Treatment of trapeziometacarpal arthritis: Results of resection arthroplasty

Ninety-one thumbs with symptomatic trapeziometacarpal arthritis were studied and classified by the severity of trapeziometacarpal arthritis, as seen on the roentgenogram. Thirty-five patients with mild changes had satisfactory relief of pain after treatment with anti-inflammatory drugs and a C-splint. Operation, consisting of resection of the trapezium and shortening by 1.5 cm of the abductor pollicis longus tendon was performed on 16 thumbs. In six patients a rolled palmaris longus tendon was inserted between the metacarpal base and the scaphoid. All patients had relief of pain, improvement of pinch and grip strength, and an increased range of thumb motion after operation. There was no difference in the results of those patients treated with or without tendon interposition. Trapezial resection was found to be an effective means of treating patients with symptomatic trapeziometacarpal arthritis who failed to improve with conservative care.

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Trapeziometacarpal arthritis may be a manifestation of systemic disease, such as rheumatoid or gouty arthritis, or may be localized, as in post-traumatic or primary degenerative arthritis. Primary degenerative arthritis of the trapeziometacarpal joint is particularly prevalent in postmenopausal women. It may result from hormonal changes which cause ligamentous laxity and metacarpal subluxation, from hereditary abnormalities of the joint surfaces, or from wear and tear of an incongruous joint. Surgical treatment of symptomatic trapeziometacarpal arthritis has included ligamentous reconstruction, arthrodesis, arthroplasty, excisional, or implant arthroplasty.

The purpose of this study is to evaluate the treatment of symptomatic trapeziometacarpal osteoarthritis by conservative means and by excisional arthroplasty and to define the indications, technique, and results achieved by this operation.

Materials and methods

Seventy-six patients with symptomatic trapeziometacarpal arthritis were reviewed; in 15, symptoms were bilateral—thus a total of 91 thumbs were studied. Sixty-seven (88%) of the patients were women; nine (12%) were men. Only the dominant thumb was involved in 39 (51%); only the nondominant thumb in 22 (29%); symptoms were bilateral in 15 (20%). The mean age of the patients at the time of referral for treatment was 59 years; the range was 24 to 82 years.

Associated hand problems included de Quervain's disease in four (5%) and carpal tunnel syndrome in 21 (28%) patients. In 67 patients (88%), there was no history of antecedent trauma, nor of collagen disease. Six (8%) patients had a previous history of a specific collagen disease—either rheumatoid arthritis, systemic lupus erythematosus, or psoriatic arthritis. The trapeziometacarpal changes in all patients were typical of degenerative arthritis. Three (4%) patients noted symptoms of trapeziometacarpal arthritis within several months of injury. One had a traumatic trapeziometacarpal dislocation, one a fractured scaphoid, and one a gunshot injury to the thenar eminence.

Nonoperated cases were followed from 3 to 38 months after initiation of treatment, with a mean of 16 months; operative cases were followed from seven to 36 months after operation, with a mean of 18 months.

Classification

We have based our classification of the severity of osteoarthritis of the trapeziometacarpal joint upon roentgenographic findings in order of increasing severity.
Stage 1. Patients in stage 1 were those whose roentgenograms showed joint narrowing or subchondral sclerosis but neither subluxation nor osteophyte formation (Fig. 1). Clinically, these patients usually had intermittent mild pain at the trapeziometacarpal joint with repeated or heavy use of the thumb. There often was mild loss of power of tip to side pinch. Passive rotation of the first metacarpal with longitudinal compression (the “grind test”) usually caused pain and crepitation. Thirty-four (37%) of the thumbs in this study were classified as stage 1.

Stage 2. Stage 2 was defined in those patients whose roentgenograms showed a small osteophyte at the ulnar border of the distal articular surface of the trapezium, increased density of the subchondral bone, and narrowing of the joint space. Subluxation of the metacarpal was limited to less than one third of its base (Fig. 2).

These patients had frequent episodes of pain at the trapeziometacarpal joint with normal use of the thumb. The “grind test” caused both pain and crepitus. The base of the first metacarpal was subluxated dorsally and radially and could be relocated with mild traction or pressure. Forty-one (45%) thumbs were classified as stage 2.

Stage 3. In stage 3 were placed those patients whose roentgenograms revealed a prominent osteophyte at the ulnar border of the distal trapezium, marked narrowing of the joint space, and increased subchondral bone density. The first metacarpal was subluxated radially and dorsally one third the width of its base (Fig. 3). Pantrapezial arthritis was noted in the majority of these patients.

Patients classified as stage 3 had pain at the thumb base with use, a positive “grind test” associated with pain and crepitus, and subluxation of the first metacarpal base dorsally and radially. Passive reduction of the metacarpal base was not possible. Some also had an adduction deformity of the first metacarpal with secondary hyperextension of the metacarpophalangeal joint. Twelve (13%) thumbs were classified as stage 3, of which 10 (83%) had roentgenographic evidence of pantrapezial arthritis.

Stage 4. In stage 4, roentgenograms showed total loss of joint space, a prominent ulnar osteophyte, subluxation of the metacarpal base and, frequently, osteoarthritic subchondral cysts (Fig. 4).

Most of these patients had relatively little pain. The trapeziometacarpal joint was usually immobile. Four (5%) thumbs were classified as stage 4.

Nonoperative care

Fifty-five (72%) of 76 patients with painful trapeziometacarpal osteoarthritis were treated with anti-inflammatory agents (indomethacin, ibuprofen, or aspirin) and given a static C-splint to immobilize the arthritic joint in abduction. They were advised to use the splint intermittently when the thumb was painful. Of 35 patients who were able to be contacted, nine (26%) had used their splints for up to 4 months and then discarded them, feeling that they were sufficiently improved to no longer require treatment. All of these patients were in stage 1. The remaining 26 patients (74%) had worn their splints 6 to 12 hours a day with symptomatic improvement, but regularly reapplied them with re-exacerbation of symptoms. This group included patients of all stages.
metacarpal use (Fig. 2). Pain at the base of the thumb was common. The ulnar bone was most frequently involved and traction on it was painful. The forearm was also involved.

Stage 3 (Fig. 3) was the most severe, with evidence of subluxation of the metacarpal bone. The thumb was immobile and there was a prominent osteophyte on the ulnar border of the distal trapezium, marked narrowing of the joint space, increased subchondral bone density, and the first metacarpal was subluxated more than one third of the diameter of its base.

Fig. 2. Stage 2 trapeziometacarpal arthritis is seen in the right thumb. There is a small osteophyte on the ulnar border of the articular surface of the trapezium, increased density of the subchondral bone, and narrowing of the joint space. The metacarpal is subluxated less than one third of the diameter of its base. The left thumb is normal.

Fig. 3. Stage 3 trapeziometacarpal arthritis is seen bilaterally. There is a prominent osteophyte to the ulnar border of the distal trapezium, marked narrowing of the joint space, increased subchondral bone density, and the first metacarpal is subluxated more than one third of the diameter of its base.
Surgical treatment

Of the 91 thumbs studied, an operation was done on 16. All had failed to respond adequately to conservative therapy. None was stage 1, 14 were stage 2, two were stage 3, and none was stage 4. Two patients had an operation on both thumbs. All were women, and all except one were postmenopausal. Mean age at time of onset of symptoms was 55 years (range, 33 to 77 years). Mean duration of symptoms prior to operation was 19 months.

Technique

A 3 cm dorsal longitudinal incision, centered at the trapeziometacarpal joint, was curved volarly at the base of the thenar eminence and prolonged for an additional three centimeters. Dissection was carried through the subcutaneous tissues bluntly, identifying the sensory branches of the radial nerve which were protected. The abductor pollicis longus tendon was transected 1.5 cm proximal to its insertion. The extensor pollicis brevis was retracted dorsally, exposing the capsule of the trapeziometacarpal joint. A longitudinal incision was made in the capsule and the dorsal aspect of the trapezium exposed by subperiostal dissection. Through the curved anterior limb of the incision, the origin of the thenar muscles was freed from the scaphoid and trapezium and retracted distally, exposing the entire anterior face of the trapezium. The trapezium was freed by sharp dissection, dividing the anterior and posterior oblique ligaments on the ulnar side and usually was removed in one piece. Particular care was taken to avoid injury to the flexor pollicis longus and flexor carpi radialis tendons.

In six cases a rolled segment of the palmaris longus tendon was inserted as a cushion between the scaphoid and the metacarpal base. In 10 cases gelfoam was used to fill this space. The capsule then was closed with nonabsorbable sutures. The abductor pollicis longus tendon was shortened about 1 cm and resutured with nonabsorbable suture holding the first metacarpal in extension. After operation the thumb was immobilized in a light plaster splint, extending from the midforearm to the interphalangeal joint of the thumb, maintaining the first metacarpal in approximately 45° of extension and slight abduction with the proximal phalanx in full extension. After 4 weeks the plaster splint was removed and a protective C-splint was worn intermittently for an additional 4 weeks.

In no case was resection arthroplasty performed if there was severe fixed adduction deformity of the first metacarpal with secondary metacarpophalangeal joint hyperextension.

Results

All patients in this series, regardless of the stage of their disease, noted decreased pain after operation.
Fig. 5A. This woman had stage 2 trapeziometacarpal arthritis which was painful and interfered with the use of her right hand. She failed to respond to anti-inflammatory agents and a C-splint.

Fig. 5B. Seven months after trapezial resection, interposition of a palmaris longus tendon graft and 1.5 cm shortening of the abductor pollicis longus, the patient is pain free.

Nine patients reported mild pain with repetitive use of their thumb in activities such as typing or crocheting. None required analgesics stronger than occasional aspirin. One patient continued to wear her C-splint with heavy use of her hand. All thumbs were clinically stable. No patient had noted that the operated thumb was shorter than the other thumb, although there was recession of up to 2.3 mm. Radial nerve dysaesthesia did not develop in any patient.

The mean abduction of the thumb was 50° on the operated side and 54° on the nonoperated side. Mean pronation was 30° on both the operated and nonoperated thumbs (Figs. 5A, 5B, and 5C). All patients except one could bring the thumb tip to the base of the little finger. The mean increase in tip to side pinch strength was 147% (range, 2 to 9 kg increase after operation). The mean increase in grip strength was 151% (range, 7 to 34 kg increase after operation).
the distal surface of the trapezium and the asymmetry of the two joint surfaces permits little articular contact in most positions. The lax joint capsule allows rotation about the long axis of the metacarpal in addition to flexion, extension, abduction, and adduction. Stability at the extremes of movement is provided by the ligaments surrounding the trapeziometacarpal joint, particularly the anterior and posterior oblique trapeziometacarpal ligaments to the ulnar side. The muscles which surround the trapeziometacarpal joint help to stabilize it in intermediate positions. Loss of stability may result from laxity of these ligaments in the postmenopausal woman, or from attrition of the shallow dorsoradial facet of the trapezium, permitting dorsal subluxation of the base of the first metacarpal.

Most patients seeking treatment for trapeziometacarpal arthritis have had pain, limitation of motion, and weakness of pinch and grasp for many months. In the more advanced cases, subluxation and adduction contracture of the first metacarpal may occur. The majority of patients (72% in this series) can be successfully treated nonoperatively, regardless of the degree of joint change at the time they first seek care. The initial treatment should include intermittent splinting for at least 10 to 12 weeks with a C-splint. Patients classified as stage 1 are more likely to be treated successfully with splints alone and less likely to require surgical intervention. If the thumb remains painful after an adequate trial of conservative care, it may be considered for operation.

In our experience, resection arthroplasty of the trapezium in the treatment of osteoarthritis of the trapeziometacarpal joint results in relief of pain, useful range of motion, and marked improvement in pinch and grip strength. This procedure alone is not advised in cases of severe adduction contracture of the first metacarpal with metacarpophalangeal hyperextension, or with fixed flexion deformity of the metacarpophalangeal joint. Appropriate reconstructive procedures of the metacarpophalangeal joint and release of the adduction contracture are necessary in these cases. At the time of operation, the tendon of the abductor pollicis longus should be shortened and the patient immobilized for 4 to 6 weeks to permit soft-tissue healing. One risks continued problems if stability is not maintained by shortening the abductor pollicis longus tendon.

The use of tendon interposition may provide a collagen layer to prevent bone-to-bone contact. However, our results of trapezial resection with and without tendon interposition are similar.
Conclusions

1. Early trapeziometacarpal arthritis may be successfully treated with a C-splint and anti-inflammatory agents.

2. Trapezial resection arthroplasty with or without tendon interposition decreases pain, increases thumb motion, and provides good pinch and grip strength to the operated hand.

REFERENCES


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