the triquetrum. With the repetitive thrust of the impingement, the TFCC can undergo a progressive wear and tear. Direct impaction of the ulnar styloid against the triquetrum is possible only when the TFCC is torn [5, 8]. Therefore, for the early stages of the condition when the TFCC is intact, the term “ulnar styloid impingement syndrome” is appropriate [14]. However, the term “ulnar styloid impaction syndrome” can be reserved for the late stages of the condition when wear and tear of the TFCC has occurred and the direct contact between the two bones is possible [14, 15].

When the arm is held at the side of the trunk with the elbow at 90 degrees of flexion, the ulna and the humerus are locked together at the elbow joint. In this position, no rotation between the ulna and the humerus is possible. However, the radius, the carpal bones and the hand as one unit can pronate and supinate over the fixed ulna [7]. The location of the ulnar styloid over the surface of the distal end of the ulna at this position is at 5 o'clock for the right wrist and at 7 o'clock for the left wrist when viewed from the distal to the proximal. During the full arc of the supination and pronation of the forearm, this position of the ulnar styloid remains unchanged (Fig. 1, top). In full pronation, over the fixed ulna, the volar aspect of the triquetrum faces the tip of the ulnar styloid. In the presence of an excessively long ulnar styloid, flexion and ulnar deviation of the wrist can cause impingement of the meniscus homologue between the two bones. Such a mechanism of impingement occurs in individuals who perform many hours of computer inputting or typing, since their upper extremities are maintained in the position described. In full supination, however, with the humerus at the side of the trunk and the elbow at 90 degrees of flexion, the carpal bones along with the radius have rotated the radius to an upside down position while the ulnar

styloid has remained in place (Fig. 1, bottom). As a result, the dorsal aspect of the triquetrum has faced the tip of the ulnar styloid. However, flexion and ulnar deviation of the wrist in this situation only increases the distance between the triquetrum and the ulnar styloid. Therefore, despite an excessively long ulnar styloid, impingement is not possible [7]. In supination, the impingement can only occur when extension and ulnar deviation of the wrist takes place [4].

Fig. 1 Coronal section of the right distal radio-ulnar joint; distal view in full pronation (*top*) and supination (*bottom*). The elbow is in 90 degrees of flexion with the arm at the side of the trunk. In full pronation, the ulnar styloid is located at 5 o'clock. In full supination, the radius rotates around the immobile distal ulna but the ulnar styloid remains at 5 o'clock

Clinical features

Patients suffering from “ulnar styloid impingement syndrome” present with pain at the ulnar aspect of the wrist when performing activities such as using a keyboard. Tenderness is present at the impingement site.

Diagnostic tests

The following tests have been performed on all five patients.

Provocation test in pronation and supination

The patient’s elbow is maintained at 90 degrees of flexion with the arm at the side of the chest and the forearm in full pronation. The examiner thrusts the patient’s wrist into flexion and ulnar deviation. In the presence of impingement, the ulnar-sided wrist pain is reproduced. If the wrist flexion/ulnar deviation thrust is performed with a fully supinated forearm, no pain can be elicited, since the opposition of the volar aspect of the triquetrum and the ulnar styloid is lost.

Standard radiographs

A standard posterior-anterior (PA) radiograph of the wrist reveals an excessively long ulnar styloid (Fig. 2). The distal ulnar variance should be addressed, since a positive ulnar variance may enhance the severity of the impingement.

Magnetic resonance imaging

MRI of the involved wrist was initially performed in all patients to rule out any TFCC tear, which could be attributed to the impingement by an excessively long ulnar styloid [16, 17].

Arthroscopy

Arthroscopy can be of additional value to evaluate the radio-ulnar joint with specific attention to a TFCC tear. However, wrist arthroscopy was not a routine diagnostic trend in the community during the period between 1992 and 2003.

Treatment

The patients diagnosed with the ulnar styloid impingement syndrome were initially managed conservatively with job modification to avoid repetitive flexion/ulnar deviation of the wrist. Wrist brace and oral anti-inflammatory medications were prescribed. Occupational therapy twice a week was undertaken by all the patients with instruction on how

Fig. 2 Standard posterior-anterior (PA) radiograph of a normal right wrist; short ulnar styloid (*top*) and an excessively long ulnar styloid (*bottom*). The reduced distance between the tip of the ulnar styloid and pisotriquetral complex is noticeable in an excessively long ulnar styloid

to avoid flexion / ulnar deviation motions of the wrist. Local steroid injections were administered if resistance to the treatment was noted. If the patients’ symptoms were not relieved after six months of conservative treatment, partial resection of the excessively long ulnar styloid was performed.

Surgical technique

Under anaesthesia and mid-arm tourniquet, the forearm is maintained in full supination over a hand stand. In this position, the tip of the ulnar styloid can be directly palpated under the ulnar collateral ligament. A one-inch longitudinal incision is made on the ulnar aspect of the wrist over the ulnar collateral ligament. The subcutaneous tissue is undermined to facilitate the exposure. The dorsal branch of the ulnar nerve is identified and gently retracted dorsally. A longitudinal incision is then made along the length of the ulnar collateral ligament. The ulnar styloid is shelled out through the longitudinally split ligament by sharp dissection and is partially resected. The proximal half of the styloid with all its ligamentous attachments should remain in place to avoid subsequent instability of the

Fig. 3 Standard posterior-anterior (PA) radiograph of a normal right wrist; the partially excised ulnar styloid (*top*), full pronation, ulnar deviation (*middle*) and full supination (*bottom*). In full pronation and ulnar deviation, the ulnar styloid mildly overlaps the piso-triquetral complex. In full supination and ulnar deviation, the stump of the ulnar styloid rotates away from the piso-triquetral complex. The apparently widened space between scaphoid and lunate was not clinically considered to represent scapho-lunate instability, since there was no history of prior injury to the wrist, symptoms or clinical objective finding referable to such condition

distal radio-ulnar joint (Fig. 3) [3]. The elimination of the impingement can then be visualised. After release of the tourniquet and appropriate haemostasis, the ulnar collateral ligament is repaired. The dorsal branch of the ulnar nerve is released to its anatomical location. The subcutaneous tissue and skin are then closed. The wound is dressed and the wrist is immobilised in a cock-up splint for two weeks. The patient then receives occupational therapy until a full recovery is achieved [18, 19].

Results

This study was based on retrospective case reports. Five patients were diagnosed with “ulnar styloid impingement syndrome”, in which factors such as age, sex and occupation as well as location and duration of the symptoms were considered. The patients were seen during a period beginning in September 1992 and ending in November 2003. The patients’ evaluation included history of the symptoms, prior history of injury or surgery, physical examination, radiological and magnetic resonance imaging studies as well as duration of their follow-up. There was no history of prior specific injury to any patient’s wrist. The mean age of the patients was 36 years. These patients failed to respond to the conservative management therefore underwent partial ulnar styloidectomy. In the follow-up, all five patients had complete relief of their wrist pain by ten to 16 weeks after surgery. The patients’ preoperative and postoperative pain level was assessed using the pain scoring system (Table 1). There was no sign of wrist instability in any of the cases that underwent partial ulnar styloidectomy. The patients’ mean follow-up was 35.6 months, during which the wrists remained symptom free (Table 2). There was no sign of postoperative carpal instability in any of the five surgical patients.

Table 2 Patients’ demographics

Case number	Gender	Age (year)	Job	Duration of symptoms before treatment (months)	USPI	Pain score before treatment	Pain score after treatment	Follow-up duration after treatment (month)	Type of treatment
1	Female	38	Typist	15	0.41	4	0	30	Partial ulnar styloidectomy
2	Female	35	Telephone operator	24	0.36	3	0	42	Partial ulnar styloidectomy
3	Female	31	Housewife	32	0.39	3	0	40	Partial ulnar styloidectomy
4	Female	27	Receptionist	10	0.33	4	0	37	Partial ulnar styloidectomy
5	Male	49	Bank officer	28	0.43	3	0	29	Partial ulnar styloidectomy

USPI ulnar styloid process index

Discussion

In presence of an excessively long ulnar styloid, the meniscus homologue of the TFCC can be crushed against the triquetrum. One mechanism for the impingement is the repetitive flexion/ulnar deviation of the wrist when the forearm is in pronation and the elbow is at 90 degrees flexion with arm resting at the side of the trunk. Such a mechanism of impingement could be seen in all patients' work in this study, as presented in Table 2. Another mechanism of the condition can be supination, extension and ulnar deviation of the wrist [4].

The reason for partial versus complete styloidectomy is the fact that the stabilising ligaments of the distal radio-ulnar joint insert to the base of the ulnar styloid. Therefore, preservation of the base of the ulnar styloid eliminates the chance for postoperative ulnar-sided wrist instability [8].

Under normal circumstances, in the PA radiographic view of the wrist, sufficient distance is noted between the tip of the ulnar styloid and the triquetrum. However, in cases of excessively long ulnar styloids, this distance is significantly reduced. In such cases, a plus or minus distal ulnar variance can increase or decrease the impingement effect of the ulnar styloid. This study adds the diagnosis of the ulnar styloid impingement syndrome to the list of the differential diagnosis for the ulnar-sided wrist pain. It also demonstrates that, once the diagnosis is made, partial styloidectomy is considered to be the decisive method of treatment for cases that fail to respond to conservative management.

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