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

Takeshi Ogawa¹, Toshikazu Tanaka², Shunsuke Asakawa¹, Masaki Tatsumura¹, Takeo Mammoto¹, and Atsushi Hirano¹

¹ Department of Orthopaedic Surgery and Sports Medicine, Tsukuba University Hospital Mito Clinical Education and Training Center, Japan
² Department of Orthopaedic Surgery, Kikkoman General Hospital, Japan

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

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. 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. Treatment with a corticosteroid injection or splint therapy is often effective for thumb pain. 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), osteotomy of the first metacarpal, trapeziectomy, arthroscopy, arthrodesis of the TMC, and arthroplasty using an implant, 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. In addition, Edwards and Ramsey 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.

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

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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 portal18). 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.
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\(^7\) 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\(^6\) reported good clinical outcomes in patients

| No. | Sex | Age | Affected side | Occupation | Anesthesia | Follow-up (month) | X-ray (Eaton’s classification) | Range of motion | VAS | qDASH |
|-----|-----|-----|---------------|------------|------------|------------------|-------------------------------|----------------|-----|-------|
|     |     |     |               |            |            |                  |                               |                |     |       |
| 1   | F   | 75  | R             | Housewife  | Regional   | 36               | IV IV 15 15 20 20         | 9 3 43.18      |     |       |
| 2   | F   | 70  | R             | Housewife  | 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             | Housewife  | 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             | Housewife  | General    | 56               | II II 40 40 40 40          | 10 2 22.72     |     |       |
| 7   | F   | 54  | R             | Housewife  | Regional   | 28               | II II 45 45 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             | Housewife  | General    | 18               | III III 60 55 60 45        | 6.7 4.2 65.625 |     |       |
| 10  | F   | 68  | R             | Housewife  | General    | 18               | III III 50 64 45 70        | 8.5 2.6 27.03  |     |       |
| 11  | F   | 68  | L             | Housewife  | General    | 12               | III III 44 45 54 55        | 8.5 0 9.38     |     |       |
| 12  | F   | 69  | L             | Housewife  | General    | 12               | III III 24 60 60 50        | 8 1.5 17.71    |     |       |
| 13  | F   | 68  | R             | Housewife  | Local      | 12               | III III 55 50 45 45        | 5.3 1.9 44.8   |     |       |
| 14  | F   | 56  | R             | Housewife  | Local      | 12               | III III 50 50 50 50        | 9 5.3 20.83    |     |       |
| 15  | F   | 77  | L             | Housewife  | Local      | 12               | III III 70 70 65 65        | 10 0 63.55     |     |       |
|     |     |     |               |            |            |                  |                               |                |     |       |
|     |     |     |               |            |            |                  | Total                        |                |     |       |
|     |     |     |               |            |            |                  | 27.27 43.35 42.83 44.88     | 8.8 2.23 26.7  |     |       |

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.
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 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. Although corticosteroids primarily treat the inflammatory component of OA, pain relief can be achieved by a corticosteroid injection into the TMC joint. 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 non-effective 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.

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.
Acknowledgments

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