CLINICAL STUDY

Early Results of Transcatheter Arterial Embolization for Relief of Chronic Shoulder or Elbow Pain Associated with Tendinopathy Refractory to Conservative Treatment

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ABSTRACT

Purpose: To evaluate the effectiveness and safety of transcatheter arterial embolization to relieve pain associated with shoulder and elbow tendinopathy refractory to conservative treatment.

Materials and Methods: This study included 13 patients (15 cases) who underwent embolization between November 2015 and December 2016 to treat chronic shoulder pain (6 with rotator-cuff tendinopathy, 2 with calcific tendinitis) or elbow pain (7 with lateral epicondylitis) refractory to conservative treatment. Microspheres were used in the first 4 cases, and imipenem/cilastatin sodium was used in the remaining 11. Visual analog scale (VAS) score changes were recorded. Decrease in VAS score and degree of enhancement on digital subtraction angiography were compared.

Results: The technical and clinical success rates were 100% (15/15) and 73% (11/15), respectively. The mean VAS scores at baseline, 1 day, 1 week, 1 month, and 4 months after embolization were 6.1, 5.8, 5.1, 4.3, and 2.5, respectively ($P < .05$ after 1 wk). Pain improved in 9 of 10 cases (90%) with "evident" enhancement and 3 of 5 cases (60%) with no evident enhancement. The VAS scores in the evident enhancement group decreased more than those in patients with no evident enhancement (4.5 vs 1.8; $P < .05$). Forearm cutaneous erythema was noted in 1 patient treated with microspheres.

Conclusions: Transcatheter arterial embolization may be an option for relieving pain associated with chronic shoulder and elbow tendinopathy refractory to conservative treatment. The degree of angiographic enhancement might be a possible factor affecting the degree of pain relief after embolization.

ABBREVIATIONS

ESWT = extracorporeal shockwave therapy, IPM/CS = imipenem/cilastatin sodium, VAS = visual analog scale

Primary tendinopathy is a common disorder, and it accounts for a high proportion of visits to rheumatologists and orthopedic surgeons (1). In the general population, the prevalence rates of lateral epicondylitis, rotator-cuff tendinopathy, and calcific tendinitis have been reported to be 2.8%, 2%, and 2.7%, respectively (2–4). In addition, tendinopathy accounts for approximately 7% of all physician visits in the United States (1). Although there has been a lack of direct and indirect cost analysis for various tendinopathies, 5% of patients with epicondylitis took sick leave from work for a duration of 29 days in 1 year in the United Kingdom. In addition, costs related to absenteeism resulting from lateral epicondylitis in the United Kingdom were estimated at £27 million in 2012 (5,6). In the Unites States, total direct medical cost related to lateral epicondylitis was reported at $660 per patient during the 1-year period after diagnosis (7).

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Although tendinopathy is considered a self-limiting condition, it may become resistant to conservative therapies and involve a long recovery time. Approximately one third of patients with tendinopathy experience significant pain and limitation of activities at 6 months after the onset of symptoms (7). Traditional treatment modalities have been focused on the inflammatory process of tendinopathy (8). However, there have been reports describing overuse tendinopathy with minimal or no inflammation (9,10). As the pathophysiology of tendinopathy has not yet been fully established, a multitude of treatment options have been proposed for this disorder, including nonsteroidal anti-inflammatory drugs, physical therapy, corticosteroid injections, extracorporeal shockwave therapy (ESWT), sclerotherapy, growth factor treatment, stem cell treatment, and surgery (9,11). However, most treatment options are limited by inconsistent outcomes.

Surgery focuses on the excision of the fibrotic adhesion and areas of the affected tendon. Open debridement, arthroscopic management, and percutaneous procedures have been reported for surgical treatment of tendinopathy (9,11). However, even though surgery is the last option in the treatment of tendinopathy, the results may not be completely satisfactory, with a wide range of reported failure rates as follows: lateral epicondylitis, 3%–31% (open), 3%–28% (arthroscopic), and 4%–26% (percutaneous); rotator cuff tendinopathy, 29% (arthroscopic); and calcific tendinitis, 6%–21% (arthroscopic) (9,11–14).

Alfredson et al (15) have suggested that neovessels and accompanying nerves are possible sources of inflammation and pain in chronic Achilles tendinosis. Based on such a theoretical background, transcatheter arterial embolization has been performed for adhesive capsulitis (16,17), tendinopathy (18), and osteoarthritis of the knee (19,20). Results of these studies (16–20) have suggested that embolization of these abnormal vessels is effective for pain reduction and clinical symptom improvement without causing complications in treatment for adhesive capsulitis, tendinopathy, and osteoarthritis. However, only a few studies (16–18) have been conducted on transcatheter arterial embolization for pain associated with shoulder and elbow disease. In addition, these studies mainly involve adhesive capsulitis. Transcatheter arterial embolization for shoulder and elbow tendinopathy has been reported in only 3 cases of which we are aware (18). In addition, factors affecting the degree of pain reduction after embolization are unknown in the literature (16–20), and our hypothesis is that the degree of enhancement of the lesion on angiography may affect pain reduction after embolization.

Therefore, the objectives of the present study are to assess the effectiveness and safety of transcatheter arterial embolization to relieve pain associated with shoulder and elbow tendinopathies refractory to conservative treatment and to examine the effect of the degree of angiographic enhancement on pain alleviation.

MATERIALS AND METHODS

Patients

This retrospective study was performed at a tertiary-care center and with institutional review board approval. The informed consent requirement was waived in view of the study's retrospective nature.

Between November 2015 and December 2016, a total of 613 patients who visited the orthopedic surgery outpatient department with shoulder or elbow pain were diagnosed with shoulder tendinopathy (rotator cuff tendinopathy, n = 262; calcific tendinitis, n = 148) or elbow tendinopathy (lateral epicondylitis, n = 203) based on shoulder or elbow joint magnetic resonance imaging or ultrasonography.

Among these patients, those who had persistent pain for more than 6 months and pain refractory to conservative treatment were included in the present study. The exclusion criteria were local infection at the site of pain, age younger than 18 years, and history of previous tendon surgery or trauma. Patient selection was accomplished by a multidisciplinary approach in collaboration with orthopedic surgeons and interventional radiologists.

As a result, 13 patients (15 cases; 10 women and 3 men with a mean age of 52.4 y; range, 27–75 y) were referred for transcatheter arterial embolization and included in the present study. Two patients had shoulder and elbow pathologic conditions at the same time and underwent a single embolization session. The etiologies were shoulder pain (rotator cuff tendinopathy, n = 6; calcific tendinitis, n = 2), and elbow pain (lateral epicondylitis, n = 7). Conservative treatments previously performed included administration of pain relievers (nonsteroidal anti-inflammatory drugs, n = 3; tramadol, n = 9), corticosteroid injection (n = 12), and ESWT (n = 5). The mean duration of symptoms was 16.7 months ± 15.3 (range, 6–68 mo; median, 13 mo). Patients' demographic and clinical data are summarized in the **Table**.

Embolization Procedure

Under local anesthesia, percutaneous arterial access was obtained by using a 5-F introducer sheath (Terumo, Tokyo, Japan) via the common femoral artery (n = 11) or a 4-F sheath via the brachial artery (n = 2). Baseline selective subclavian, axillary, and/or brachial arteriography was performed by using a 5-F (H1; Cook, Bloomington, Indiana) or 4-F angiographic catheter (Glidecath, non-taper angle; Terumo) to identify abnormal enhancement around the shoulder or elbow area.

After identifying abnormal enhancement, superselective arteriograms of corresponding feeding arteries were obtained by using a coaxial 2.0-F microcatheter (Parkway Soft; Asahi Intecc, Nagoya, Japan) and microguidewire (Meister; Asahi Intecc). Tris-acryl microspheres (Embosphere; Merit Medical, South Jordan, Utah) with a diameter of 40–120 μm were used in the first 4 cases. Imipenem/cilastatin sodium (IPM/CS) suspension was used in the following 11 cases as an embolic agent. IPM/CS suspension was prepared by