NATIONAL INSTITUTE FOR CLINICAL EXCELLENCE

INTERVENTIONAL PROCEDURES ADVISORY COMMITTEE

Interventional procedures overview of artificial metacarpophalangeal and interphalangeal joints for osteoarthritis of the hand

Introduction

This overview has been prepared to assist members of the Interventional Procedures Advisory Committee (IPAC) advise on the safety and efficacy of an interventional procedure previously reviewed by SERNIP. It is based on a rapid survey of published literature, review of the procedure by one or more specialist advisors and review of the content of the SERNIP file. It should not be regarded as a definitive assessment of the procedure.

Procedure name

- Artificial metacarpophalangeal (MCP) and interphalangeal (IP) joints for osteoarthritis of the hand.

SERNIP procedure number

3

Specialty society

- British Society for Surgery of the Hand.

Description

Indication

Osteoarthritis of the metacarpophalangeal (MCP) and interphalangeal (IP) joints of the hand.

Osteoarthritis of the hand joints is a common condition that deteriorates over time, although severity of symptoms, rate of deterioration and functional effects are variable. Common sites of osteoarthritis that may be suitable for artificial implants include the trapeziometacarpal joint of the thumb (also called carpometacarpal joint); and MCP and IP joints of the fingers and thumb.

Current treatment and alternatives

Conservative treatments for osteoarthritis of the hand include anti-inflammatory and analgesic medication, and steroid injections. Other treatments include complete joint excision without replacement (also called excision arthroplasty), native graft arthroplasties, in which the patient's own tissue (typically tendons) is interposed in the space left after joint excision, and fusion of the joint (arthrodesis).

What the procedure involves

A general anaesthetic is usually used and a tourniquet is applied to the affected arm to maintain a blood-free operation site. An incision is made over the diseased joint to expose the tendons. The tendons are retracted and the joint is removed with an oscillating saw. A prosthetic joint, typically made of a silicone based material, is inserted in place of the original joint. Local anaesthetic may be injected into the arm at the end of the operation. The

incisions are sutured and a splint is applied to the fingers. Most patients stay in hospital overnight.

Proponents of artificial hand joints have suggested that they reduce pain, increase mobility and improve function compared with alternative treatments.

Efficacy

Four studies reported efficacy data on a total of 125 patients and 202 joints. Two studies, including 74 joints with osteoarthritis, reported that there was no significant improvement in the range of movement. The proportion of patients with less pain after the procedure ranged from 29% (2/7) to 100% (31/31). Two studies reported that 95% (18/19) and 87% (27/31) of patients were satisfied with the result of the surgery, after mean follow-ups of 3 years and 6 years respectively.

The Specialist Advisors noted concerns regarding the long term benefits compared to joint arthrodesis.

Safety

A systematic review, including 70 articles (15,556 MCP and IP joint replacements), reported on complications. The most common complication was change to surrounding bone, including bone cysts, osteolysis, resorption, and heterotopic bone, in 4% (577/15,556) of implants. Other complications included implant fracture in 2% of joints (352/15,556), implant loosening in 0.7% (114/15,556), and infection in 0.6% (86/15,556). Removal was necessary in 1% (143/15,556) of joints. The reasons for removal included implant fracture, infection, loosening, pain, and synovitis. Two small case series reported that 7% (5/69) and 3% (1/31) of implants had fractured after mean follow-up periods of 3 and 6 years respectively.

The Specialist Advisors listed potential adverse effects including stiffness, loosening of the prosthesis, generation of wear debris, bone resorption, nerve injury, wound haematoma, silicone synovitis, infection and prosthesis fatigue.

Literature review

Appraisal criteria

Studies examining effects of artificial MCP and IP joints in people with hand joint osteoarthritis were included.

List of studies found

Interphalangeal (IP) joints

No controlled studies were found.

Fourteen case series were found. Four are described in the table.[1,2,3,4] The remaining studies are listed in the Appendix.

One systematic review was found, reporting on complications of IP and MCP joints taken together (see table).[4]

One paper written in German was identified (Sauerbier M et al 2000), which described a series of arthroplasties in 60 people who did not all have osteoarthritis. Further details were not available from the English abstract (see Appendix).

Metacarpophalangeal (MCP) joints

One systematic review was found, reporting on complications of IP and MCP joints taken together (see table).[1]

No controlled studies were found.

Two case series and one case report were found. In total, these included only five patients with degenerative arthritis or osteoarthritis, who were not reported on separately. References to these studies are provided in the Appendix.

Summary of key efficacy and safety findings

Study details	Key efficacy findings	Key safety findings	Key reliability and validity issues
Herren DB[1] (2000) Case series Zurich, Switzerland Proximal IP joint n = 38 adults (mean age 65) who had 59 implants: • 38 palmar approach • 21 dorsal approach • 36 for osteoarthritis • 23 for inflammatory arthritis Follow-up: > 12 months (mean 28 months)	No significant improvement in range of movement from baseline (p = 0.78)	No complications reported	Small uncontrolled series. Main results compared outcomes between diagnostic groups and between palmar and dorsal approach groups. No further detail presented about preoperative versus postoperative pain or mobility.

Study details	Key efficacy findings	Key safety findings	Key reliability and validity issues
Lin HH[2] (1995) Case series Cincinnati, USA Date not stated Proximal IP joint n = 36 adults (mean age 52 years); 69 joints • 38 for osteoarthritis (18 patients) • 10 for post-traumatic arthritis (10 patients) • 13 for rheumatoid arthritis (5 patients) • 6 for psoriatic arthritis (2 patients) • 2 for scleroderma (1 patient) Mean follow-up: 3.4 years	Average preoperative and postoperative extension deficit (degrees) Osteoarthritis: • preop = 9, postop = 4 Post-traumatic arthritis: • preop = 30, postop = 22 Rheumatoid arthritis: • preop = 20, postop = 5 Psoriatic arthritis: • preop = 18, postop = 10 Scleroderma: • preop = 70, postop = 75 Average preoperative and postoperative total active motion (degrees) Osteoarthritis: • preop = 59, postop = 58 Post-traumatic arthritis: • preop = 26, postop = 39 Rheumatoid arthritis: • preop = 35, postop = 32 Psoriatic arthritis: • preop = 11, postop = 19 Scleroderma: • preop = 20, postop = 13 97% (67/69) immediate pain relief	Complications • Implant fracture 7.2% (5/69) • Malrotation 4.3% (3/69) • Subsequent joint fusion performed 2.9% (2/69) (1 rheumatoid digit and 1 with sceleroderma) • Osteophyte excision 1.4% (1/69) • Prominent implant 1.4% (1/69) • Implant infection 1.4% (1/69) • Suture abscess 1.4% (1/69) • Reflex sympathetic dystrophy 1.4% (1/69) • Chronic pain 1.4% (1/69)	Small uncontrolled series. Complications were not presented separately for people with osteoarthritis.

Study details	Key efficacy findings	Key safety findings	Key reliability and validity issues
Pellegrini VD[3] Case series USA 1975 – 1985 Proximal IP joint n = 24 adults (mean age 57 years); 43 joints • 26 Swanson silicone implants (24 erosive osteoarthritis, 1 psoriatic arthritis, 1 degenerative disease after trauma) • 7 biomeric implants (7 erosive osteoarthritis) • 10 arthrodeses (5 erosive osteoarthritis, 4 psoriatic arthritis, 1 degenerative disease after trauma) Mean follow-up: 3 years (range 1 to 9 years)	**Silicone arthroplasty** Pain relief 100% (19/19) Satisfaction 95% (18/19) Revisional surgery 0% (0/26) Alignment within 5 degrees of the neutral axis 81% (21/26) **Biomeric device** Pain relief 29% (2/7) Revisional surgery 100% (7/7) Alignment within 5 degrees of the neutral axis 14% (1/7) **Athrodesis** Pain relief 100% (7/7) Successful solid fusion 90% (9/10)	Complications of silicone arthroplasty: • Unsightly appearance of operated finger 26% (5/19) • Erosion of the cut end of the phalanx 27% (7/26) • Periprosthetic endosteal erosion = 8% (2.26) "More than one third of all implants followed a minimum of 2 years demonstrated destructive bone changes adjacent to the implant joint space." Complications of biomeric device: • Progressive inability to straighten finger 100% (7/7) • Implant removal because of mechanical failure of device 100% (7/7)	No randomisation. No adverse changes were seen in joints with silicone prostheses with less than 2 years follow-up. Manufacture of the biomeric device was terminated while this manuscript was being prepared.

Study details	Key efficacy findings	Key safety findings	Key reliability and validity issues
Zimmerman NB[4] (1989) Case series USA Date not stated Distal IP joint n = 18 adults (mean age 58 years); 31 joints 17 patients with osteoarthritis 1 patient with rheumatoid arthritis Mean follow-up: 6 years (range 1 to 10 years)	Pain relief 100% (31/31) Improved cosmetic appearance 87% (27/31) Improved power 71% (22/31) Improved dexterity 81% (25/31) Overall satisfaction 87% (27/31) Mean active range of motion (23 fingers) = 33.2° 43% (10/23) joints stable to lateral stress	Complications • Implant removal 9.7% (3/31) Reason for implant removal • Erosion through the skin: 3% (1/31) • Infection: 3% (1/31) • Fracture: 3% (1/31)	Small uncontrolled series. 11-year study period. Power and dexterity were subjectively evaluated by the patient.
Foliart D[5] Systematic review of long term complications of Swanson silicone MCP and IP implants in people with rheumatoid or osteoarthritis Literature search 1965 to 1994 Primary source: Medline 70 articles reporting complications • 13,031 MCP implants • 2,525 IP implants	No efficacy measures reported	Complications (% of implants) • Implant fracture (2) • Implant removal (1) • Implant loosening (0.7) • Infection (0.6) • Lymphadenopathy (0.1) • Particulate synovitis (0.1) 4/13 people with lymphadenopathy diagnosed with non-Hodgkins lymphoma Reason for implant removal (% of removed implants): • Fracture (47) • Infection (22) • Loosening (8) • Continued pain (7) • Synovitis (7)	Search limited to English language articles on Medline. Specific inclusion criteria described. Rates based on number of implants, not people. Outcomes not presented separately for people with osteoarthritis.

Validity and generalisability of the studies

The settings of all described studies appear applicable to the UK.

IP joints

The search strategy of the systematic review on complications of IP and MCP joints was limited, which may bias the results.[5] Separate results were not provided for people with osteoarthritis or for IP joints.

Information on efficacy is limited to small uncontrolled case series.[1,2,3,4] All the studies included at least one patient with an indication other than osteoarthritis and most did not report the results separately by indication.

MCP joints

The search strategy of the systematic review on complications of IP and MCP joints was limited, which may bias the results.[5] Separate results were not provided for people with osteoarthritis or for MCP joints.

All other case series described the procedure's outcomes in fewer than ten people with osteoarthritis.

Specialist advisor's opinion

Specialist advice was sought from consultants who have been nominated or ratified by their Specialist Society or Royal College.

The procedures are currently uncommon and largely confined to specialist hand surgeons. Spread of the technique is likely to reflect the growth of hand surgery as a specialty. Uptake will probably remain limited for many years, because most patients are managed adequately with conservative treatments.

IP and MP silastic replacements are considered an established technique.

The Specialist Advisors drew attention to the range of joints and joint implants that are available and note that newer implants are unproven. They expressed concern over long term effects compared with older techniques, such as arthrodesis, and concurred that evidence is limited.

The British Society for Surgery of the Hand has recently set up a voluntary register for artificial hand joint procedures. There are no suitable codes for these procedures.

Issues for consideration by IPAC

None other those discussed above.

References

1. Herren DB, Simmen BR. Palmar approach in flexible implant arthroplasty of the proximal interphalangeal joint. *Clinical Orthopaedics & Related Research* 2000;(371):131-5.

2. Lin HH, Wyrick JD, Stern PJ. Proximal interphalangeal joint silicone replacement arthroplasty: Clinical results using an anterior approach. *Journal of Hand Surgery* 1995; 20(1):123-32.

3. Pellegrini VD, Burton RI. Osteoarthritis of the proximal interphalangeal joint of the hand: arthroplasty or fusion? *Journal of Hand Surgery* 1990; 15A: 194–209.

4. Zimmerman NB, Suhey PV, Clark GL et al. Silicone interpositional arthroplasty of the distal interphalangeal joint. *Journal of Hand Surgery* 1989; 14(5): 882-7.

5. Foliart DE. Swanson silicone finger joint implants: A review of the literature regarding long-term complications. *Journal of Hand Surgery* - American Volume 1995; 20(3):445-9.

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Updated by NICE July 2004

Appendix: references for relevant studies excluded from summary table

Interphalangeal joint implants	n
Möller K, Geijer M, Sollerman C et al. Radiographic evaluation of osseointegration and loosening of titanium implants in the MCP and PIP joints. *The Journal of Hand Surgery* 2004; 29: 32-8.	86 mixed group
Sauerbier M, Cooney WP, Berger RA et al. [Complete superficial replacement of the middle finger joint-long-term outcome and surgical technique] [German]. *Handchirurgie, Mikrochirurgie, Plastische Chirurgie* 2000; 32(6):411-8.	60 mixed group
Wilgis EF. Distal interphalangeal joint silicone interpositional arthroplasty of the hand. *Clinical Orthopaedics & Related Research* 1997;(342):38-41.	23
Condamine JL, Fourquet M, Marcucci L et al. [Primary metacarpophalangeal and proximal interphalangeal arthrosis of the hand. Indications and results of 27 DJOA arthroplasty] [French]. *Annales de Chirurgie de la Main et du Membre Superieur* 1997; 16(1):66-78.	20
Lundborg G, Branemark PI. Osseointegrated proximal interphalangeal joint prostheses with a replaceable flexible joint spacer--long-term results. *Scandinavian Journal of Plastic & Reconstructive Surgery & Hand Surgery* 2000; 34(4):345-53.	19
Johnstone BR. Proximal interphalangeal joint surface replacement arthroplasty. *Hand Surgery* 2001; 6(1):1-11.	13
Brown LG. Distal interphalangeal joint flexible implant arthroplasty. *Journal of Hand Surgery* 1989; 14(4):653-6.	13
Lang E, Schmidt A, Ishida A et al. [Experiences with the alloplastic joint prosthesis of the interphalangeal joint]. [German]. *Handchirurgie, Mikrochirurgie, Plastische Chirurgie* 2000; 32(1):44-9.	12
Moller K, Sollerman C, Geijer M et al. Early results with osseointegrated proximal interphalangeal joint prostheses. *Journal of Hand Surgery* - American Volume 1999; 24(2):267-74.	12
Mentzel M, Hoss H, Ebinger T et al. [DIGITOS-prosthesis for the proximal interphalangeal joint. A 2-year follow-up] [German]. *Handchirurgie, Mikrochirurgie, Plastische Chirurgie* 2000; 32(5):347-52.	7
Metacarpopharyngeal joint references	
Harris D, Dias JJ. Five-year results of a new total replacement prosthesis for the finger metacarpo-phalangeal joints. *Journal of Hand Surgery* 2003; 28: 432-8.	8
McGovern RM, Shin AY, Beckenbaugh RD et al. Long-term results of cemented Steffee arthroplasty of the thumb metacarpophalangeal joint. *Journal of Hand Surgery* 2001; 26(1):115-22.	2
Netscher D, Eladoumikdachi F, Gao YH. Resurfacing arthroplasty for metacarpophalangeal joint osteoarthritis: a good option using either perichondrium or extensor retinaculum. *Plastic & Reconstructive Surgery* 2000; 106(6):1430-3.	1
Cook SD, Beckenbaugh RD, Redondo J et al. Long-term follow-up of pyrolytic carbon metacarpophalangeal implants. *Journal of Bone & Joint Surgery* 1999; 81(5):635-48.	3?