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Surgical treatment of basal joint disease of the thumb: comparison between resection-interposition arthroplasty and trapezio-metacarpal arthrodesis

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Abstract Thirty-six thumbs with symptomatic osteoarthritis of the first carpometacarpal joint were treated either by trapezio-metacarpal arthrodesis (*n*=18) or resection-tendon-interposition arthroplasty (*n*=18). The mean follow-up of the 29 patients was 42 months. With the data available, we could not find any difference in the outcome of either procedure. In the majority of cases, the main aim of the operation, relief of pain, was achieved, the patients were satisfied and pleased with the functional result of the operation. No difference in grip strength between the operated and the normal contralateral hand could be established. Nevertheless, the arthrodesis seems to be the procedure causing fewer problems (only one patient not completely satisfied) and is therefore preferred over the resection-tendon-interposition arthroplasty.

Keywords Osteoarthritis · Carpometacarpal joint · Trapezio-metacarpal arthrodesis · Resection-tendon-interposition arthroplasty

Introduction

Osteoarthritis of the basal joint of the thumb is a common problem among middle-aged women. Occasionally, the condition develops postraumatically, i.e., due to a Bennett fracture. The symptoms consist of pain, restricted mobility, reduced grip strength, and also functional problems in handling small objects. On clinical examination, swelling, tenderness, and in severe cases instability of the joint are presented. Standard X-rays are sufficient to establish the diagnosis, if other painful conditions in the region can be excluded clinically. The treatment of first choice is conservative. Surgery can be considered if conservative measures fail, the pain becomes disabling, and the function is severely affected.

Various methods of surgical treatment have been described. Trapezio-metacarpal arthrodesis has proved to be a reliable method to relieve pain, maintain stability and mobility of the first ray, and regain a good function of the operated hand [2]. However, the interposition arthroplasty with flexor carpi radialis (FCR) split tendons [4] has become popular. Various other methods ranging from simple trapezectomy [3] through FCR sling arthroplasties for the reconstruction of the intermetacarpal ligaments [1, 8] and osteotomies of the first metacarpal to prosthetic replacements are reported in the literature.

The goal of our study is to investigate the outcome of the two methods used in our clinic, the arthrodesis and the resection-interposition arthroplasty.

Patients and methods

During 1982 and 1998 we operated on 37 thumbs in 30 patients. Of these, 29 patients (36 thumbs) could be reviewed with a mean follow-up of 42 months (range 6 months to 14 years). Mainly women were involved (*n*=26). We lost one patient to follow-up who has died in the meantime. The indication was mainly an idiopathic degenerative arthritis (*n*=33), but also 3 posttraumatic cases due to malunion of a Bennett fracture of the base of the first metacarpal. In 11 patients, the condition occurred on the dominant hand, in 11 patients on the nondominant side, and 7 patients were operated on bilaterally. The mean age at the time of the operation was 63 years (range 46–79 years). According to the preference of the individual operating surgeon, either a trapezio-metacarpal arthrodesis (*n*=18) or a resection-tendon-interposition arthroplasty (*n*=18) was carried out.

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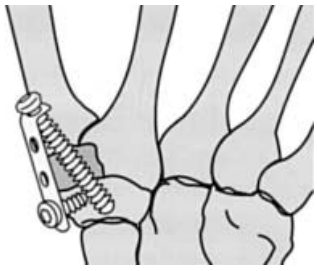

Fig. 1 The trapezio-metacarpal arthrodesis

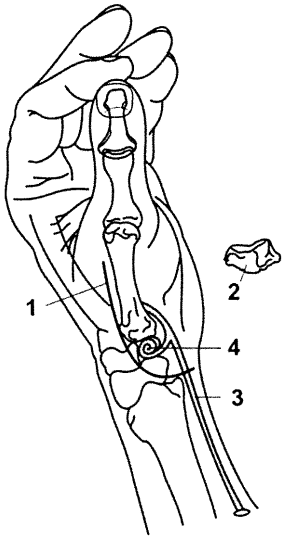

Fig. 2 The resection-tendon-interposition arthroplasty, surgical technique (*1* incision, *2* removed multangulum majus, *3* flexor carpi radialis tendon, *4* the interpositioned rolled split tendon strip, the anchovy)

Operative technique

The trapezio-metacarpal arthrodesis was carried out through a straight incision on the radial border of metacarpal I running over the trapezium to the wrist. The superficial branch of the radial nerve was identified and protected. The joint space was approached and the joint cartilage and the adjacent sclerotic subchondral bone removed using an osteotome, small saw blades, or dentist drills. A small laminar spreader was interposed to achieve lengthening and correction of the adduction. A corticocancellous bone graft is cut out of the iliac crest and interposed to create intrinsic stability and abduction. The remaining space is filled with cancellous bone. A stable fixation is achieved by a special miniplate technique. The first screwhole of a 3–4 hole AO mini plate is bent 90° and sunken in the metacarpal bone, acting as a washer to achieve maximal compression with a 2.7 mm cortical screw crossing the former joint space. With a second screw at the level of the trapezium, further compression and buttressing can be achieved by asymmetric drilling [7]. This compound system allows functional aftertreatment by a removable splint for 6–8 weeks according to radiological consolidation (Fig. 1).

To perform the resection–interposition arthroplasty, a similar incision is used. The remaining joint cartilage is removed, and a partial trapezectomy is performed. Through a second small incision approximately 10 cm proximal to the wrist, the flexor carpi radialis tendon (FCR) is identified and split with a tendon stripper from proximal, leaving the distal insertion intact. The split tendon is rolled and stitched to form an anchovy-like structur of the appropriate size to fill the gap created to the first metacarpal base (Fig. 2). This procedure is followed by a scaphoid type of plaster fixation for 6 weeks.

Evaluation

The patients were interviewed about their subjective outcome. Pain was estimated on an visual analog score (0 = no pain and 10 = unbearable pain). Function in daily living such as unbuttoning clothes or keeping up with hobbies such as knitting and sewing were part of the question protocol. Clinical investigation included the extent of radial abduction of the thumb (measured angle between first and second metacarpal in degrees), first to second and first to fifth finger pinch. The thumb opposition measured in centimeters is the maximum distance from the interphalangeal joint of the opposed thumb to the head of the second metacarpal, and the lack of adduction the respective distance between the interphalangeal joint and the second metacarpal when trying maximum adduction. A grip meter (JAMAR Adjustable Dynamometer, Asimov Engineering, Los Angeles, Calif.) was used to measure the maximum grip force. The tests were performed on both hands. The amount of shortening of the first ray was measured on standard anteroposterior radiographs compared with the normal opposite side or, in the case of bilateral operations, the preoperative situation.

Results

The results are given in Table1. We used the untreated and clinically and radiologically unaffected hands of our patients as the control group. With the data available, neither a significant difference between the two methods nor a difference from the control group could be detected. We further evaluated the X-rays. In the arthroplasty group, shortening of the first ray occurs depending roughly on the amount of trapezoid bone removed. The mean shortening of the first ray was 5 mm (range 0–10 mm). Once again due to the small numbers involved, no influence on the subjective outcome or on the grip strength could be detected. We observed a few complications. One arthrodesis failed to unite and required another bone graft, eventually resulting in an excellent result. In the arthroplasty group, we tried to correct a shortening subluxation of the first ray in a second intervention without success. One dystrophy occurred in each group, was treated successfully, and had no influence on the final outcome.

Discussion

Osteoarthritis of the first carpometacarpal joint is not uncommon among middle-aged and older women. The condition develops gradually. In contrast to hip and knee problems, medical attention is sought only in severe, disabling cases. If conservative treatment fails to relieve the symptoms, surgical procedures can offer a solution with low concomitant morbidity. Operative procedures for the treatment of CMC1 osteoarthritis are generally rewarding.

Simple trapezectomy introduced by Gerwis [5] is an easy and quick procedure which is still favoured [4]. The majority of the patients are satisfied. The results obtained regarding power grip are comparable with the values we found in our patients. The procedure is suitable in undemanding cases with moderate adduction contracture [4].

Nevertheless, discouraging cases with gross instability and shortening of the first ray followed by loss of power grip have been observed. To overcome these problems,

Table 1 Results

	Resection-interposition arthroplasty (*n*=18)	CMC1 arthrodesis (*n*=18)	Controls (*n*=13)
Age (when operated; years)	65±9 (range 47–79)	61±8 (range 45–75)	
Age (at follow-up; years)	68±9 (range 51–82)	66±11 (range 46–79)	61±10 (range 47–82)
Follow-up (years)	3±2 (range 1–7)	6±5 (range 1–16)	
Pain (scale 1–10)	2±1 (range 1–7)	2±1 (range 1–7)	
Satisfaction	14 completely satisfied 1 quite satisfied 3 unchanged	16 completely satisfied 2 quite satisfied	
Pleased with result	15 pleased 3 displeased	18 pleased	
Operation again?	14 yes 4 no	18 yes	
Hobby kept up	15 yes 3 stopped	16 continued 2 stopped	
Function	12 normal 6 reduced	16 normal 2 reduced	
Radial abduction (deg)	66±14 (range 40–85)	56±21 (range 20–85)	72±12 (range 50–90)
Lack of adduction (cm)	1±1.1 (range 0–4)	1.6±1.5 (range 0–4)	0.2±0.6 (range 0–2)
Thumb opposition (cm)	4.8±1.7 (range 2–8)	4.4±0.9 (range 2–6)	6.2±1.1 (range 5–8)
Pinch 1–2 possible	18 yes	17 yes 1 no	
Pinch 1–5 possible	15 yes 3 no (2×1cm,1×2cm)	17 yes 1 no	
Grip strength (kg)	18±7 (range 8–34)	14±7 (range 4–33)	19±6 (range 10–30)

numerous procedures have been described. Froimson [4] introduced the interposition of a rolled flexor carpi radialis tendon in the space of the removed trapezium, later nicknamed the anchovy plasty due to its appearance and in this version performed by generations of registrars. The advantage of this interposition is still a matter of controversy. Despite the generally good outcome of the operation, we observed problems. The more extensive the trapezectomy performed, the greater the shortening of the first ray we observed, with subsequent reduction of the grip strength. Limited excision of the trapezium makes the access to osteophytes on the ulnar border of the base of the first metacarpal difficult, and leaving them in place causes serious complaints between the first and the second metacarpal, as observed in one of our patients. Subsidence of the interposition material is to be expected and was also observed in our patients during the follow-up period. In the more recent literature, ligament reconstruction-tendon-interposition arthroplasties [9, 10] are popular. The flexor carpi radialis tendon strip is first passed through a drill hole in the base of the first metacarpal to prevent lateral subluxation, and then the spacer is formed either by winding it around the stump of the remaining part of the tendon or holding it in place by a pull-out suture.

Arthrodesis of the first carpometacarpal joint proved to be a reliable method and affords good strength and stability with a reasonable functional range [2]. It is advocated for young patients who do heavy work [6] but not reserved for these cases. For some authors, it became the treatment of choice after comparing it with other techniques [6]. We can share this opinion. We avoid the disadvantage of long plaster fixation by adding a sufficient osteosynthesis in place of a Kirschner wire [2]. All except one patient with severely disabling generalised osteoarthritis of the other finger joints were very pleased by the result. The thumb function is excellent, and the grip force comparable with the unaffected side. In the arthroplasty group, however, we observed two poor results, and a solution for the problem is still not in sight. Although we could not establish significant differences between our patient groups, our preferred treatment method is the arthrodesis. The results are satisfying, and the method is reliable. The range of movement is not markedly restricted. Problems that arise can be easily handled. Only if arthrodesis as the method of treatment is rejected should serious consideration be given to using modifications of the classic anchovy plasty of Froimson [4] with additional ligament reconstruction techniques [9, 10] .

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