



Presentation and management of arthritis affecting the trapezio-metacarpal joint

Sunil PAI, Sumedh TALWALKAR, Michael HAYTON

From Wrightington Hospital, Wigan, United Kingdom

Arthritis affecting the trapezio-metacarpal joint (TMJ) of the thumb is a very common condition, and in the upper limb represents the site most often requiring surgery for symptomatic osteoarthritis. The condition predominantly affects women, especially those who are post menopausal. Management of the condition initially entails the use of conservative measures. Many of these are administered in the community by general practitioners as well as occupational therapists, surgery being reserved for disabling symptoms and loss of function resistant to these measures.

From a review of the currently available literature, we present an overview of this common condition, commenting on its clinical presentation, pathophysiology and the treatment options available. A treatment algorithm is presented, to aid practitioners in the management and referral of patients with symptomatic thumb TMJ arthritis.

Keywords : thumb ; trapezio-metacarpal joint ; osteoarthritis ; rhizarthrosis.

EPIDEMIOLOGY

Osteoarthritis at the base of the thumb is a common condition predominantly affecting women from the fifth decade onwards. Some published series have shown the female to male ratio to be in the order of 10:1 (37). Furthermore, it is thought that about 30% of post menopausal women present radiological changes of osteoarthritis at the TMJ, but the vast majority of these patients are asymptomatic or have tolerable symptoms for which they never consult their general practitioner (1). To date there is no good evidence to suggest that TMJ arthritis is caused by certain repetitive work practices (10).

SOURCES AND SEARCH CRITERIA

We searched the Medline and Pubmed databases for relevant English language literature.

We used the search terms "trapezio-metacarpal arthritis" and "thumb carpo-metacarpal joint arthritis". We identified additional literature from the references in these papers.

- Sunil Pai, MD, Clinical research fellow in orthopaedics.
- Sumedh Talwalkar, MD, Specialist registrar in orthopaedics.

■ Michael Hayton, MD, Consultant hand surgeon.
The Upper Limb Unit, Wrightington Hospital, Hall Lane, Appley Bridge, Wigan, WN6 9EP, United Kingdom.

Correspondence : Mr Sunil Pai, 24 Brookhus Farm Road, Sutton Coldfield, Birmingham, B76 1QP, United Kingdom.
E-mail : sunilkumarpai@doctors.org.uk.

© 2006, Acta Orthopædica Belgica.

CLINICAL PRESENTATION

Patients usually consult their general practitioners with a history of well localised pain at the base of the thumb. Aggravating manoeuvres include turning a key in a door, holding a tea cup, opening jars and sewing. This progresses to the dropping of objects from the symptomatic hand as the disease progresses. Patients may also complain of a decreased power grip, and stiffness at the base of the thumb. Although in both sexes the condition is usually due to primary osteoarthritis (37), a history of fractures involving the base of the thumb such as Bennett's fracture subluxation and the Rolando fracture should be sought. Another common first presentation of the condition may be continuing pain at the base of the thumb following relatively minor trauma, whereby a previously asymptomatic arthritic joint has been aggravated.

Clinical examination often reveals prominence and squaring off of the base of the thumb metacarpal. Degenerative changes at the TMJ typically produce an adduction-flexion deformity of the thumb metacarpal. The patients attempt to adapt to these changes by bringing their thumb out of the palm into a more functional position. In doing so, the thumb MCPJ joint is forced into hyperextension. Palpation of the TM joint line may produce pain. If the pain is well localised, and severe, it is not necessary to perform any further provocative tests, to avoid any further distress to the patient. However, in equivocal cases, the "grind test" – is performed by rotating the thumb metacarpal on the trapezium whilst applying an axial load. Pain and crepitus indicate a positive test for TMJ arthritis. The "reverse grind test" involves relocating a subluxed joint and rotating the thumb. Movement of the thumb and wrist will further help to determine where pain at the base of a patient's thumb originates. With isolated TMJ arthritis, the patient will experience pain during the grind test, but not during wrist movements. With arthritis isolated to the Scapho-Trapezium-Trapezoid (STT) joint, pain is experienced with ulnar or radial deviation of the wrist, but not with the grind test. Patients with arthritis affecting both of these articulations complain of pain on both thumb and wrist movements.

A number of associated hand and wrist conditions may be associated with TMJ arthritis, and an active search for these conditions should be made during examination of the hand and wrist. TMJ arthritis as part of a picture of generalised primary osteoarthritis, and the marked synovial hypertrophy which accompanies this syndrome, may account for the associated high incidence of carpal tunnel syndrome and trigger finger in these patients.

In one series a 43% incidence of co-existent carpal tunnel syndrome was noted in patients undergoing surgery for TMJ arthritis (13).

The thumb adduction deformity referred to above is also believed to exert increased forces in the tendons of the first extensor compartment sometimes producing coexistent de Quervain's tenosynovitis. Finally, ganglia arising from the region of the degenerate TMJ may also be present.

ANATOMY, BIOMECHANICS & PATHOPHYSIOLOGY

The TMJ is a complex saddle shaped, synovial joint. The trapezium also forms joints with the scaphoid, trapezoid and radial facet of the base of the index finger metacarpal.

Stability of the joint is dependent upon the actions of neighbouring tendons (especially the contribution from the abductor pollicis longus), the joint capsule and neighbouring ligaments. One ligament in particular – "the beak ligament" is of particular importance. This intracapsular ligament originates from the volar-ulnar corner of the trapezium and attaches to the volar beak of the base of the thumb metacarpal. Its strength allows it to act as the primary static stabiliser of the thumb, resisting dorsal translation of the thumb metacarpal during key pinch. It is believed that degenerative changes in the crucial beak ligament (31, 32), lead to a destabilisation of the thumb metacarpal, allowing abnormal movement in a dorso-palmar direction and abnormal shear forces to be generated at the articulation. Bony contribution to stability is very small in comparison to the deep seated ball and socket joint arrangement seen in the hip joint.

Table I. — Staging for osteoarthritis of the Trapezio-Metacarpal Joint (Eaton and Glickel) (12)

Stage	Criteria
I	Normal Articular contours Joint space widening due to effusion or synovitis secondary to ligamentous laxity of basal joint
II	Joint space narrowing with some subchondral sclerosis Joint debris and osteophytes < 2 mm
III	Complete loss of joint space, severe subchondral sclerosis Joint debris and osteophytes > 2 mm
IV	Scaphotrapezial joint is normal Stage III changes plus scaphotrapezial joint narrowing and sclerosis

The two sides of the saddle joint are very congruent which means the two surfaces are in close contact across the whole surface area. However if the joint subluxes or rotates, the two sides of the saddle become incongruent, leading to areas of point loading, excess pressure and eventual wearing away of the articular cartilage.

RADIOGRAPHIC ASSESSMENT

Eaton and Glickel's staging system (12) (which is based upon a true lateral view of the TMJ) is widely used to define the severity of disease (table I), which in turn guides the treatment regime used. Therapeutically, it is important to differentiate between patients with isolated STT arthritis and those with TM arthritis as this will affect surgical management (10).

Fig 1 shows an example of the radiographic findings in a patient with stage IV disease.

TREATMENT

Non operative treatment

The initial treatment of all patients presenting with arthritis of the TM joint should be non-operative (3, 37).

(i) *Non Steroidal Anti-Inflammatory Drugs (NSAID's)*



Fig. 1. — Radiograph of a patient with Eaton & Glickel Stage IV disease.

(ii) *Hand Therapy*

This has a role in maintaining the first web space and strengthening the thenar muscles. Therapists may also be able to provide advice on avoiding activities that may lead to thumb metacarpal adduction and possible subluxation of the joint.

(iii) *Splintage*

As heavy stresses are placed on the TM joint, particularly during pinching or grasping, splintage has been commonly used in the conservative management of TM arthritis.

Fig 2 shows an example of a splint that could be used for a patient with TMJ arthritis.

Swiggart *et al* (34) in a retrospective review of 114 patients (in whom 130 thumbs were affected by TMJ arthritis), found that 54% of patients with stage I and II disease and 61% of patients with stage III and IV disease, reported having prolonged relief of their symptoms at six month follow-up as a result of using splints that rested the TMJ.

Weiss *et al* (39) in a prospective analysis of splinting of the TMJ, found that splints appeared to reduce subluxation in patients with stage 1 & 2 disease ; however, they did not appear to increase pinch strength or affect pain levels associated with the performance of pinch strength measurements in these patients.

Overall, splinting is an effective conservative treatment to diminish but not completely eliminate



Fig. 2. — Example of a ready made splint suitable for a patient with arthritis affecting the TMJ.

the symptoms of TMJ arthritis in patients who are able to tolerate it and remain compliant.

(iv) Intra-articular Steroid Injections

Corticosteroids have been used in the management of many osteoarthritic joints as an effective method of pain relief (9, 20). Investigators have shown that the beneficial effects of steroids compared with placebo tend to be short lasting and are confined to the first three weeks (14, 19). A recent randomised controlled trial (25) showed that no clinical benefit was gained from intra-articular TMJ steroid injection in moderate to severe osteoarthritis compared with placebo injection. However, due to the fact that the injections in this study were not performed under fluoroscopic guidance, and that this study was underpowered, the exact role of intra-articular steroid injections in TM joint arthritis remains uncertain. Furthermore, due



Fig. 3. — TMJ injection technique, illustrating the TM joint line and the course of the abductor pollicis longus tendon.

to potential complications that may be associated with TM joint injection, which include fat necrosis, depigmentation and radial nerve neuritis, steroid injection therapy should be used judiciously in the management of this condition.

Injection Technique (fig 3) :

Patients are positioned with the forearm in the semi-prone position ; the joint line is identified by palpation, and by abducting and adducting the patient's thumb. Needle entry is greatly facilitated by longitudinal traction on the thumb. A 22 gauge needle is inserted just proximal to the base of the thumb metacarpal bone and just lateral to the abductor pollicis longus tendon. Ideally this procedure is performed using an image intensifier to ensure accurate delivery of injected steroid. One milliliter of 40 mg/ml of depomedrone with 1% lignocaine is injected into the TMJ under aseptic conditions.

(v) Non operative combination therapy

A synergistic effect may be seen when the above modalities are combined : In a prospective randomised controlled trial, Berggren *et al* (3) showed that after an initial seven month trial of conservative management consisting of the use of splintage, activity modification and a course of non-steroidal anti-inflammatory medication, 70% of patients (23/33) no longer required surgical intervention. Likewise, Day *et al* (6) showed that steroid injection

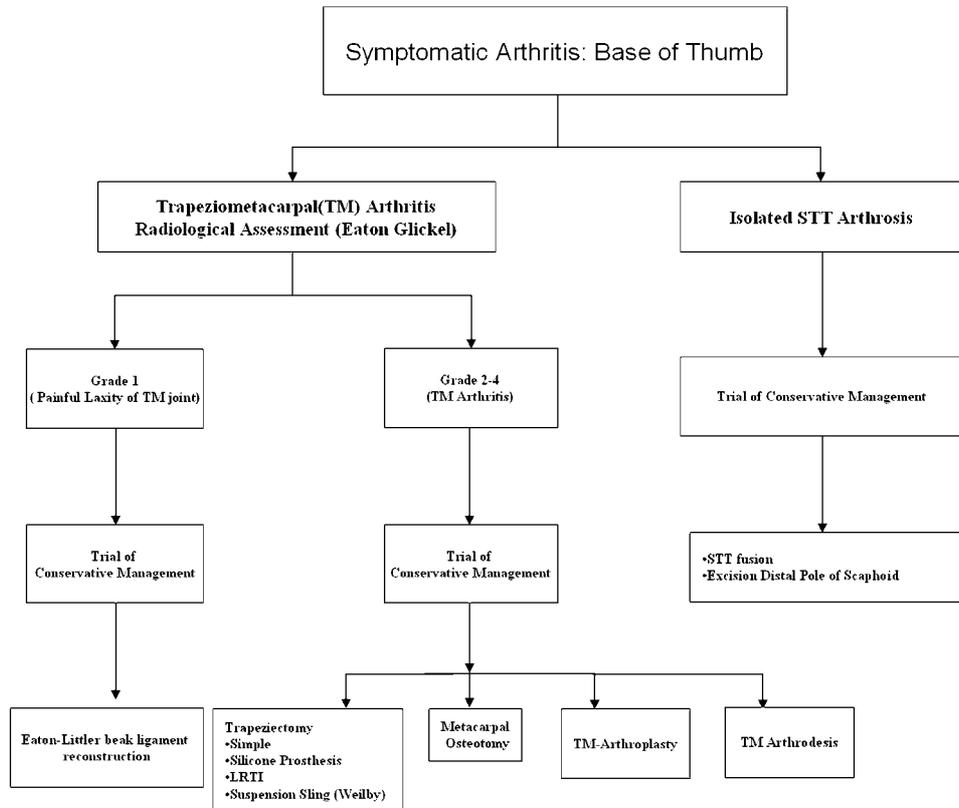


Table I. Suggested management algorithm for patients with symptomatic arthritis at the base of the thumb (STT = Scapho-trapezial- trapezoid ; LRTI = ligament reconstruction and tendon interposition)

with splinting for the treatment of TMJ arthritis provided reliable long-term relief in thumbs with stage 1 disease, and in patients with stage 2 and 3 disease, 35% of patients were noted to have reliable pain relief.

Surgical Treatment

Surgery is indicated in the presence of disabling pain that cannot be controlled adequately by non operative measures.

In isolated STT arthritis, the standard procedure is an STT fusion (38), risks of which include a 20-30% loss of wrist motion (21) as well as failure in terms of non-union of the fusion. An alternative procedure for STT arthritis is excision of the distal pole of the scaphoid (16), a procedure recommended in the middle aged and the elderly due to its high success rate.

Patients with TMJ disease are treated according to their Eaton and Glickel stage (12) (table I).

Stage 1 :

TMJ stabilisation by isolated reconstruction of the beak ligament is performed in Stage 1 disease using the technique modified by Eaton and Littler (11), in which a flexor carpi radialis (FCR) graft is passed through an oblique tunnel in the base of the first metacarpal and then through the trapezium after which the reconstructed ligament is tensioned and sutured back on itself. Some series (23, 24) have reported that 97-100% of Stage 1 patients achieved good or excellent results with this procedure and had little or no pain with return of strength and stability. Other authors however (10) have had more modest success rates of 60-70%.

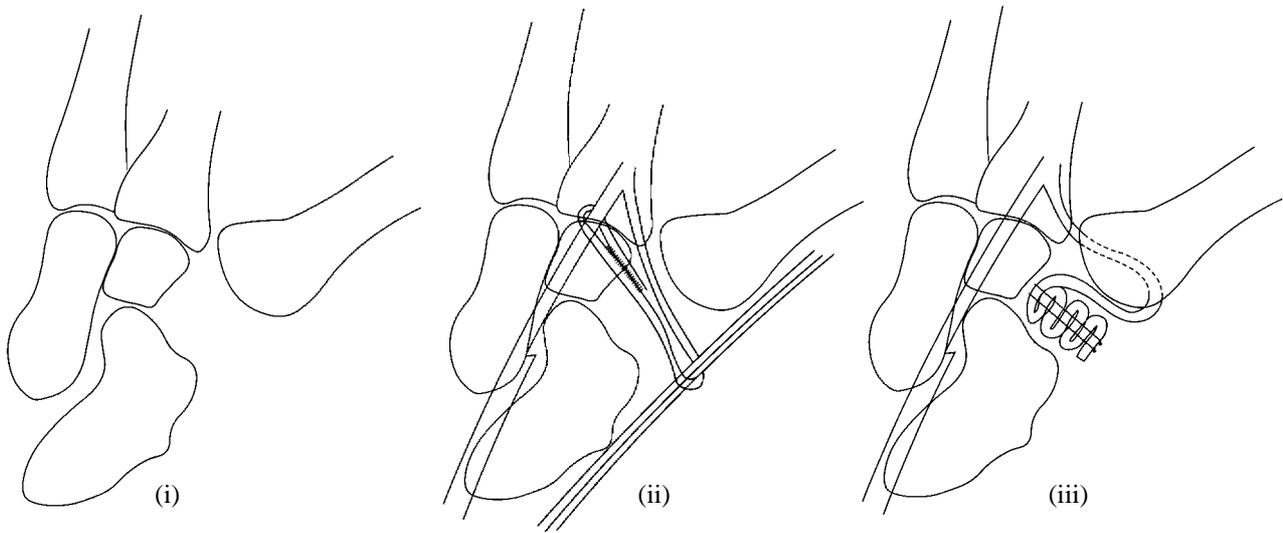


Fig. 4. — Operations for TMJ arthritis. From left to right : (i) Simple trapeziectomy ; (ii) The Weilby Sling ; (iii) Ligament Reconstruction with tendon interposition (LRTI).

An extra-articular metacarpal osteotomy (36) which works by redistributing the joint contact area and load has also been proposed for stage 1 disease.

Stages 2-4 :

Historically, excision of the trapezium alone (fig 4) has produced excellent results with pain relief and improved grip and pinch strength (8, 17). However, long term follow-up of trapeziectomy alone by Gervis (18) (who first proposed the procedure) (17) found that it resulted in proximal migration of the first metacarpal with shortening of the thumb and weakness.

To address these problems an interpositional arthroplasty, consisting of either a rolled-up ball of tendon (15) (either palmaris longus or flexor carpi radialis) or a silicone spacer (33), may be used to fill the void created by the excision of the trapezium. In the former technique thumb length is lost with the metacarpal settling into the interpositional material with no significant improvement over trapeziectomy alone (26). Long term reviews of the silicone spacer technique have shown that in addition to subluxation/dislocation of the implant, implant wear producing particulate silicone debris with subsequent silicone synovitis can occur (2, 29).

Consequently silicone implants tend to be reserved for use in rheumatoid and elderly patients where demands are low (27).

The Weilby suspension sling (28) (fig 4) has the advantage of preventing dorsal subluxation of the metacarpal, thus making it a useful alternative to silicone spacers, the risks of implant dislocation and silicone synovitis being eliminated.

Ligament reconstruction and tendon interposition (LRTI) arthroplasty techniques preserve metacarpal length and prevent dorsal subluxation of the metacarpal (30, 35).

A split flexor carpi radialis tendon is used to support the base of the thumb metacarpal after a trapeziectomy (fig 4), with any remaining tendon acting as an interpositional spacer. A prospective randomised trial (5) comparing the outcomes of trapeziectomy alone, trapeziectomy with palmaris longus interposition and trapeziectomy with LRTI failed to show any difference in the outcome of these surgeries at one year follow-up. More recently another prospective randomised study from Austria (22) found that tendon interposition does not affect the outcome after ligament reconstruction for the treatment of osteoarthritis of the thumb carpometacarpal joint. Furthermore, proximal

migration of the thumb metacarpal did not appear to influence the functional outcome.

TM arthrodesis is generally considered the operation of choice for the younger age-group involved in manual labour. However, this procedure has a significant failure rate (10-15%) (7) and has the potential to restrict thumb movement.

Total joint arthroplasties usually consisting of a polyethylene trapezial cup and a stemmed metal proximal metacarpal have been used. Of these, the de la Caffiniere prosthesis has the longest follow-up (4). However some surgeons have reported high rates of loosening and dislocation (7).

Although a large number of surgeons in the United Kingdom perform simple trapeziectomies alone, in our experience trapeziectomy with LRTI is the optimal surgical approach for osteoarthritis at the base of the thumb.

SUMMARY POINTS

Arthritis affecting the Trapezio-Metacarpal Joint is very common, with more than 30% of post menopausal women having characteristic radiological changes.

Only a small proportion of this group of patients however seek medical advice for clinically symptomatic disease.

Non operative treatment consists of non steroidal anti-inflammatory drugs, splintage and intra-articular steroid injections.

For symptomatic disease not controlled by non operative measures, a number of surgical options are available, tailored according to the stage of disease at which the patient presents to the surgeon.

None of the surgical options stand head and shoulders above the others, but Trapezio-Metacarpal Joint fusion is the surgical option of choice for young male patients who are involved in heavy manual labour jobs.

REFERENCES

- Armstrong AL, Hunter JB, Davis TR.** The prevalence of degenerative arthritis of the base of the thumb in post-menopausal women. *J Hand Surg* 1994 ; 19-B : 340-341.
- Atkinson RE, Smith RJ.** Silicone synovitis following silicone implant arthroplasty. *Hand Clin* 1986 ; 2 : 291-299.
- Berggren M, Joost-Davidsson A, Lindstrand J et al.** Reduction in the need for operation after conservative treatment of osteoarthritis of the first carpometacarpal joint : a seven year prospective study. *Scand J Plast Reconstr Surg Hand Surg* 2001 ; 35 : 415-417.
- Chakrabarti AJ, Robinson AH, Gallagher P.** de la Caffiniere thumb carpometacarpal replacements. 93 cases at 6 to 16 years follow-up. *J Hand Surg* 1997 ; 22-B : 695-698.
- Davis TR, Brady O, Barton NJ et al.** Trapeziectomy alone, with tendon interposition or with ligament reconstruction ? *J Hand Surg* 1997 ; 22-B : 689-694.
- Day CS, Gelberman R, Patel AA et al.** Basal joint osteoarthritis of the thumb : a prospective trial of steroid injection and splinting. *J Hand Surg* 2004 ; 29-A : 247-251.
- de la Caffiniere JY.** Long-term results of the total trapezio-metacarpal prosthesis in osteoarthritis of the thumb. *Rev Chir Orthop* 1991 ; 77 : 312-321.
- Dhar S, Gray IC, Jones WA, Beddow FH.** Simple excision of the trapezium for osteoarthritis of the carpometacarpal joint of the thumb. *J Hand Surg* 1994 ; 19-B : 485-488.
- Dieppe PA.** Are intra-articular steroid injections useful for the treatment of the osteoarthritis joint ? *Br J Rheumatol* 1991 ; 30 : 199.
- Downing ND, Davis TRC.** Osteoarthritis of the base of the thumb. *Current Orthopaedics* 2001 ; 15 : 305-313.
- Eaton RG, Littler JW.** Ligament reconstruction for the painful thumb carpometacarpal joint. *J Bone Joint Surg* 1973 ; 55-A : 1655-1666.
- Eaton RG, Glickel SZ.** Trapeziometacarpal osteoarthritis. Staging as a rationale for treatment. *Hand Clin* 1987 ; 3 : 455-471.
- Florack T, Miller R, Pelligrini VD et al.** The prevalence of carpal tunnel syndrome in patients with basal joint arthritis of the thumb. *J Hand Surg* 1992 ; 17-A : 624-630.
- Friedman DM, Moore ME.** The efficacy of intra-articular steroids in osteoarthritis : a double-blind study. *J Rheumatol* 1980 ; 7 : 850-856.
- Froimson AI.** Tendon arthroplasty of the trapezio-metacarpal joint. *Clin Orthop* 1970 ; 70 : 191-199.
- Garcia-Elias M, Lluch AL, Farreres A et al.** Resection of the distal scaphoid for scaphotrapeziotrapezoid osteoarthritis. *J Hand Surg* 1999 ; 24-B : 448-452.
- Gervis WH.** Excision of the trapezium for osteoarthritis of the trapezio-metacarpal joint. *J Bone Joint Surg* 1949 ; 31-B : 537-539.
- Gervis WH, Wells T.** A review of excision of the trapezium for osteoarthritis of the trapezio-metacarpal joint after twenty-five years. *J Bone Joint Surg* 1973 ; 55-B : 56-57.
- Jones A, Doherty M.** Intra-articular corticosteroids are effective in osteoarthritis but there are no clinical predictors of response. *Ann Rheum Dis* 1996 ; 55 : 829-832.

20. **Kehr MJ.** Comparison of intra-articular cortisone analogues in osteo-arthritis of the knee. *Ann Rheum Dis* 1959 ; 18 : 325-328.
21. **Kleinman WB.** Long-term study of chronic scapholunate instability treated by scapho-trapezio-trapezoid arthrodesis. *J Hand Surg* 1989 ; 14-A : 429-445.
22. **Kriegs-Au G, Petje G, Fojtl E et al.** Ligament reconstruction with or without tendon interposition to treat primary thumb carpometacarpal osteoarthritis. A prospective randomized study. *J Bone Joint Surg* 2004 ; 86-A : 209-218.
23. **Lane LB, Eaton RG.** Ligament reconstruction for the painful "prearthritic" thumb carpometacarpal joint. *Clin Orthop* 1987 ; 220 : 52-57.
24. **Lane LB, Henley DH.** Ligament reconstruction of the painful, unstable, nonarthritic thumb carpometacarpal joint. *J Hand Surg* 2001 ; 26-A : 686-691.
25. **Meenagh GK, Patton J, Kynes C, Wright GD.** A randomised controlled trial of intra-articular corticosteroid injection of the carpometacarpal joint of the thumb in osteoarthritis. *Ann Rheum Dis* 2004 ; 63 : 1260-1263.
26. **Menon J, Schoene HR, Hohl JC.** Trapeziometacarpal arthritis-results of tendon interpositional arthroplasty. *J Hand Surg* 1981 ; 6-A : 442-446.
27. **Millender LH, Nalebuff EA, Amadio P, Philips C.** Interpositional arthroplasty for rheumatoid carpometacarpal joint disease. *J Hand Surg* 1978 ; 3-A : 533-541.
28. **Nylen S, Juhlin LJ, Lugnagard H.** Weilby tendon interposition arthroplasty for osteoarthritis of the trapezoidal joints. *J Hand Surg* 1987 ; 12-B : 68-72.
29. **Peimer CA, Medige J, Eckert BS et al.** Reactive synovitis after silicone arthroplasty. *J Hand Surg* 1986 ; 11-A : 624-638.
30. **Pellegrini VD Jr, Burton RI.** Surgical management of basal joint arthritis of the thumb. Part I. Long-term results of silicone implant arthroplasty. *J Hand Surg* 1986 ; 11-A : 309-324.
31. **Pellegrini VD Jr.** Osteoarthritis of the trapeziometacarpal joint : the pathophysiology of articular cartilage degeneration. I. Anatomy and pathology of the aging joint. *J Hand Surg* 1991 ; 16-A : 967-974.
32. **Pellegrini VD Jr.** Osteoarthritis of the trapeziometacarpal joint : the pathophysiology of articular cartilage degeneration. II. Articular wear patterns in the osteoarthritic joint. *J Hand Surg* 1991 ; 16-A : 975-982.
33. **Swanson AB, de Groot Swanson G, Watermeier JJ.** Trapezium implant arthroplasty. Long-term evaluation of 150 cases. *J Hand Surg* 1981 ; 6-A : 125-141.
34. **Swigart CR, Eaton RG, Glickel SZ, Johnson C.** Splinting in the treatment of arthritis of the first carpometacarpal joint. *J Hand Surg* 1999 ; 24-A : 86-91.
35. **Tomaino MM, Pellegrini VD Jr, Burton RI.** Arthroplasty of the basal joint of the thumb. Long-term follow-up after ligament reconstruction with tendon interposition. *J Bone Joint Surg* 1995 ; 77-A : 346-355.
36. **Tomaino MM.** Treatment of Eaton stage I trapeziometacarpal disease. Ligament reconstruction or thumb metacarpal extension osteotomy ? *Hand Clin* 2001 ; 17 : 197-205.
37. **Tytherleigh-Strong G, Hampton R, McCullough CJ.** Carpo-metacarpal arthritis of the thumb. *Current Orthopaedics* 1999 ; 13 : 302-308.
38. **Watson HK, Hempton RF.** Limited wrist arthrodeses. I. The triscaphoid joint. *J Hand Surg* 1980 ; 5-A : 320-327.
39. **Weiss S, LaStayo P, Mills A, Bramlet D.** Prospective analysis of splinting of the first carpometacarpal joint : an objective, subjective and radiographic assessment. *J Hand Ther* 2000 ; 13 : 218-226.