



Salvage revision arthroplasty after failed TMC joint prosthesis

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The purpose of this retrospective study was to describe our experience with failed TMC joint prostheses and to report the results of 7 cases that were treated by a salvage revision arthroplasty. We only performed this salvage arthroplasty when partial (cup replacement) or total replacement of TMC prosthesis was not possible. We performed a resection arthroplasty with (partial) trapezial excision and spacer insertion to prevent scaphometacarpal collaps. We used the proximal part of the Ascencion® MCP implant (Integra) as spacer. Among our 7 patients, 3 were satisfied with a VAS satisfaction of 8 or more. Four patients had pain levels less than or equal to 3. Our mean DASH score was 32.7. Our patients had good opposition and retropulsion scores and the mean TMC joint flexion and abduction values were both 40°. But tip and key pinch ipsilateral was insufficient (mean tip pinch of 2kg and key pinch of 1kg).

We believe that the salvage revision arthroplasty with (partial) trapezial excision and spacer insertion is a valuable treatment option for failed TMC joint replacement. But further research needs to compare all the different revision options after TMC joint replacement in a multicenter randomized controlled trial.

Keywords : trapeziometacarpal arthroplasty, salvage procedure

INTRODUCTION

Osteoarthritis of the trapeziometacarpal (TMC) joint is a very common and disabling condition. Total joint arthroplasty of the TMC joint has proven to be efficacious with improved motion, strength and pain relief (3). However, complications such as component loosening, cup protrusion and instability can occur. Unfortunately little data is available regarding the complications of TMC joint replacement and management of these complications lacks consensus (9).

The purpose of this retrospective study was to describe our experience with failed TMC joint prostheses and to report the results of 7 cases that were treated by a salvage revision arthroplasty. We only performed this salvage arthroplasty when partial (cup replacement) or total replacement of TMC prosthesis was not possible. We performed a resection arthroplasty with (partial) trapezial excision and spacer insertion to prevent scaphometacarpal collaps. We used the proximal part of the Ascencion® MCP implant (Integra) as spacer.

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MATERIALS AND METHODS

Between 2014 and 2016, 7 patients underwent a salvage revision arthroplasty because of TMC complications. We excluded patients who had other revision procedures performed (partial or total replacement of TMC joint).

We included 4 male and 3 female patients. The mean age at the time of revision surgery was 64 years (55-75). The dominant hand was affected in 5 cases.

Implants used for the initial TMC arthroplasty were the ARPE® implant (Zimmer-Biomet) in 5 cases and the MAIA® implant (Lepine) in 2 cases.

The mean interval for revision after the TMC arthroplasty was 10 months (3-26) and was performed because of scaphotrapeziotrapezoid (STT) arthrosis in 2 cases, cup protrusion in 1 case and instability in 4 cases.

The anterior approach was used in all cases. Branches of the superficial radial nerve were identified and protected. The thenar muscles were reflected and the capsule of the TMC joint was opened. The prosthetic neck, trapezial cup and metacarpal stem were removed. The trapezium was exposed and excised partially in 2 cases and completely in 5 cases.

Our goal was to use the proximal part of the Ascencion® MCP implant (Integra) as spacer.

The metacarpal canal was prepared by broaching : we upsized the broach until we had a good fit. We first used a trial metacarpal stem and stability and circumferential motion were assessed to ensure no impingement on the implant. The definitive metacarpal stem was then inserted and the joint reduced and reassessed. The capsule was closed with an absorbable suture. During the procedure, intraoperative fluoroscopy was performed to check proper alignment and placement of the prosthesis. We closed the skin and subcutaneous tissue with an absorbable suture and patients were placed into a short cast with the thumb in a functional position for 2 weeks. After 2 weeks removal of the cast and an exercise program with an active and gentle active assisted range-of-motion protocol was undertaken.



Figure 1. — Kapandji method for opposition (A) and retropulsion (B) of the thumb.

Clinical and radiological assessment was performed by an independent observer, that is not one of the surgeons.

For subjective assessment, the Disability of the Arm, Shoulder and Hand (DASH) questionnaire was used. Pain and satisfaction was monitored using a visual analogue scale (VAS pain ; 0= no pain, 10= unbearable pain, VAS satisfaction ; 0= not satisfied at all, 10= very satisfied).

Clinical examination consisted of the range of motion (evaluated with a goniometer) and thumb opposition and retropulsion using the Kapandji method (7).

The test for opposition involves the patient attempting to touch the thumb to 10 points on the same hand in order from point 0 to 10, as shown in figure 1. The test for retropulsion involves the patient attempting to touch the thumb to 3 points on the other hand in order from point 0 to 3, as shown in figure 1. We measured grip strength using a dynamometer (Jamar Digital Hand Dynamometer) and pinch strength using a pinch gauge (Preston Pinch Gauge). Strength measurements were not corrected for hand dominance and they were made as a mean of 3 attempts.

Posteroanterior and lateral radiographs were obtained at the final follow-up. Radiographs were obtained to evaluate stem subsidence, zones of osteolysis and joint (sub)luxation.

RESULTS

The patients were reviewed a mean of 20 months (7-35) after the revision.

The mean VAS pain level was 3 (0-7) and the mean VAS satisfaction was 6 (0-10). Patient rated outcome was measured using the DASH score and

Table 1. — Clinical results of 7 patients treated by a salvage revision arthroplasty after failed TMC joint replacement

	Strength(kg)			ROM		Kapandji		DASH
	Grip	Key	Tip	Flexion	Abduction	Opposition	Retropulsion	
Patient 1	3.3	0	0	45°	35°	6	1	65.5
Patient 2	9.3	0.5	0.5	30°	45°	6	1	45
Patient 3	12	0	0.5	30°	30°	8	2	46.2
Patient 4	26.6	0	0.3	40°	35°	8	3	12.5
Patient 5	25.3	0	0	45°	40°	9	3	20.3
Patient 6	42.6	0	0.5	45°	45°	10	3	21.2
Patient 7	45	6	9	45°	45°	10	3	18.3

Grip strength, Key pinch and tip pinch of ipsilateral thumb, ROM : range of motion of ipsilateral thumb



Figure 2. — Radiographic studies. A. Radial subluxation of prosthesis, stabilisation metacarpal 1 and 2 with tight rope system. B. Flexion-adduction contracture with swan-neck deformity of first ray. C. Complete excision of trapezium. D. Partial excision of trapezium.

the mean DASH score at final follow-up was 32.7 (12.5-65.5).

The final thumb opposition and retropulsion was measured using the Kapandji method and we calculated a mean of 8 (6-10) for the opposition and a mean of 2.3 (1-3) for retropulsion. The mean final TMC flexion was 40° (30°-45°) and TMC abduction was 40° (35°-50°).

The mean grip strength was 23kg (3kg-45kg) ipsilateral and 31kg (10kg-53kg) contralateral. The mean key pinch was 1kg (0kg-6kg) ipsilateral and 4kg contralateral (0kg-6kg), the mean tip pinch was 2 kg (0kg-9kg) ipsilateral and 4kg contralateral (0-9kg). Table 1 lists the clinical results.

Radiographic studies showed 2 patients with a radial subluxation of the implant and 2 patients with a flexion-adduction contracture of the first metacarpal and swan-neck deformity of the first ray.

Five patients had a total trapezial excision and two patients had a partial excision. (Figure 2)

One patient had an important radial subluxation of the implant with a clinical impact, a stabilization of metacarpal 1 and 2 with a tight rope system was performed 9 months after revision surgery. There was only a partial reduction of the implant with this procedure and the patient wears a brace for comfort. No other complications were reported.

Four patients said they would have the operation (TMC joint replacement) again. Only one patient had scar tenderness.

DISCUSSION

Vander Eecken et al. reported a survival rate for the Arpe prosthesis of 97% at 5 years, Martin Ferrero reported a 10 years survival rate of 93.9% (4,5). In the study by Aparad and Saint-Cast the survival of the Arpe prosthesis was 85% in 5 years and 79% in 11 years and the failure rate was higher than 1% per year (1).

These results of the Arpe prosthesis are comparable to other modular TMC joint prosthesis. Goubeau et al reported a 95%, 5 year overall survival of the Ivory prosthesis (6). Skytta reported a 94% survival at 5 years for the de la Caffinière prosthesis implanted in rheumatoid patients (12). Van Capelle et al. and Chakrabarti et al. reported a survival of greater than 16 years (72% and 89%, respectively) for the de la Caffinière prosthesis (4,14). Semere et al. reported a survival of 91% with a mean follow-up of 12.5 years for the Roseland prosthesis and Dehl et al. reported a survival of 98% after a mean

of 10 years for the Rubis II thumb carpometacarpal joint reverse prosthesis (5,11).

The most important complications of the TMC joint prosthesis are instability, implant loosening, trapezial fracture, excessive polyethylene wear and complex regional pain syndrome (1,4,5,6,10,11, 12,13,14). But most TMC joint prosthesis studies do not specify management or results in patients with complications (9).

Lenoir et al. reported 12 cases of failed TMC joint replacement that were treated by trapeziectomy with ligament reconstruction and tendon interposition (LRTI) arthroplasty. They reported good functional (DASH score, satisfaction) results without scaphometacarpal collaps on the radiographic studies. But the grip and pinch strength of their patients was reported as a percentage of the contralateral side, so it's difficult to draw conclusions about the physical assessment. Nevertheless, among their 12 patients, 11 were satisfied or very satisfied with the overall outcome (9).

Apard and Saint-Cast reported 6 cases of failed TMC joint replacement that were treated by trapeziectomy and interposition of the palmaris longus tendon (Jones procedure) (2). Four patients were satisfied with the overall outcome. They reported good thumb function (thumb opposition and retropulsion) but force (key pinch and grip strength) was lower than on the opposite side and scaphometacarpal height was always reduced (34.5% on average).

At last, Kaspaz et al. presented the results of 15 cases of failed total TMC joint replacement : 4 had secondary partial trapezial excision, 4 complete trapeziectomy and 7 LRTI (8). All patients were satisfied, the mean DASH score was 16.2 and the clinical examination (opposition and range of motion) was sufficient. This study also showed that the outcomes of secondary trapeziectomy after failed TMC joint replacement generally do not differ from the primary trapeziectomy results.

Among our 7 patients, only 3 were satisfied with a VAS satisfaction of 8 or more. Four patients had pain levels less than or equal to 3. Our mean DASH score was 32.7. Nevertheless, our patients had good opposition and retropulsion scores with a mean of 8 and 2.3 respectively. The mean TMC joint

flexion and abduction values were both 40°. But tip and key pinch ipsilateral was insufficient with a mean tip pinch of 2kg and key pinch of 1kg. If we compare our results with the results reported after trapeziectomy for failed TMC joint replacement, the subjective outcome and the tip and key pinch are slightly better (2,8,9).

We have no explanation for the key and tip pinch deficit because we don't have measurements of these values before revision surgery.

It's striking that the two patients with only a partial trapezial excision had better subjective outcomes with a mean VAS satisfaction of 10 and a VAS pain of 2.5. We believe that this can be caused by the pseudo-articulation of the pyrocarbon stem with the remaining cancellous bone of the trapezium. Further research needs to confirm this finding.

The present study has some limitations. First, the design of our study was a case series study and we could only include 7 patients. Second, we had no preoperative measurements to compare our results and third our follow-up period was short. A longer follow-up will provide additional information.

We believe that the salvage revision arthroplasty with (partial) trapezial excision and spacer insertion is a valuable treatment option for failed TMC joint replacement.

Further research needs to compare all the different revision options after TMC joint replacement in a multicenter randomized controlled trial.

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