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Original article

Arthroscopic synovectomy for the treatment of stage II to IV trapeziometacarpal joint arthritis

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Abstract

Objective: As a minimal invasive surgery for the treatment of thumb carpometacarpal joint (trapeziometacarpal [TMC]) arthritis, we performed an arthroscopic synovectomy for Eaton stage II to IV arthritis.

Patients and Methods: We included patients who were effectively treated with a corticosteroid injection, experienced recurrence of TMC pain, and had no major instability of the TMC. Surgery was performed in 17 female patients. Synovectomy was performed, when possible, using radiofrequency and a shaver. The mean follow-up period was 27.2 months.

Results: Two patients required additional surgery; however, 15 patients were satisfied with the outcome. The mean visual analogue scale score improved from 8.8 preoperatively to 2.2 postoperatively.

Conclusion: Arthroscopic synovectomy is indicated to be an effective treatment for stage II to IV TMC arthritis. The goal of this treatment was to relieve severe pain minimally invasively. Furthermore, if symptoms remain or reoccur, another curative procedure can be chosen.

Key words: synovectomy, arthroscopy, trapeziometacarpal joint arthritis, corticosteroid injection, minimum invasive surgery

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Introduction

The trapeziometacarpal (TMC) joint is the center of movement of the thumb. Despite not being a weight-bearing joint, TMC is a common site of arthritis. Radiography has indicated that the prevalence rate is 25% in men and 40% in women aged > 75 years[1]. We speculate that TMC arthritis occurs more regularly in individuals who live in rural communities. Those with TMC arthritis often experience pain due to cartilaginous abrasion and, subsequently, synovitis and TMC instability[2, 3]. Treatment with a corticosteroid injection or splint therapy is often effective for thumb pain[4]. However, in cases of resistance to these conservative treatments, many surgical treatment options that provide good clinical results for TMC arthritis, including ligament reconstruction and tendon interposition (LRTI)[5], osteotomy of the first metacarpal[6], trapeziectomy[7, 8], arthroscopy[9, 10], arthrodesis of the TMC[11, 12], and arthroplasty using an implant[13, 14], are available. If the pain is reduced over time, a less invasive treatment option may be better. Hofmeister *et al*. reported favorable long-term results by using arthroscopic shrinkage, trapeziectomy, and Kirshner wire fixation[15]. In addition, Edwards and Ramsey[16] treated patients with Eaton stage III TMC arthritis by using arthroscopic shrinkage, trapeziectomy, and Kirshner wire fixation. Arthroscopic debridement and synovectomy have also been reported to improve clinical outcomes, as compared with nonoperative therapy, in stage I or II TMC arthritis[17].

In this study, we performed the arthroscopic synovectomy procedure to treat stage II to IV TMC arthritis and describe its middle-term results.

Materials and Methods

Patient selection

Since 2011, 15 patients (17 thumbs) with stage II to IV TMC arthritis were treated with arthroscopic synovectomy. All the procedures involving human participants were conducted in accordance with the ethical standards of the institutional research committee (No. 17-38) and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. For the patients that were resistant to conservative therapy, we decided on the following inclusion criteria: 1) no major instability of the TMC and 2) temporary efficacy of corticosteroid injection on the affected TMC. The first author judged instability by using manual testing on all the patients. In addition to the corticosteroid injection, triamcinolone acetonide (5 mg) with 1% xylocaine (1 ml) was injected in the TMC joint one or two times by the first author. All the patients were female, with a mean age of 64.5 years (range, 54–77 years) at the time of surgery. The dominant hand was affected in nine patients; and the non-dominant hand, in four patients. The arthritis was bilateral in two patients. Plain radiography revealed stage II TMC arthritis in six thumbs, stage III in 10 thumbs, and stage IV in one thumb.

Surgical technique

Surgery was performed under regional or general anesthesia, except for the final three cases, in whom local anesthesia was used. A tourniquet was applied to the upper arm but did not need to be inflated in any case. Ten-pound vertical traction was applied to the thumb by using a finger trap and a traction tower (Medical Next Co. Ltd.) (Figure 1). We used a 1.9-mm-diameter, 30° oblique arthroscope (Stryker Co. Ltd. or Smith & Nephew Co. Ltd.). Three portals were made, 1-R on the radial side of the abductor pollicis longus (APL) tendon, 1-U between the extensor pollicis brevis (EPB) and extensor pollicis longus (EPL) tendon, and the thenar portal[18]. The synovectomy was undertaken using radiofrequency (Smith & Nephew Co. Ltd.) and a shaver (Stryker Co. Ltd.); the scope of each can be switched between two portals (1-R and 1-U) freely (Figure 2). The intra-articular view is difficult to see just after scope insertion. On the upper side, you can see the first metacarpus; and on the lower side, the trapezium (Figures 3a, b). The thenar portal was used for drainage with an 18-gauge needle (Figures 3c). Special care must be taken when using the radiofrequency device (Figures 3d). Ablation should not continue for > 1 second, and the scope should be used for protection. If a free body is present, it is removed using a small punch or a shaver (Figures 3e). We did not resect any bone or cartilage on the surface of the TMC joint and did not perform any drilling on the joint surface. The goal of synovectomy is to view the anterior oblique ligament and the capsule all around the joint in the arthroscopic field of view (Figures 3f). To avoid iatrogenic injury, certain traction of the thumb is needed and the insertion of the scope or another device must be performed gently.

Postoperative protocol and patient assessment

After the surgery, an elastic hard splint was constructed by occupational therapists and applied for 4 weeks. Office work was allowed after 2 weeks, and sports activity and heavy occupation were allowed after 2 months postoperatively. The outcomes were evaluated at the time of final follow-up by using the visual analogue scale (VAS) score; the disability-symptom score to assess the disabilities of the arm, shoulder, and hand function (quick DASH); range of motion, and radiographic finding.

Statistical analysis

We compared the clinical results obtained preoperatively and at the time of final follow-up, including the VAS score and range of motion, and analyzed the differences by using a paired *t* test. Significance was assumed when the p value was < 0.05.

Results

We performed arthroscopic synovectomy in 15 patients and found no side effects. Two patients required additional surgery; therefore, we excluded these two patients and fully evaluated only 13 patients (15 thumbs). The mean follow-up period was 27.2 months (range, 12–57 months). The mean VAS score improved from 8.8 preoperatively to 2.23 at the final follow-up ($p < 0.01$). The preoperative and postoperative range of motion did not significantly differ in all the patients (Table 1). On radiographic examination, the TMC arthritis stage did not change in 12 thumbs; however, two thumbs with stage II advanced to stage III, and one thumb with stage III advanced to stage IV, although all of these patients experienced decreased postoperative pain. The mean postoperative disability-symptom score in the quick DASH was 26.7 (Table 1).

A representative case with radiographic assessment preoperatively and at 2 and 5 years postoperatively is shown in Figure 4. This patient was a 70-year-old woman diagnosed as having preoperative Eaton stage III. The postoperative DASH score was 13.63, and the VAS score improved from 8.0 preoperatively to 0 postoperatively.

Figure 1 Preoperative setting. Ten-pound vertical traction is applied to the thumb by using a finger trap and traction tower (Medical Next Co. Ltd.).

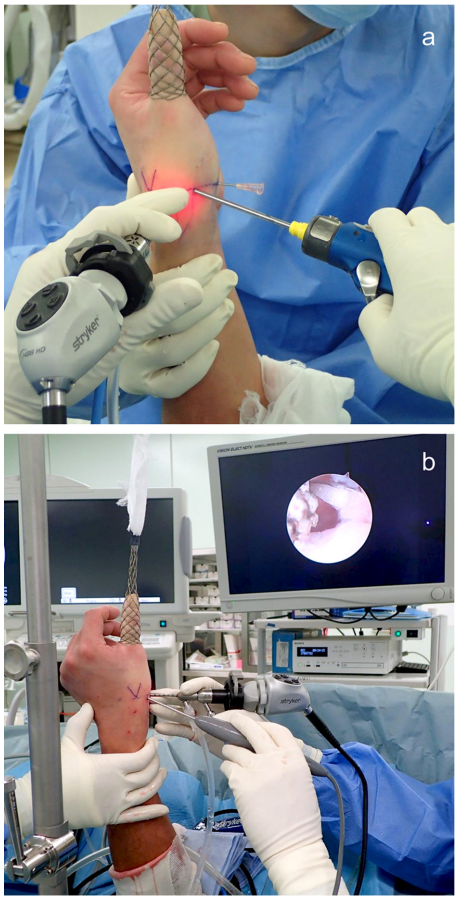

Figure 2 a, b. The scope, radiofrequency, and shaver from two portals (1-R and 1-U) can be modified freely.

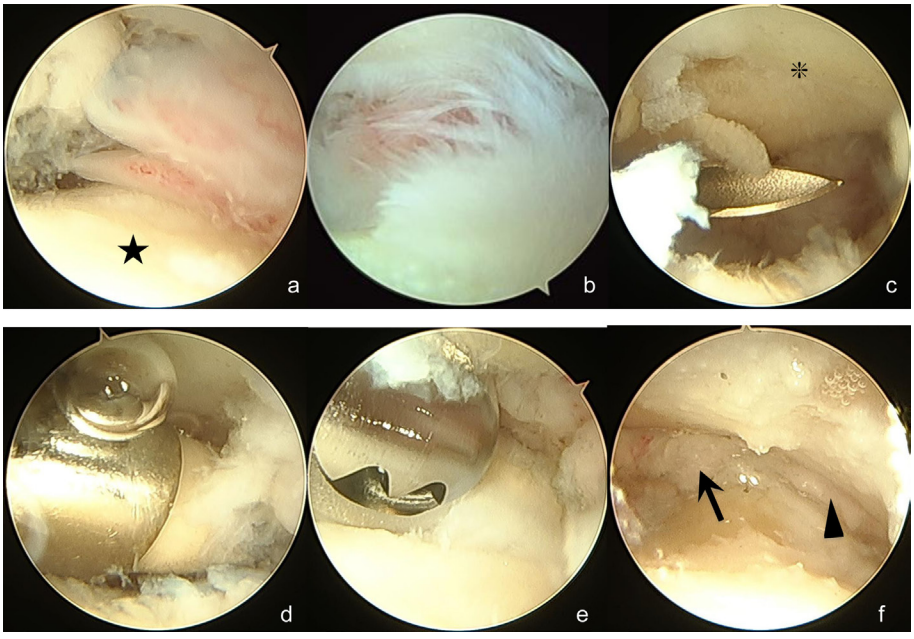

Figure 3
a, b. Synovia of the TMC joint just after inserting the scope. The surface of the trapezium is indicated by a star on the inferior view. c. An 18-gauge needle at the thenar portal for drainage. The surface of the first metacarpus is indicated by an asterisk in the superior view. d. Synovectomy using a radiofrequency device. e. Synovectomy using a shaver. f. After synovectomy. The arrow indicates the anterior oblique ligament, while the arrowhead is the capsule.

Table 1 Summary of all patients

No.	Sex	Age	Affected side	Occupation	Anesthesia	Follow-up (month)	X-ray (Eaton's classification)		Range of motion				VAS		qDASH
									Radial abduction		Palmar abduction				
							Preope	Postope	Preope	Postope	Preope	Postope	Preope	Postope	Postope
1	F	75	R	House wife	Regional	36	IV	IV	15	15	20	20	9	3	43.18
2	F	70	R	House wife	Regional	57	III	III	30	30	30	30	8	0	13.63
3	F	60	L	Medical office	Regional	37	III	III	45	45	45	45	10	6	18.18
4	F	62	R		Regional	15	II	III	50	50	45	45	10	3	18.18
5	F	72	R	Piano instructor	General	56	II	III	45	40	40	40	10	2	22.72
6	F	72	L			56	II	II	40	40	40	40	10	2	22.72
7	F	54	R	Folding paper instructor	Regional	28	II	II	45	35	45	35	10	2	6.81
8	F	51	R	Nurse	Regional	28	III	IV	35	35	35	35	9	0	6.25
9	F	54	L	House wife	General	18	III	III	60	55	60	45	6.7	4.2	65.625
10	F	68	R	House wife	General	18	III	III	50	64	45	70	8.5	2.6	27.03
11	F	68	L	House wife	General	12	III	III	44	45	54	55	8.5	0	9.38
12	F	69	L	House wife	General	12	III	III	24	60	60	50	8	1.5	17.71
13	F	68	R	House wife	Local	12	III	III	55	50	45	45	5.3	1.9	44.8
14	F	56	R	House wife	Local	12	III	III	50	50	50	50	9	5.3	20.83
15	F	77	L	House wife	Local	12	III	III	70	70	65	65	10	0	63.55
Average		65.1				27.27			43.35	42.83	44.88	44.12	8.8	2.23	26.7
1	F	57	R	Office work	Regional	4	II	II	40		45		100	LRTI	
2	F	57	R	Massagist	Local	2	II	II	45	40	45	30	100	Arthrodesis	

Figure 4 The left side is the anteroposterior (AP) view, and the right side is the lateral view of the radiograph. The preoperative, 2-year postoperative, and 5-year postoperative views are shown.

Discussion

We performed arthroscopic synovectomy for the treatment of TMC arthritis (Eaton stages II to IV), which showed favorable results when pain, function, and patient satisfaction were assessed. However, most patients had little pain remaining in the TMC (mean VAS score: 2.2). Two patients who required additional surgery were deemed contraindication cases. One patient had a slight instability of the thumb, and the other was a massage therapist, which meant that she exerted excessive pressure on her thumbs. These patients were treated with LRTI or TMC arthrodesis, respectively. Furia[17] reported the favorable clinical outcomes of arthroscopic debridement and synovectomy for the treatment of Eaton stage I or II TMC arthritis. Furthermore, Edwards and Ramsey[16] reported good clinical outcomes in patients

Table 2 Summary of the studies that were performed using the arthroscopy

Previous reports	Treatment	Patients	VAS	DASH	Terms of follow up
Furia (Arthroscopy 2010)	debridement and synovectomy conservative	23 cases Stage I, II	7.7 → 2.7	55.6 → 26	1 year
		21 cases Stage I, II	7.5 → 7.3	54.4 → 53	1 year
Hofmeister. (Hand 2009)	Trapeziectomy + shrinkage + K-wire fixation	18 cases	Improved all cases		7.6 years
Edward (JHS 2010)	Trapeziectomy + shrinkage + K-wire fixation	23 cases Stage III	8.3 → 1.5	61 → 10	4 years
Ogawa	debridement and synovectomy	15 cases Stage II - IV	8.8 → 2.2	26.7 postoperatively	2 years

with Eaton stage III TMC arthritis treated with arthroscopic hemitrapeziectomy and thermal capsular modification without interposition. However, the use of only arthroscopy to perform a synovectomy in patients with Eaton stage II to IV TMC arthritis has not been reported yet. Therefore, our study is the first trial on this technique for the treatment of Eaton stage III and IV TMC arthritis (Table 2). The mean postoperative disability-symptom score in the quick DASH[19] was 26.7, which is similar to the postoperative outcomes obtained using other arthroscopic treatments for TMC arthritis (Table 2).

In general, synovitis causes pain and cartilage destruction in the joint. Osteoarthritis (OA) is characterized by cartilage breakdown and synovial inflammation, which are directly linked to clinical symptoms such as joint swelling, synovitis, and inflammatory pain[3]. Although corticosteroids primarily treat the inflammatory component of OA, pain relief can be achieved by a corticosteroid injection into the TMC joint[20]. Moreover, if the pain recurs, a synovectomy may be required to secure pain relief; therefore, we decided to only perform a synovectomy using arthroscopy. In cases where the corticosteroid injection is noneffective for the TMC arthritis, an arthroscopic synovectomy may also not provide pain relief. Concerning the two cases where we achieved poor results, we believe that the contraindications were as follows: the instability of the TMC joint caused the pain, the corticosteroid injection was not effective, the joint was heavily worked, or a collagen-linked disease such as rheumatoid arthritis was present. For these reasons, we considered our treatment protocol for TMC arthritis (Figure 5). If the splint and non-steroidal anti-inflammatory drug treatment were not effective, corticosteroid injection was performed. If temporary effectiveness and no instability of the TMC joint were observed, arthroscopic synovectomy was selected. If the patient had instability of the TMC joint or was poorly satisfied with the result of the arthroscopic synovectomy, we performed a ligament reconstructed arthroplasty (LRA) or arthrodesis.

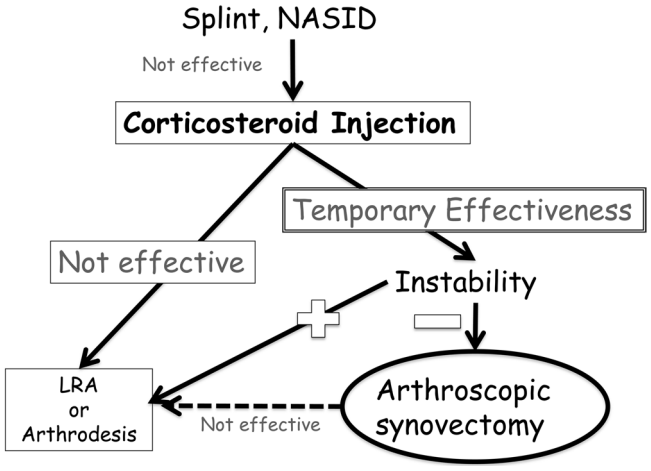

Figure 5 Our treatment protocol for trapeziometacarpal arthritis. AS, arthroscopic synovectomy; LRA, ligament reconstructed arthroplasty.

This study has several limitations. First, the number of patients in this study was small and had a relatively short follow-up period. In addition, the alignment of the thumb cannot be changed; thus, adduction deformity of the thumb persists. In the long-term, the thumb function is expected to worsen, but we considered the pain relief as the most important factor in this study.

In summary, arthroscopic debridement and synovectomy are expected to be effective treatments for stage II to IV TMC joint arthritis with two advantages. First, they are less invasive and can be performed with local anesthesia. Second, the patients can select curative treatment (ligament reconstruction and arthrodesis) if the pain remains or reoccurs.

Conflicts of Interest: None.

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