



## Is there still a place for arthrodesis in the surgical treatment of basal joint osteoarthritis of the thumb ?

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**Despite the obvious success of arthroplasty – trapeziectomy with or without interposition and prosthesis – in the treatment for trapeziometacarpal osteoarthritis, one may question the value of an arthrodesis in particular situations. In most reported series the outcome is reasonably successful, but when comparing the results of arthrodesis with arthroplasty, there is convincing evidence that the latter gives better outcomes. Considering the overall complication rate, and more specifically the incidence of nonunion after trapeziometacarpal fusion, it can be reasonably concluded that the latter should be reserved for specific indications.**

**Keywords :** thumb ; trapeziometacarpal joint ; arthrodesis ; osteoarthritis ; arthroplasty ; surgery.

modified the procedure by resecting only part of the trapezium, or by interposing biological or synthetic tissue in the gap (3,6,8,12,17,23,25,28,31,32,35,38,41,43, 49,51,58,60,62-64). However the superiority of these novel modifications has not been clearly demonstrated. Neither has replacement of the arthritic TM joint by a total joint prosthesis, usually based on the design of de La Caffinière, been shown to provide superior results (2,7,13,18,21,48,55,61,65).

Muller (46) proposed in 1949 to fuse the TM joint and reported a small series of 7 cases with satisfactory results. Since then larger series have been reported (1,5,9-11,14,16,22,26,27,29,36,37,40,42,45,50,53,56) and the debate between a fusion versus a mobility preserving procedure (4,33,47,52,54,59) is not yet over. Trapeziometacarpal arthrodesis should provide stability and strength. Despite clear advan-

### INTRODUCTION

The surgical treatments for symptomatic arthritic joints in general can be categorized as arthroplasties (resection with or without interposition or prosthetic replacement), arthrodeses and denervation operations. These three options are available in the treatment of basal joint osteoarthritis of the thumb, also known as carpometacarpal or trapeziometacarpal (TM) osteoarthritis, or rhizarthrosis.

Gervis (30) proposed in 1949 to simply resect the trapezium ; several authors have subsequently

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tages, the method has been criticized for various reasons : predisposition to increased arthritis in adjacent joints, significant limitation in range of motion, limited ability to flatten the hand, necessity for prolonged postoperative immobilisation, compensatory hyperextension of the metacarpophalangeal joint (MCP) and a high rate of nonunion. The authors have reviewed the literature in order to assess the value of arthrodesis in the treatment of carpometacarpal osteoarthritis of the thumb.

Finally Lorea *et al* in 2002 (44) described a denervation technique and reported promising outcomes, but their results could not be reproduced by other authors.

### **IMPORTANCE OF CMC MOBILITY IN OVERALL HAND FUNCTION**

Although practically all textbooks and biomechanical papers stress the importance of the trapeziometacarpal joint in overall thumb function, the implication of fusing this joint on thumb mechanics and hand function has not been studied extensively. Jensen *et al* (39) and Herck *et al* (34) studied the influence of joint motion (CMC, MCP and IP) of the thumb on mechanical functions of the hand in healthy volunteers, particularly grip strength and dexterity. From these surveys it was clear that the width of the first web was determinant in hand function. This width is assured by the mobility of the CMC joint. We could confirm this statement (34).

### **TECHNIQUE OF CMC ARTHRODESIS**

A longitudinal incision over the dorso-radial aspect of the trapeziometacarpal joint between the short and long thumb extensors, protecting the sensitive branches of the radial nerve, or a hockey stick incision on the lateral aspect of the thumb (Moberg-Geda or Wagner approach) can be used. We prefer the latter. A longitudinal incision of the capsule is performed and the degenerated joint surfaces are resected. The position of the first metacarpal is placed in about 15° extension and in moderate antepulsion. In fact in the resting position the pulp of the thumb should fall on the lateral side of the

PIP of the index finger. Usually an iliac bone graft is interposed. Internal fixation can be carried out with K-wires, K-wires and cerclage, staples, or plates and screws. A forearm hand thumb spica cast is applied for 5 to 8 weeks. Stokel *et al* (57) have tested several fixation techniques and the combination of longitudinal K-wires and tension band cerclage seemed to be the most solid construction (fig 1). Mureau *et al* used plate and screws (47). Forseth and Stern (27) reported the complications of plates and screws in trapeziometacarpal arthrodesis. They concluded that there was no advantage of plate and screws compared to simple K-wires.

Staples were used by Caputo and Bennett (9). Clough *et al* (15) reported on failure of Herbert screws to obtain fusion.

### **OUTCOMES**

The primary goal when treating basal joint osteoarthritis of the thumb is to relieve pain. Most surgical procedures effectively reach this goal in middle aged women. There is however in contem-



*Fig 1.* — Successful arthrodesis with K-wires and cerclage

porary orthopaedics a continuous shift from arthrodesis towards arthroplasty, for almost all joints. However in young and active patients, secondary objectives such as preservation of stability and strength in the thumb become equally important. Trapeziometacarpal arthrodesis restores or is supposed to restore stability and strength. Clinical outcomes are satisfactory in general but complications – and more specifically nonunions – are numerous (1,5,9-11,14,16,22,26,27,29,36,37,40,42,45,46, 50,53,56).

The nonunion rate in a pooled group of 14 series was 13% (table I). Much higher non-union rates have however been observed in some series. Mattson (45) had a 47% non-union rate in 19 cases with cerclage wiring. Alberts and Engkvist (1) had 6 non-unions in 33 patients, and only 20 patients were satisfied with the outcome. Pardini *et al* (50) added a tension band wire and had union in all of their six cases. Fixation with K-wires only was performed by Karlsson (N = 43, 98% satisfaction, 4 nonunions) (40). Stark *et al* (56) had only 2 nonunions in 30 patients, also with K-wires only,

with or without bone grafts. Cavallazzi and Spreafico (11) had 8 nonunions in 43 fused thumbs, using K-wires. House *et al* (36) had a 24% nonunion rate in 21 tetraplegic patients. Clough *et al* (15) with Herbert screws in 11 cases had 38% non-unions but 100% satisfaction. The pinch strength at one year follow-up was 90% in all cases. Caputo and Bennett (9) used staples for fixation and observed 100% satisfaction in 20 cases, with 10% nonunion. Eiken and Carstman (20) also used staples and had 3 non-unions in 21 cases. Bamberger *et al* (5) had 75% satisfied patients at 4 years follow-up with 8% non-unions and a key pinch strength of more than 98%. Chamay and Piaget-Monerod (14) with several fixation types had 87.5% unions in 32 patients, with 94% patient satisfaction and 82% key pinch strength. They did not use bone grafts. Our series had a high nonunion rate (fig 2) and less favourable patient satisfaction than most reported series. Most patients however were involved in workmen's compensation or had other secondary gains (22).

Table I. — Outcome of different series of basal joint osteoarthritis treated with trapeziometacarpal arthrodesis (N : number)

Author	Year	N	% Satisfaction	% Nonunion	Ref
Pardini <i>et al</i>	1982	6	?	0	50
Mattson	1969	19	?	50	45
Eiken & Carsten	1970	23	?	13	26
Stark <i>et al</i>	1977	28	100	7	56
Cavallazzi & Spreafico	1986	42	98	21	11
Alberts & Engkvist	1989	29	61	33	1
Clough <i>et al</i>	1990	11	100	46	15
Karlsson	1991	43	91	9	40
Bamberger <i>et al</i>	1992	37	?	8	5
Caputo & Bennett	1993	20	100	10	9
Chamay & Piaget-Morerod	1994	29	78	13	14
Lisanti <i>et al</i>	1997	52	85	8	42
Fulton & Stern	2001	59	97	7	29
Forseth & Stern	2003	26	81	8	27
De Smet <i>et al</i>	2005	35	27 to 88	31	22
Rizzo <i>et al</i>	2009	126	96	14	53



*Fig 2.* — Obvious non-union

### COMPARATIVE SERIES

Recently a few authors have compared trapeziometacarpal arthrodesis with the more popular trapeziectomy with ligament reconstruction/tendon interposition technique (LRTI) (table II). Mureau *et al* (47) and Raven *et al* (52) found that trapeziectomy with LRTI was more successful in terms of pain relief. The range of motion was better in the LRTI group in the series of Hartigan *et al* (33), Mureau *et al* (47), and Raven *et al* (52). Only in the

Table II. — Comparative series. (LRTI) : ligament reconstruction/tendon interposition ; AD = arthrodesis

Author	Year	LRTI	AD	Ref
Mureau <i>et al</i>	2001	32	24	47
Hartigan <i>et al</i>	2001	58	49	33
Schroder <i>et al</i>	2002	18	18	54
Taylor <i>et al</i>	2005	36	25	59
Raven <i>et al</i>	2007	28	17	52

series of Hartigan *et al* (33) was a better key pinch grip found in the arthrodesis group. The other comparative series found no difference in grip, pinch or key pinch force. Hartigan *et al* (33), Mureau *et al* (47) and Taylor *et al* (59) reported fewer complications in the LRTI groups. Schroder *et al* (54) found no measurable difference between both techniques.

### CONCLUSIONS : A VALUABLE OPTION IN LIMITED INDICATIONS

Despite overall favourable results, the high number of complications is not in favour of arthrodesis of the TM joint in basal joint osteoarthritis of the thumb, in the typical population of middle aged women. Theoretically arthrodesis should be indicated for manual workers but there is no hard evidence for this statement. We can however delineate specific conditions under which arthrodesis should be preferred. In severe ligament laxity (such as in Ehler Danlos disease), in paralytic conditions (tetraplegics) and in inflammatory arthritis, arthrodesis is the first choice. In failed procedures, arthrodesis is sometimes the only possible way out (fig 3).



*Fig 3.* — Salvage procedure after failed, multioperated basal joint arthritis.

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