Pisiform excision for refractory flexor carpi ulnaris tendinopathy of the wrist

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The aim is to report the long-term clinical results after pisiform excision in patients with refractory flexor carpi ulnaris (FCU) tendinopathy.

We performed pisiform excision in 14 patients with recalcitrant FCU tendinopathy, who had failed conservative treatment. Nine patients were followed-up for more than 2 years. Pre-operative pain visual analog scale (VAS) was extracted from the electronic medical records. Post-operative symptoms and function were assessed with pain VAS, quick disabilities of arm, shoulder and hand (DASH) score, patient rated wrist evaluation (PRWE) score, and satisfaction VAS for surgery at the final follow-up.

After the mean follow-up period of 6 years, all patients showed improvement in pain VAS (from 5.9 to 1.2). The post-operative scores of quick DASH and PRWE were 3.5 and 13.1, respectively. Satisfaction VAS score was 8.8 and all patients returned to their work.

Excision of the pisiform bone improved symptoms in patients with refractory FCU tendinopathy.

Keywords : Flexor carpi ulnaris ; pisiform ; tendinopathy ; wrist.

INTRODUCTION

Hand surgeons frequently encounter patients with focal pain over the pisiform. The most common cause of pain is piso-triquetral arthritis [8]. However, if simple radiographic examination shows no arthritic change, the pain might have originated from tendinopathy (or enthesopathy) of the flexor carpi ulnaris (FCU) insertion area [2,9].

There are several conservative treatment options including modification of activity, medication, and steroid injection for patients with FCU tendinopathy over the pisiform. When all conservative management options including

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steroid injection fail, the surgical option should be considered as a last resort. Although pisiform acts as a sesamoid bone for FCU by increasing its moment arm, total excision of the pisiform is known to alleviate the symptoms without affecting the FCU function *(4,7-9)*. However, there is little information about the clinical outcome of pisiform excision in a homogeneous patient group with FCU tendinopathy. In several case series published in 1980s, they only reported the brief clinical outcome after surgery without detailed clinical information in heterogeneous cohort of patients *(4,8,9)*. The purpose of the current study is to investigate the long-term clinical result of total pisiform excision for the treatment of intractable FCU tendinopathy.

MATERIALS AND METHODS

Diagnosis of FCU tendinopathy was made if two or more conditions among the following four conditions were satisfied. Tenderness around the pisiform should be present for making the diagnosis.

1) Tenderness over the pisiform area; usually there should be well-localized tenderness over the pisiform or just proximal to the pisiform when direct pressure is applied.

2) Localized swelling over the FCU tendinous portion.

3) If pain was elicited when the patient's wrist was actively flexed against resistance produced by the examiner, the provocative test was regarded as positive.

4) Local steroid injection over the pisiform should provide complete or near-complete pain relief for at least several months. When there was no effect of the steroid injection, other pathology was considered.

Other common disease entities, which require careful differentiation for making a proper diagnosis, included ulnar impaction syndrome, the triangular fibrocartilage complex (TFCC) lesion, distal radio-ulnar joint instability, or extensor carpi ulnaris tendinopathy or subluxation. Characteristic tender points usually distinguished FCU tendinopathy from the other pathologies.

Surgical treatment was indicated when all the conservative measures failed, which were usually provided for more than 6 months. Steroid injection was always provided as a part of conservative treatment, when the patients did not respond to activity modification and oral medication.

From 2002 through 2010, 14 patients with refractory FCU tendinopathy were treated at our institution by the pisiform excision procedure. Exclusion criteria were as follows: 1) associated surgery such as ulnar shortening, TFCC debridement or Guyon's canal release was performed at the same time as pisiform excision; 2) bilateral cases; 3) rheumatoid arthritis patients; or 4) patients with less than minimum 2 years' clinical follow-up duration. After exclusion, finally, nine patients were eligible for inclusion in this case series. There was one male patient and 8 female patients with an average age of 43 years (range, 32~57 years) at the time of surgery. None of the patients filed a worker's compensation claim. In 5 patients, the right wrist was affected and the left wrist was affected in 4 patients. The dominant arm was involved in 5 cases. All patients had no other associated condition in their operated arm.

Routine wrist radiographs including antero-posterior and lateral views were obtained. Additional special views (carpal tunnel view and external rotation view [30' supination antero-posterior view]) were also obtained to observe the piso-triquetral joint space and osteoarthritic change. Computed tomography, MRI, or sonography was occasionally indicated for differential diagnosis in the selected patients. Our local ethics committee approved this retrospective study. We made an effort to adhere to the Strengthening the Reporting of Observational Studies in Epidemiology guidelines.

FCU-preserving pisiform en bloc resection through subperiosteal dissection was performed. A single surgeon (the senior author) performed all operations after a regional nerve block. The skin incision (V shaped incision) was placed volar and ulnar to the pisiform. When the FCU tendon was exposed, the incision was added to the ulnar side of the FCU tendon to expose the pisiform bone. Although it is possible to incise the center of the FCU longitudinally, we prefer dissection through the ulnar corner of the FCU tendon because it can help to preserve the integrity of the FCU tendon and to avoid injury to the ulnar nerve. The pisiform
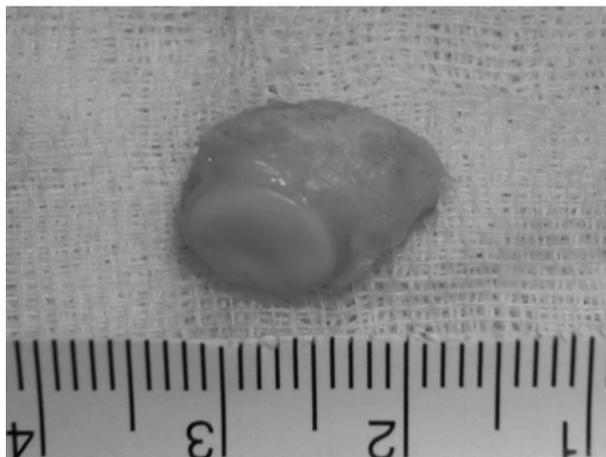
Fig. 1A. — The pisiform was excised en bloc from patients. An intact cartilage was observed.

was carefully shelled out by subperiosteal elevation without interruption of the major fibers of the FCU tendon (Figure 1A). Periosteal dissection was performed in an ulnar to radial ward direction. The ulnar nerve was on the radial side of the surgical window and great attention was paid so as not to cause injury to the nerve. Routine ulnar nerve identification was not performed. After excision, the integrity of the tendon was usually well maintained (Figure 1B). After hemostasis, skin closure was performed. Short-term post-operative immobilization was provided for faster pain relief.
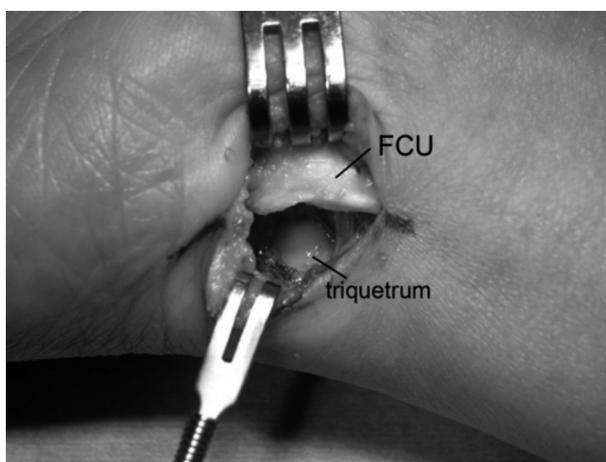

Fig. 1B. — FCU integrity was maintained after en bloc excision. Triquetrum cartilage against the pisiform was also intact.

Numerical data are reported as the mean and range. We used the Shapiro-Wilk normality test to determine the distribution form. For comparison between the pre-operative and post-operative clinical outcomes, paired Student's T test or Wilcoxon rank sum test was used. According to the normality of distribution, $P < .05$ was considered statistically significant.

Clinical review and questionnaire assessment were performed at the last visit to the clinic. The level of pain during activity was assessed using visual analogue scale (VAS), ranging from 0 (no pain) to 10 (the worst imaginable pain). Patients completed a Quick form of 'Disabilities of the Arm, Shoulder and Hand (DASH)' and the 'Patient Rated Wrist Evaluation (PRWE)' questionnaire. Satisfaction for surgery was assessed with VAS from 0 (much dissatisfied) to 10 (entirely satisfied). Return to work or daily activity was also assessed.

RESULTS

We could obtain a satisfactory long-term clinical result after total en bloc pisiform excision for intractable FCU tendinopathy. Post-operative pain relief and functional recovery was successfully achieved and satisfaction for surgery was high without recurrence of pain during the long-term follow-up. Pisiform is a small sesamoid bone underneath the distal insertion site of the FCU tendon. Although the symptom of this enthesopathy usually responds well to local steroid injection, when repeated injections fail, there is no other proven surgical option reported in the homogeneous patient group. In our experience, pisiform excision is a promising procedure to ensure long-term pain relief without functional deterioration.

We do not know the exact underlying mechanism through which the pain subsided after pisiform excision. One possible explanation is that the pisiform acts as an offending force towards the FCU tendon inducing micro-injury. The pain elicited by FCU tendinopathy resembles epicondylitis of the elbow, in which the cause is chronic repetitive micro-injury. When the degree of repetitive injury exceeds the natural healing capacity, a chronic disorganized lesion characterized by angiofibroblastic hyper-

plasia and further calcific material deposition could be observed at the tendon insertion site. Our assumption is that with excision of the pisiform, excessive strain over the FCU tendon produced by the mass effect of the pisiform would be reduced, and then sufficient time could be available for the enthesopathy to heal without further micro-injury. Furthermore, concomitant removal of some nerve endings over the pisiform, which are responsible for pain, might have a certain role in obtaining pain relief. Tendinosis (degenerative change) or tendinitis (mainly inflammatory change) as the cause of this condition might be another point of debate *(2)*. The most appropriate explanation for this entity might be enthesopathy, when we think of the fact that the symptom is relieved by removal of the insertion site (pisiform). Enthesopathy in an excised pisiform was once shown on histologic examination in another study *(8)*. However, clear distinction among these conditions is not very meaningful from the clinical aspect. Even tendinosis, in which there are no inflammatory cells in the degenerative tissue, usually shows a good short-term response to steroid injection.

Pisiform excision was usually indicated in OA or chondromalacia of the piso-triquetral joint and many authors have reported a successful clinical outcome *(3-5,7-9,11)*. In one large case series, pisiform excision was performed in 67 patients *(4)*. The patients usually consisted of those with post-traumatic piso-triquetral OA (30% of patients) or chondromalacia (40% of patients). They additionally treated 8 patients with FCU tendinitis and reported a good clinical outcome in most patients. In another large case series published in 1982, 21 patients underwent excision of the pisiform *(9)*. Six cases were caused due to OA and fracture was the reason for surgery in 5 patients. The remaining 10 patients were operated upon because of intractable FCU tendonitis. In this very heterogeneous group, the author reported that pisiform excision provided a satisfactory result in most patients. One article reviewed all the previous reports including a total of 216 cases in 1987 and concluded that 55.4% of patients who underwent pisiform excision had accompanying osteoarthritic change including primary, secondary (post-traumatic or post-operative) or inflammatory

cause of OA *(8)*. The patient with FCU tendinitis (44.6%) was the second most common entity in the pooled data.

There is still little consensus on the adequate surgical option for intractable FCU tendinopathy. Besides excision of the pisiform, simple debridement of the degenerative portion of the FCU tendon was also introduced *(2)*. The authors defined the pathology in their patients as tendinopathy, because patients usually had tenderness not over the pisiform, but over the more proximal area (3 cm proximal) from the pisiform. Histologic examination also showed typical tendinopathy. They debrided the distal portion of the tendon after making a longitudinal incision over the tendon. Degenerative portion, which is usually located in the deep surface, was removed with a scalpel until healthy tissue was encountered. Although they reported a good clinical outcome, one limitation was the small number of patients (a total of 4 patients). The nature of pathology did not seem to be similar to that in our patients because the location of the tender point was different. We agree that if the degenerative portion of the tendon is removed adequately, the symptom would be alleviated. However, in some cases, the degenerative change is very unclear on gross examination, causing difficulty in delineating the extent of debridement, resulting in incomplete debridement. Furthermore, if the pisiform acts as an offending factor that induces tendinopathy, symptom could recur later. Because of these concerns, we prefer excision of the pisiform for this disease entity. The limitation of the above mentioned article was that all patients filed a worker's claim and three patients had an associated condition besides FCU tendinopathy such as wrist synovitis, carpal tunnel syndrome, or De Quervain syndrome requiring surgical management, which complicated the analysis of post-operative data.

Many studies have showed that wrist weakness and joint instability do not occur after total excision of the pisiform if the integrity of the surrounding soft tissue is meticulously preserved *(1,6,9)*. It is known than the FCU function was not impaired after pisiform excision and it had little effect on flexion strength of the wrist *(10)*. Wrist flexion power was equal to or less than that on the contra-

Fig. 2. — External rotation view of the wrist (30' supination A-P) of patients. A well preserved joint space of P-T and calcific deposition volar to the pisiform were noted

lateral non-affected side *(1)*. But the difference was not statistically significant. No late dysfunction of the FCU or wrist was noted clinically *(4)*.

Our article has several limitations. Firstly, this is a retrospective case series without a comparative group. Further prospective comparative study is required. Secondly, small number of patients was another limitation. Because many patients were successfully treated conservatively, it was difficult to gather a large number of patients who had intractable FCU tendinopathy as the sole reason for surgery. The final limitation was that we did not measure the objective outcome such as range of wrist motion, grip power, or flexion strength of the wrist before and after surgery. However, we can expect that the objective outcome would be maintained after surgery according to the previous report.

DISCUSSION

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