

INTRODUCTION

Osteoarthritis of the trapezio-metacarpal joint is a disabling condition is seen very frequently in every day practice. It is more common among women than men. A large number of papers have appeared in the past in connection with the treatment of the painful osteoarthritic TM joint of the thumb.

The papers have ranged from the treatment by conservative means,^{1,2} by early debridement of joint and reconstruction of ligament, by fusion of the involved joint,^{3,4,5} by resection arthroplasty and creation of pseudarthrosis, or resection of the trapezium and insertion of some type of interposition, namely, silicone prosthesis,^{6,7,8,9,10,11,12,13} vitalium prosthesis or a tendon graft.

In this paper, the three types of treatment will be discussed.

- 1) early debridement and reconstruction of the ligaments
- 2) the fusion
- 3) resection of trapezium and insertion of silicone wafer or tendon graft

ANATOMY AND PATHOPHYSIOLOGY

The trapezio-metacarpal joint of the thumb is responsible for the circumduction motion of the normal thumb and it has a great importance in the activities involving grasping and pinching. This joint is a saddle joint and allows movement in two planes, adduction and radial abduction and retraction and palmar abduction. The ligamentous structures that are supporting the TM joint are relatively loose which allow some actual motion, in a third axis, namely rotation. The surfaces of this articulation are kept in opposition by the tone of the muscles and by the surrounding ligaments. The most important ligament is the anterior oblique or the volar ligament which holds the volar beak of the first metacarpal to the deep intercarpal ligament. When this ligament is lost or attenuated in arthritic or traumatic condition, a radial (lateral) subluxation of the metacarpal base occurs. This ligament is called the ulnar ligament by Kaplan, trapezio-metacarpal by Lantz and Wachsmuth and anterior oblique by Napier.

The dorsal ligament is thin and less well defined. It is reinforced by the expanded insertion of the tendon of the abductor pollicis longus, into the dorsal radial aspect of the first metacarpal. The dorsal ligament contributes very little to the stability of the joint and does not prevent dorsal radial subluxation. The capsule is extremely weak in its superficial or radial aspect. This area which lies between the dorsal ligaments is essentially membranous being devoid of strong ligamentous substance. The movements of the thumb can be divided into: 1) adduction; 2) abduction; 3) antepulsion (motion that moves the thumb away from the palm in a plane perpendicular to the palmar plane); 4) opposition, which is the motion when the tip of the thumb touches the tip of the other fingers, particularly the little finger; 5) retropulsion, in this motion the thumb is moved in a plane perpendicular to the palmar plane and in a posterior direction. The average rotation of the thumb in a normal opposition ranges between 90° and 100°. Passive rotation of the thumb is possible between 60° and 80° and it is of greater degree at the metacarpal phalangeal joint than at the TM joint. Opposition may be measured as the distance between the palmar crease of the terminal joint and the distal palmar crease over the third metacarpal. The capsule and the articulation surfaces of the TM joint receive evenly applied stress, during flexion and extension, adduction and abduction, but with opposition and pinch where flexion and adduction is required the articulating surfaces are just further twisted into an incongruous relationship. During the opposition and pinch motion, a great amount of compression is transmitted across the articulation. Any laxity of the ligaments of the TM joint will cause a further incongruity and increase of the compression force. This in time will create compression on the cartilage with consequent necrosis and erosion of the articular cartilage of this joint, so a progressive subluxation of the TM joint will be created. Once this has been established, synovitis may develop at this joint with pain on motion and gradually the function of the thumb is decreased. In summary, the thumb has motions in different planes and when the TM joint is painful, the above described motions are impaired and the function of the thumb is markedly diminished particularly for pinching and grasping against the fingers.

CLINICAL SYMPTOMS

Pinching and swelling at the base of the thumb are the most common complaints. As the osteoarthritic changes progress, instability, loss of motion and strength are also observed. The pain is particularly accentuated by repeated pinching, ringing motions and grasping. The osteoarthritic lesions are most commonly seen at the TM joint but they may be seen at the other joints as between the trapezium and scaphoid, between trapezium and trapezoid or trapezium and base of the second metacarpal. The periarticular thickening at the TM joint may be present for some time until an acute injury occurs or until the joint is irritated by repeated minor traumata. The patient usually avoids strong pinching or abduction motion, and when these motions are painful, therefore, some relief is obtained by avoiding the use of the thumb. Other patients with this condition learn to live with their disability and they avoid any movement of the thumb that requires pinching and abduction of the thumb. When limitation of motion at the TM joint occurs, compensatory movement takes place in the distal joint to give the thumb the necessary function. From these compensatory improvements the thumb eventually becomes deformed and the MP joint is held in hyperextension while the TM joint is forced into a subluxed position with the terminal joint in flexion. As the abduction of the thumb becomes painful, this motion is avoided and gradually an adduction contracture is developed. If there is marked effusion in the joint, the capsule becomes attenuated and the joint is enlarged and consequently the base of the metacarpal is subluxed. The x-ray findings are typical, namely, there is marked narrowing of the joint with sclerotic changes with spur formation and lateral subluxation of the base of the first metacarpal (Fig. 1)

MATERIAL

The author had the opportunity to treat 130 patients with the three methods of treatment, namely, debridement of the joint, synovium, reconstruction of the ligaments, fusion or excision of the trapezium and fusion and insertion of a silicone wafer or tendon graft. Out of 130 cases, 30 had fusion of the TM joints, thirty had silicone wafer prosthesis or tendon graft, and 70 had the conservative type of operation, namely debridement. The diagnosis was from osteoarthritis to the post-traumatic arthritis. Ninety were females and 30 males. The ages ranged from 38 to 68 years; the right hand was involved in 90 cases and the left in 30. The follow-up ranged from two to twenty years.

TREATMENT

A) CONSERVATIVE

B) SURGICAL

A) Conservative: When the patient is first seen, after the evaluation of the x-rays, and the clinical examination, the thumb is put at rest with a moveable splint and at times if the pain is severe, the thumb is immobilized in a plaster cast for two weeks. At other times the joint is infiltrated with $\frac{3}{4}$ cc of hydrocortisone diluted in 5 cc of Xylocaine 1%. Patient is also put on anti-inflammatory medication unless there are contraindications, from the general condition of the patient or from the gastrointestinal tract. Usually, we use one of the following medications, Indocin, Motrin, Nalfon, Aspirin, Vioxx or Celebrex. In the majority of cases, pain may subside with the conservative therapy. If the painful symptoms continue in spite of this therapeutic regime, then surgical intervention is decided. B) Surgical: For the surgical treatment of this condition, we have used as mentioned in the early part of this paper 1) conservative type of surgery, where debridement of the joint with reconstruction of the ligaments is performed. 2) fusion of the TM joint or 3) resection of the trapezium and replacement with a silicone wafer prosthesis or insertion of tendon graft.

INDICATIONS AND TECHNIQUE

The indications for the different procedures were as follows: 1) For the conservative type of surgery, the so-called debridement with reconstruction of the collateral ligaments. This operation is indicated when the

symptoms are mild, the instability moderate and the x-ray changes are of slight degree.

Technique of synovectomy and reconstruction of ligaments are as follows: 1) A zig-zag incision is made over the radial border of the carpometacarpal joint of the thumb (Fig. 2A). The superficial radial nerve is dissected and retracted. The dorsal capsule of the joint is incised longitudinally, explored and debridement of joint is performed namely, synovectomy, and removal of the osteophytes (Fig. 2B); replacement of the subluxed base of the first metacarpal into the joint is now accomplished. The dorsolateral collateral ligament is made from the distal two inches of the half of the flexor carpi radialis tendon (Fig. 2C, 2D); also the abductor pollicis longus tendon is advanced distally; a K-wire is used to immobilize the reconstructed joint. After five weeks the K-wire is removed and patient starts on active exercises (Fig. 2E, 2F)

2) Fusion of trapezio-metacarpal joint – 30 cases were performed. In general, the indication for fusion, is when you have a relatively young patient that requires excessive strength in the pinch, grasping or twisting mechanisms. In general, patients who have occupations that require strenuous use of their thumbs are good candidates for fusion.

Fusion Technique - The fusion is again performed through the same approach described for the conservative type of surgery. The articular cartilage is excised from both the base of the first metacarpal and the articular surface of the trapezium. Good cancellous bone is exposed. A drill hole is made from the base of the metacarpal into the trapezium and bone graft is taken from the olecranon which is introduced as a peg through the drill holes. Cancellous bone is also taken from the olecranon and it is placed in between the resected articular surfaces. Two K-wires in a criss-cross fashion are also placed for internal fixation. A cast is applied for six weeks then followed with active exercises (Fig. 3A, 3B)

3) Resection arthroplasty with the insertion of tendon graft or silicone wafer. The indications are patients
a) who need the dexterity of their thumbs, b) for the patients whose occupations are not demanding excessive stress and strain, pinch and excessive grasping power; c) it is usually indicated for the older individual where the demands for excessive power is not required (Fig. 4A). The trapezium is removed (Fig. 4B) a tendon graft or

silicone wafer is inserted. Marked instability is corrected by the reconstruction of the dorsal lateral and volar radial carpal ligaments by using the half of the distal two-inches of the tendon of the flexor carpi radialis with advancement of the abductor pollicis longus. A K-wire is inserted and cast applied for six weeks. At this time the cast and K-wire are removed, partial immobilization continuous with the splint until a further period of four weeks, and active range of motion exercises begin.

RESULTS

A) For the debridement operation the results were as follows: There were 70 cases in this group.

Excellent result was when the patient had no complaints and stiffness; he did not require any medication and could use the hand normally. Good result was when the patient had some slight stiffness, but could use the involved thumb without any pain for every-day tasks. A fair result was when the patient had to take an anti-inflammatory medication from time to time and there was slight stiffness although the patient could use his thumb for every day living. Poor results, when no change was present comparing with the preoperative status. Out of 70 cases, 40% had an excellent result; 40% good result, and 20% had fair results.

B) In the fusion series there were 30 patients. An excellent result was when patient could apply a great amount of force while using the thumb. There was no pain with the use of the thumb. There was excellent strength in grasping and pinching with minimal loss of motion in abduction (Fig. 5A- 5B). Seventy-five percent of the cases had an excellent result. A good result was when the patient had minimal discomfort around the carpometacarpal joint area. There was very slight limitation of motion. Patient could do strenuous tasks and be engaged in the same occupation he had before the fusion. Twenty-five percent fell into this good result group. There were no poor results in these series.

C) In the resection group there were 30 patients with wafer or tendon grafting. The ideal candidates for the resection and the insertion of the silicone wafer or tendon graft interposition patients who did not require excessive force on pinching and grasping. An excellent result was when patients who patient had no pain in the operated upon thumb. There was good stability, good pinch and excellent range of motion.

They had elimination of the pain and increased dexterity. A good result was when the patient could use the thumb without much discomfort. He had increase of dexterity, elimination of pain with satisfactory use of the thumb.

When the thumb was used against resistance and excessive pinch and grasping was performed, patient had some discomfort at the TM joint. Fair results, when the patient had to take medication and had slight weakness of grasping.

SUMMARY

RESULTS - In this paper a review of the treatment of 130 cases with osteoarthritis of the trapezio-metacarpal joint of the thumb was made; 90 females and 40 males; age ranged form 28 to 68 years old. The anatomy of the carpometacarpal joint, the pathophysiology involving the suffering joint by the osteoarthritis and the clinical symptoms were reviewed. The right hand was involved 90 times, the left 40. Follow-up ranged from two to twenty-five years. The treatment consisted of conservative and surgical therapy. The surgical therapy consisted of 1) conservative type of surgery, namely, debridement and reconstruction of the attenuated trapezio-metacarpal ligaments; 2) fusion of the TM joint, and 3) resection of the trapezium and insertion of a silicone wafer or tendon graft type. The ligaments of the TM joint were reconstructed in this group. The results were evaluated. In the debridement group there were 70 cases; 40% excellent; 40% good, and 20% fair. In the fusion group, out of 30 cases 75% were excellent, and 25% good. In the silicone wafer and tendon interposition group, there were 30 cases with 50% excellent results, 40% good and 10% fair.

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