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Silastic interposition arthroplasty for osteoarthrosis of the carpometacarpal joint of the thumb

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We performed Ashworth's (1977) silastic interposition arthroplasty for painful osteoarthrosis of the carpometacarpal (CM) joint of the thumb. Recently, however, some unsuccessful cases treated by this method have been reported. We therefore reviewed the results of patients treated by Ashworth's method.

We reviewed 16 patients operated on according to the original Ashworth method for osteoarthrosis of the first CM joint. The cases consisted of 8 males and 8 females, ranging in age from 32 to 76 years (average, 59.6 years).

The patients were grouped according to Eaton's classification as follows: 1 patient was stage II, 6 were stage III, and 9 were stage IV. All patients were followed postoperatively for 1 to 12.5 years (average, 4.5 years).

Twelve patients did not complain of any pain but 3 patients felt slight pain when moving their thumb. However, the degree of pain was much less than that experienced preoperatively. Only one patient complained of severe pain 2 years after the first operation. Her implant ruptured and required additional surgery. All except one showed either an increase or no change in grip strength. The range of motion (ROM) was full in all patients. Implants showed sinking in 3 patients, a partial rupture of the implant edge in 5 patients and a whole body failure in only 1 implant, roentogenographically. In spite of these troubles, only 3 patients complained of an unpleasant feeling and 2 reported slight pain. Implant trouble did not always cause the symptoms. The clinical results of this method were mostly satisfactory.

Key words : thumb, CM joint, osteoarthrosis, Ashworth implant, interposition arthroplasty

INTRODUCTION

The carpometacarpal (CM) joint of the thumb is a saddle joint and is forced to move in multiple directions. Therefore, the joint is likely to suffer from instability and arthrosis [6], which can lead to serious hand dysfunction. We have frequently used the silastic interposition arthroplasty technique developed by Ashworth [1] to surgically treat cases of painful CM arthrosis of the thumb. Although the surgery has generally provided good results, it has been reported to be unsuccessful in some cases. In this study, we reviewed the postoperative results of surgery performed as long as 20 years ago to determine the advantages and disadvantages of the surgical procedure.

MATERIALS AND METHODS

A total of 16 patients, consisting of 8 males and 8 females, received silastic interposition arthroplasty by the Ashworth method to treat arthrosis of the CM joint of the thumb. Age at the time of surgery ranged from 32 to 76 years (average, 59.6 years). More than half of the patients had overused their hands during work for a long period of time. The time from onset of the disease to the first presentation ranged from 1 month to 4 years, with an average of 1 year and 2 months. Symptoms before surgery included pain and reduced grip strength in all the patients. The range of motion of the thumb was almost normal. Seven patients had arthrosis in both thumbs. Surgery was performed on 9 right and 7 left thumbs.

The follow-up period ranged from 1 to 12.5 years (average, 4.5 years). Ten patients were followed for at least 3 years.

Radiographic findings at the first presen-

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tation included subluxation of the CM joint of the thumb, osteophyte formation, reduction of the articular space, and a cyst or sclerosis of the subchondral bone. Mild degeneration of the scapho-trapezial joint was also observed in 4 patients.

Based on the radiographic findings, the patients were classified into 4 stages according to Eaton's classification [4] published in 1973 (this classification is used hereafter). We determined that 1 patient was in stage II, 6 in stage III, and 9 in stage IV (According to a revision in 1985, 1 patient was in stage II, 11 in stage III, and 4 in stage V).

We generally treat patients with arthrosis using conservative therapy. That is, they are instructed to wear a simple thumb fixation brace when they use the hand or feel pain. We have not performed physical therapy, such as thermal therapy, on an outpatient basis because the condition is chronic and requires long-term treatment, although we recognize the beneficial short-term effects. Another reason for not doing it is that many of our patients are referrals from distant.

Apart from the 16 patients who received surgery, 13 of 18 other patients treated only with conservative therapy (including 4 stage I, 4 stage II, 5 stage III, and 5 stage IV patients) were followed for 4 years and 1 month, on average.

Of the 13 patients, 3 had no pain, 6 had occasional pain, and 4 had persistent pain. All 4 patients with persistent pain were serious cases classified into stage III or IV. There was almost no difference in ROM between the right and left thumbs. Grip strength was further reduced in those with persistent pain.

We performed silastic interposition arthroplasty using the Ashworth method for those whose pain or reduced grip did not improve after conservative therapy for about 2.4 months, and who elected to receive surgical treatment.

SURGICAL TECHNIQUE

Two sizes (large and small) are available for the stem of the implant. Implants with small stem were used for 3 patients and with large stems (Fig. 1) for the remaining 13 patients. Since the medullary cavity of the trapezium is relatively wide, the small stem is likely to cause loosening of the implant, which may break the stem and finally the whole implant. Therefore, large stem implants were substituted for the implants with small stems. The lazy Z skin incision is made on the CM joint of the thumb. The skin is carefully elevated to avoid damage to a few sensory branches of the radial nerve, because damage to the nerve may cause numbness or tingling in the area of the nerve branch postoperatively. Care is also taken to avoid damage to the radial artery crossing the proximal edge of the CM joint. The abductor pollicis longus tendon is cut off from the base of the metacarpal bone. A single slip of this tendon is cut about 5 cm proximal from insertion to the bone and is

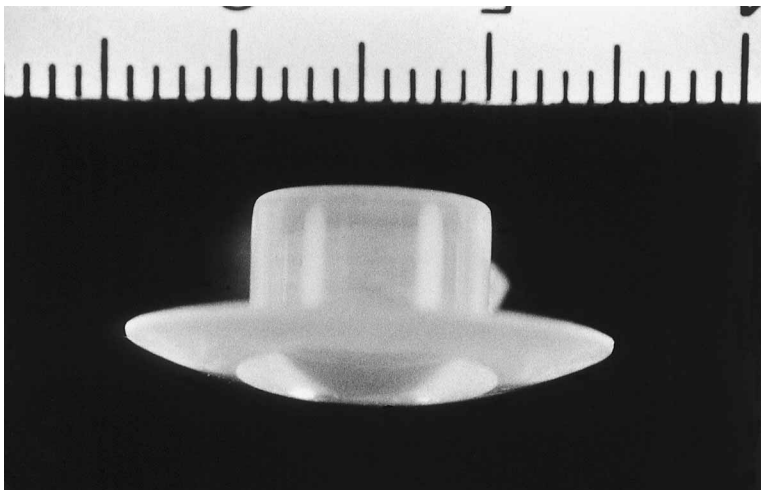


Fig. 1 Ashworth implant (large)

inverted distally to prepare for subsequent reinforcement of the articular capsule. The articular capsule is then cut transversely. The articular surface of the trapezium, at a thickness of 1 to 2 mm, is removed with an air drill. The surface should be sufficiently removed around the ulnar osteophyte. The articular cartilage is removed from the base of the first metacarpal bone to expose the subchondral bone without damaging it and the surface smoothed (Fig. 2). A hole, with a diameter of either 5 or 9 mm, is made on the body of the trapezium for the small or large stem of the implant, respectively. An implant tester is applied to adjust the hole to ensure a proper fit.

After hemostasis and irrigation, an implant with an appropriate stem is inserted (Fig. 3) and the articular capsule is firmly sutured. To reinforce the articular capsule, the previously inverted slip of accessory tendon of the abductor pollicis longus is firmly sutured to the capsule in a zigzag manner from the radial dorsal side to the ulnar base of the second metacarpal bone. At the base of the first metacarpal bone, the rest of the previously cut abductor pollicis longus tendon is distally advanced by 1 cm (Fig. 3) and sutured to the periosteum so that a force to reduce subluxation of the first CM joint will act on the base of the first metacarpal bone.

The surgery is completed by closing the skin incision. The thumb is fixed with a compression dressing in a slightly abduction-opposition position. Rehabilitation is started 5 weeks after surgery.

RESULTS

The pain felt by the 16 patients was classified into 5 stages, based on severity; none, slight, moderate, severe at motion and always severe. Twelve of the 16 patients had no pain. Although 3 had occasional slight pain at motion, the severity of the pain was dramatically reduced postoperatively. Severe pain at motion persisted in 1 patient and resulted from the failure of the implant.

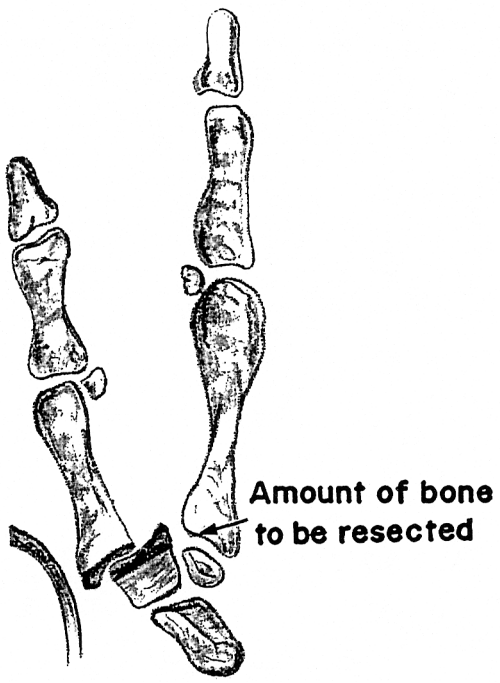


Fig. 2 Surgical technique (1): range of resection of the bone and cartilage

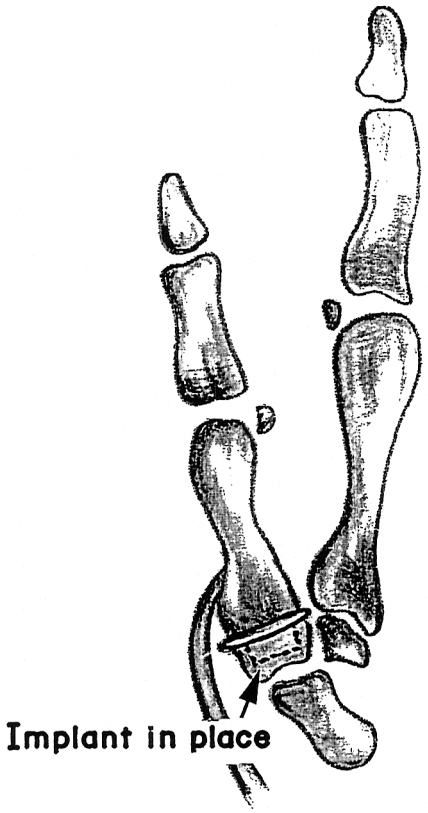


Fig. 3 Surgical technique (2): insertion of the implant and distal advancement of the abductor pollicis longus tendon

Only this patient required revision. Atypical complaints, such as strange sensations rather than pain, were noted in 5 patients.

Grip strength was examined in 12 patients. The result showed an increase in 7, unchanged in 4, and reduced in 1. The ROM either increased or remained unchanged in all the patients postoperatively. For activities of daily living (ADL), only 1 patient always felt inconvenience in rotating a driver or doorknob, and in writing. Two patients sometimes felt mild inconvenience in rotating a driver.

Plain radiograms showed the following findings: a sunken implant in 3 patients; brim of implant broken in 5 patients (Fig. 4); and failure of body of implant in 1 patient, which occurred 2 years postoperatively and required revision.

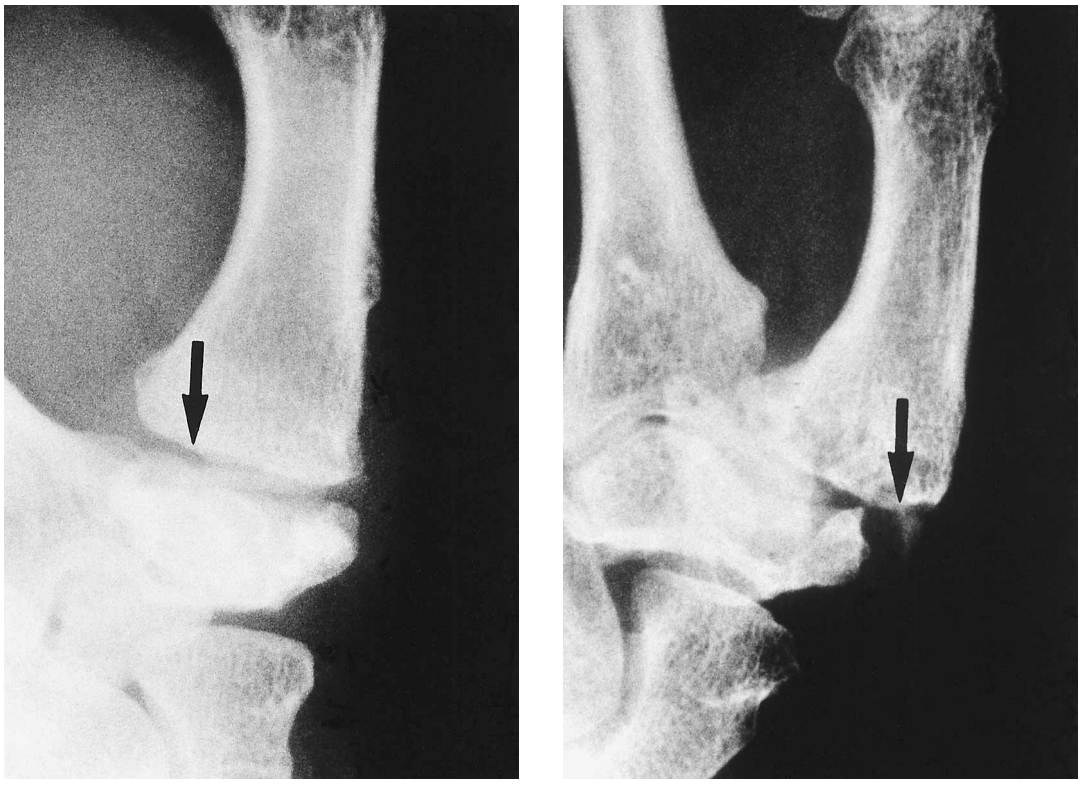
REPORT OF A REPRESENTATIVE CASE

Case 1: A 37-year-old male working as an automobile mechanic (Fig. 5a to 5c).

He was classified as Stage III radiographically. After conservative therapy with a brace for 4 months, he received surgery using the Ashworth method. The postoperative course has been uneventful. He has no pain 5 years and 2 months postoperatively, although the implant has sunk. There is slight pain when he overworks the hand. ROM is normal. Grip strength is 43 kg for the treated hand and 45 kg for the other hand. The patient is completely satisfied with the surgical results.

DISCUSSION

Follow up of cases treated with conservative therapy showed that many patients with arthrosis of the CM joint of the thumb put up with pain even when the change to osteoarthrosis was evident because of reluctance to receive surgery. In fact, the period from onset of pain to the first presentation averaged 1 year and 2 months. This is probably because the pain and functional disorder depends not only on severity of the arthrosis, but also on the usage of hands by each patient. In addition, this tendency to refuse surgery is also based on the fact that the pain or disorder developed when the



a) b)

Fig. 4 Radiographic implant problems: a) sinking, b) partial rupture of the brim

a)

patients were about 63 years of age, when they had already retired or were on the point of retiring. Conservative therapy should be done primarily to alleviate pain and reduce the disability. Surgery should be performed only on those patients who wish to receive it.

The surgical technique for the present disability can be roughly divided into 4 types: arthrodesis of the first CM joint [2, 9, 14], excision of the trapezium [3], replacement of the trapezium with a spacer [16] or tendon [5, 10, 11], and replacement of the CM joint surface with interposition [1, 13]. Each of the techniques has advantages and disadvantages (Table 1). Fixation of the CM joint is generally considered to provide good gripping power, but an inferior ROM. The removal of the trapezium reduces grip power. Although replacing the trapezium with a silicone implant provides good ROM and grip, it has been reported to cause implant failure and luxation. The replacement with tendon tissue has been reported to provide good results. However, as the pre-

b)

c)

Fig. 5 Case 1: representative case. a) preoperative radiogram. b) 4 months after surgery. c) 5 years and 2 months after surgery.

sent and other papers [10, 11] have demonstrated, it may slightly reduce grip power and ROM.

We have frequently performed silastic interposition arthroplasty using the Ashworth method. In addition to good results in terms of pain, ROM, and grip power, Ashworth cited numerous advantages of his method: (1) since only a small amount of bone is resected, anatomically normal tissues and their positions can be well conserved; (2) the severely affected articular surface of the trapezium can be replaced with an implant; (3) because the abductor pollicis longus tendon advances 1 cm distally and a slip from the tendon reinforces the articular capsule, a force that reduces subluxation of the base of the first metacarpal bone acts to stabilize the implant and prevents luxation; and (4) other surgical alternatives can be still used if the present method is not successful or causes complications. Because we attach great importance to point 4 above, we have frequently used the Ashworth method.

A follow up of the 16 cases showed partial failure of the implant in 5 patients. However, 3 of the 5 cases merely complained of strange sensations and did not have pain, reduced grip power, or abnormality of daily living. It was also found that the implant had sunk in 3 patients. Although 2 of the patients sometimes complained of pain, it was milder and much weaker than that experienced before surgery. The development of pain was not always consistent with implant abnormality (Table 2).

Osteoarthrosis at adjacent joints may also

Table 1 Advantages and disadvantages of the surgical techniqes

Surgical procedure		ROM	Grip strength	Complications
Arthrodesis of first CM		↘	→	
Trapezial excision		→	↓	
Trapezial excision	a) Silicone spacer	→	→	dislocation, disruption
	b) Tendon spacer	→	→ ↘	sacrifice of normal tendon
Interposition arthroplasty	a) Silicone	→	→	disruption
	b) Tendon	→	→	

Table 2 Correlation between implant problems and pain

Implant problem	pain		
	always	sometimes	never
Failure of body	1	0	0
Repture of brim	0	0	5
Sinking	0	2	1
None	0	1	6

Table 3 Incidence of OA at the joints surrounding the trapezium (%)

	Swanson[16]	Stark[1]	Kessler[6]	North[12]
Trapezio-IInd metacarpal	86	77	—	1
Trapezio-trapezoid	35	20	—	0
Trapezio-scaphoid	48	33	7	46

cause persistent pain. The severity of the disease influences the decision as to whether the Ashworth method is indicated or not. The method is not considered to be as effective for pan-arthrosis, but may be indicated for mono-arthrosis of the CM articular surface. Although some European and American studies have reported a high incidence of osteoarthrosis at joints around the trapezium [12] (Table 3), it does not affect the indications of the Ashworth method because the disease tends to progress slowly in Japanese patients. Since all the patients who received the Ashworth surgery have been in remission, except for 1 in whom the implant was broken, the surgical method clearly provided good clinical results. However, there remain some disadvantages in the form and material of the implant which require improvement. In addition, a problem related to silicone occurred [15]. Therefore, the use of silicone materials for the surgical implant has decreased recently. Because of these reasons, an arthrodesis procedure of the first CM joint has been appreciated once again [9, 14], and has become the recent trend for surgical intervention for CM joint arthrosis, in spite of the disadvantage of inferior ROM of the thumb.

We have also used the arthrodesis procedure in recent surgery, although the patients treated by this method complain of a slight inconvenience due to the limit of ROM, especially vertical abduction contracture of the thumb.

With further improvement in implant materials for the surface replacement, satisfactory results with a good range of motion and relief from pain of the CM joint of the thumb might be expected.

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