MOTEC®

Basal thumb joint prosthesis

Swemac

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Pain, instability, and reduced motion of the basal thumb joint (CMC I) may be caused by rheumatoid arthritis, primary osteoarthrosis and secondary arthrosis due to fracture of the first metacarpal or trapezium.

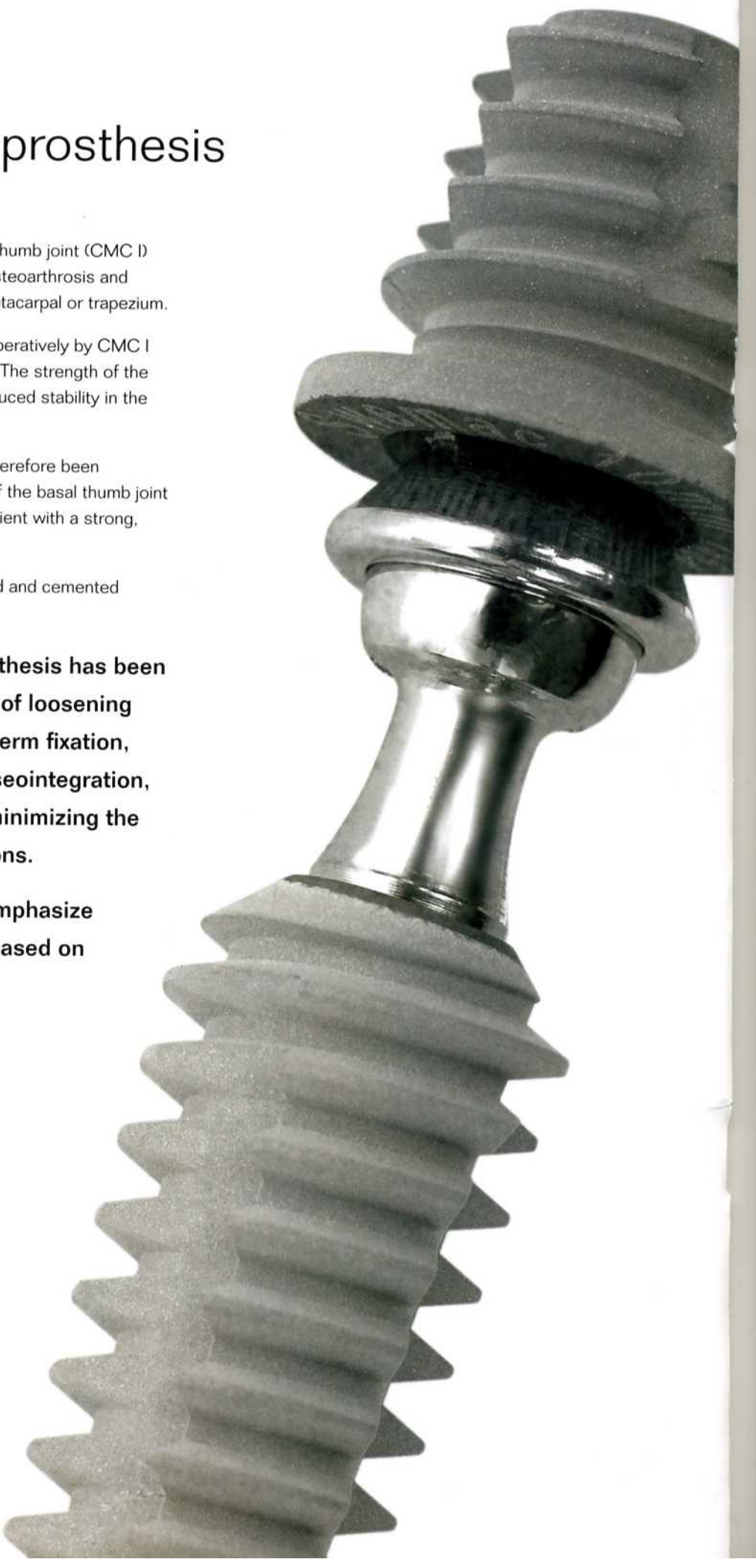
Traditionally, these problems have been treated operatively by CMC I fusion or different kinds of resection arthroplasty. The strength of the thumb is less after resection arthroplasty, and reduced stability in the basal joint may be a problem (Ref. 1).

Different types of total CMC I-prostheses have therefore been developed. When successful, total replacement of the basal thumb joint affords the best solution in that it provides the patient with a strong, stable, mobile and pain free thumb.

A high frequency of loosening of both uncemented and cemented prostheses has been reported (Ref. 2, 3 and 4).

The MOTEC® basal thumb joint prosthesis has been designed to overcome the problems of loosening and subluxation by improving short term fixation, optimizing long term fixation and osseointegration, reducing the risk of osteolysis and minimizing the risk of procedure related complications.

However, we promote caution and emphasize the importance of patient selection based on functional demand.



Patent number 0500353-8
Patent application number 0800679-3

The MOTEC is a modular prosthesis consisting of four parts, providing the surgeon with 168 combinations replicating the patient's normal CMC-1 joint range of motion.

Trapezium threaded implant (3 sizes + 3 XL sizes).

Trapezium Cup

Metacarpal head implant (4 sizes)

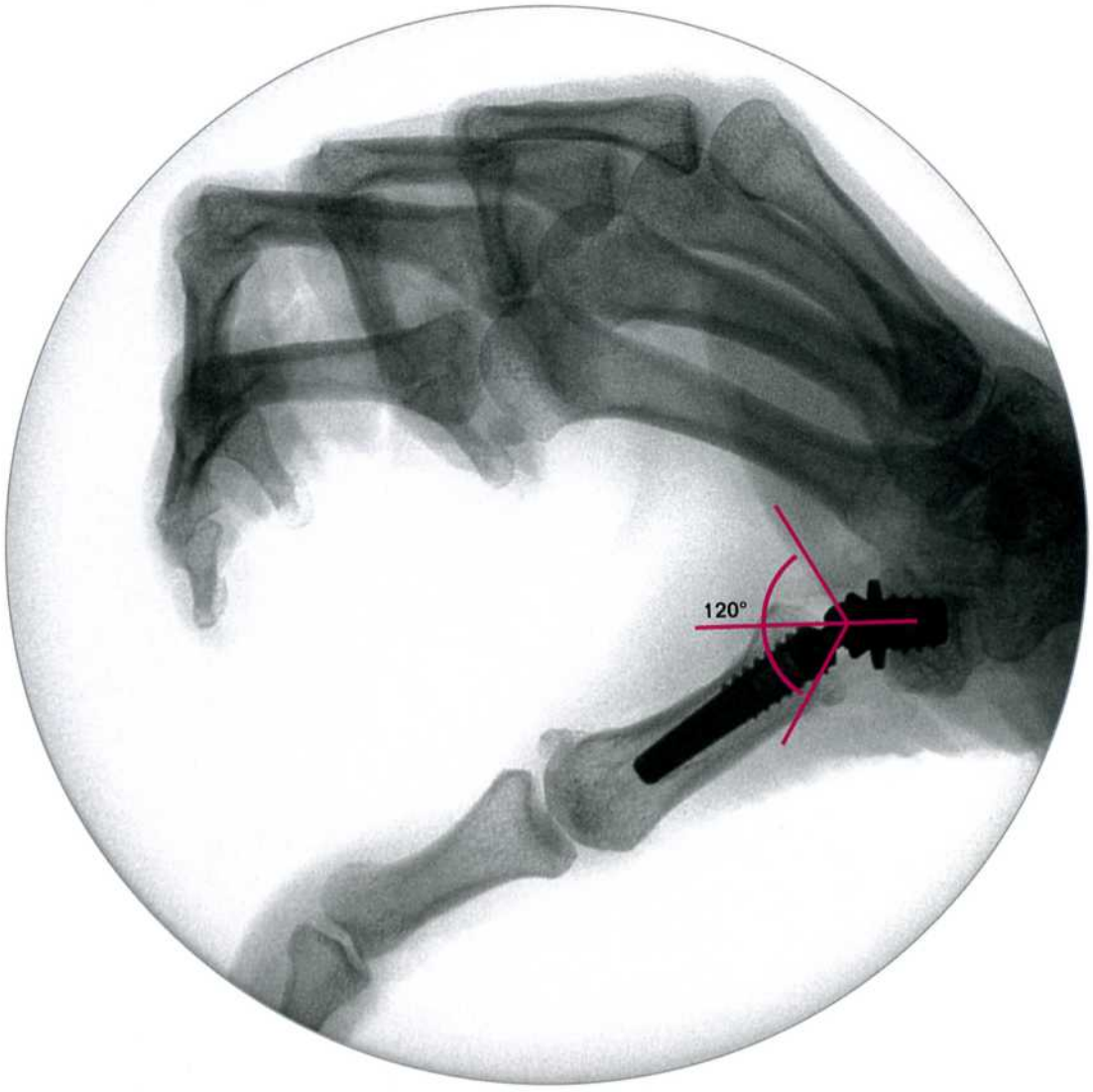
Metacarpal threaded implant (5 sizes + 2 XL sizes).

The implant has a collar.

The articulation is metal against metal with ball and socket articulation made of cobalt chrome molybdenum alloy treated with chromium nitride.

Fixation is achieved by threaded implants made of titanium alloy, blasted and coated with Bonit®, which is a resorbable calcium phosphate combination with proven osteoconductive properties.

Range of motion (ROM) 120°



Improved short term fixation

■ **Immediate primary fixation is achieved by threaded implants.**

The trapezium implants are available in 7 mm, 8.5 mm and 10 mm lengths.

■ **The design of the threaded trapezium implants has been optimized for maximum bone purchase** (Ref. 5).

■ **A collar prevents the trapezium implant from pivoting sideways or sinking.**

■ **The threads of the conical metacarpal implant engage into the cortical bone of the intramedullary canal, preventing the implant from sinking.**

The metacarpal implants are available in 20 mm, 24 mm, 28 mm, 32 mm and 36 mm lengths.

The metacarpal drill core diameter matches the diameter of all metacarpal implants.

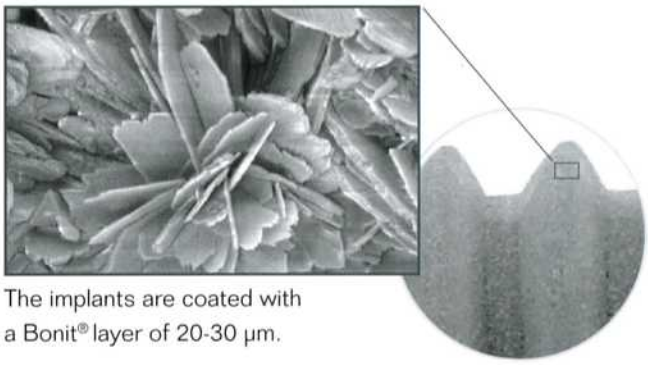
Optimized long term fixation and osseointegration

■ **Optimal blasting of titanium alloy implants improves long term fixation and osseointegration** (Ref. 6).

The titanium surface is blasted with extra pure Al_2O_3 using a specific technique and to a specific roughness value to maximize the bone ingrowth.

■ **The titanium alloy threaded implants are coated with Bonit®, a resorbable calcium phosphate combination with proven osteoconductive properties, improving long term fixation.**

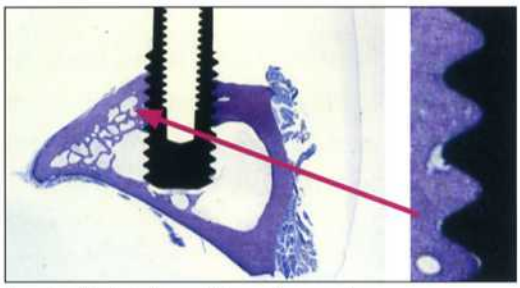
■ **Cementless – eliminating potential cement related complications.**



The implants are coated with a Bonit® layer of 20-30 µm.

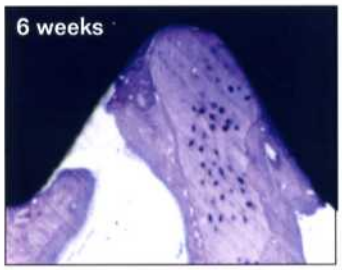
In vivo biomechanical comparison

Bonit® and hydroxyapitite (HA) coated titanium screws were inserted in the proximal tibia of a rabbit. The screw fixation increased with time (6 to 12 to 52 weeks) for the Bonit® coated screws whereas HA screws showed no increase in fixation with time after 6 weeks. (Ref. 7 and 8).

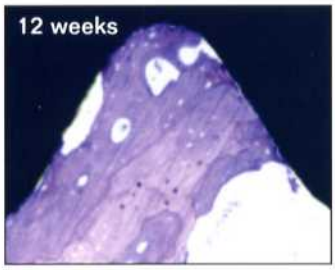


Implant in black and bone in purple.

Bonit®

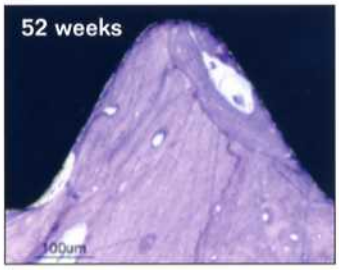


Bonit®



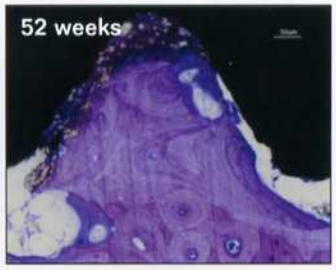
The Bonit layer is partly resorbed.

Bonit®



The Bonit layer was fully resorbed and the osseointegration is acting between titaniumoxid layer and bone.

HA coating



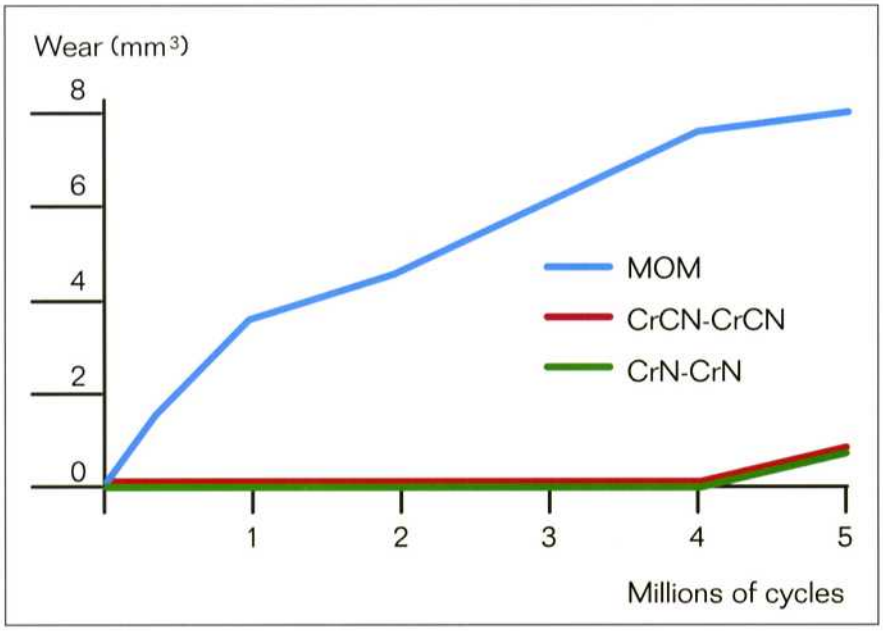
The HA-layer and particles are loosening from the titanium surface. Giantcell, macrophages are visible.

Problems with long term fixation using HA coating on implants have been shown in a thesis by Magne Røkkum (Ref. 9).

Reduced risk of osteolysis

■ **The modular cup and head are made of cobalt-chrome-molybdenum (CoCrMo) alloy. Metal-on-metal articulation (MOM) bearing couples have been shown to have much lower wear rates than polyethylene bearings in vitro simulator tests as well as in recent clinical studies** (Ref 10, 11, 12, 13).

■ **The modular cup and head have been coated with chromium nitride (CrN). When using chromium nitride, the wear rate is reduced by a factor of 40 compared to a standard cobalt-chrome-molybdenum articulation** (Ref. 14).



Total wear loss of CrN-CrN, CrCN-CrCN and MOM prosthesis

Minimized risk of procedure related complications

- **No risk of drilling to deep. The trapezium drills have a collar, making it impossible to drill further than the chosen drill depth.**
- **The drill for trapezium is very sharp and only slightly conical, reducing the risk of cracking the bone during drilling.**

- **XL trapezium implants with deeper threads are available for patients with severely osteoporotic bone or in the event the bone is stripped using a standard implant.**
- **The collar of the trapezium implant ensures a good fixation in the subchondral bone by preventing the implant from being inserted too deep.**

Standard trapezium implant.

XL trapezium implant.

The XL trapezium implant has the same core diameter as the standard implant.

- **If fixation with the standard or XL trapezium implants is unsuccessful a polyethylene cemented salvage cup is available.**

Do not use the polyethylene cup as a standard solution.

Case – 62 year old woman

CMC-1 OA. Severe pain, VAS 10. Pre-operative A/P-view.

Direct post-operative lateral view.

6 weeks post-operative lateral view. No pain.

10 months post-operative lateral view. No pain, full ROM and good grip.

Reference

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Surgical technique

Indication

The MOTEC is indicated as a total joint replacement of the basal thumb joint in cases with pain or instability due to rheumatoid arthritis, primary osteoarthrosis and secondary arthrosis due to fracture of the first metacarpal or trapezium.

Contraindication

The physician's education, training and professional judgement must be relied upon to choose the most appropriate device and treatment. Conditions presenting an increased risk of failure include:

- Previous open fracture or infection in the joint.
- Physical interference with with another prosthesis during implantation or use.
- Inadequate skin, bone or neurovascular status.
- Irreparable tendon system.
- Inadequate bone stock or soft tissue coverage.
- Any mental or neuromuscular disorder which would create an unacceptable risk or complication during the postoperative care.
- Other medical or surgical conditions which would preclude the potential benefit of surgery.

Patient positioning

The patient is placed supine on the operating table with the arm abducted 90 degrees over an arm table. A tourniquet is applied and inflated. The patients arm is prepared and and draped in the usual sterile manner.

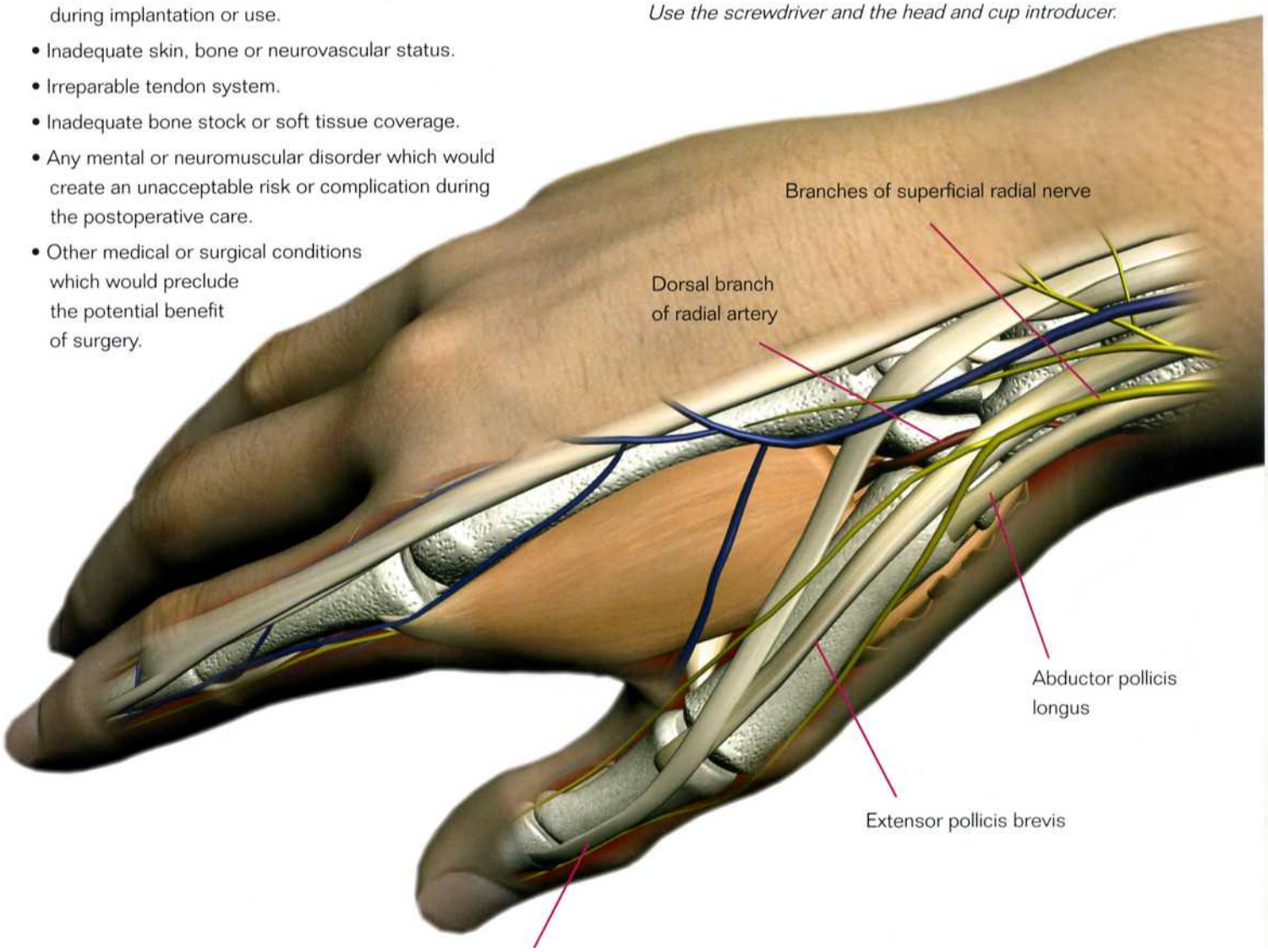
Anaesthesia and antibiotics

Either axillary block or general anaesthesia is recommended. Preoperative antibiotics are recommended.

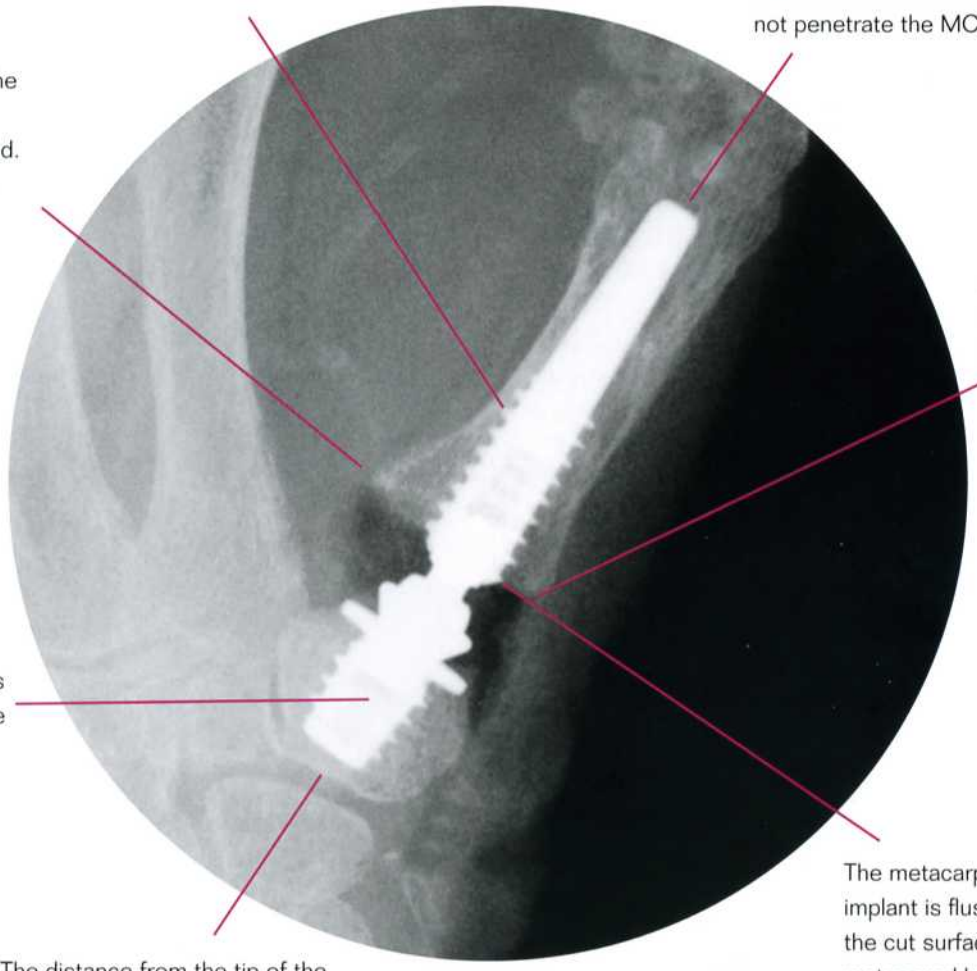
Pre-operative planning

It is recommended as an important part of the preoperative planning process that the surgeon should be familiar with the anatomy of the carpal area with special attention to the neuromuscular system.

NB. Do not touch the implants with your fingers!
Use the screwdriver and the head and cup introducer.

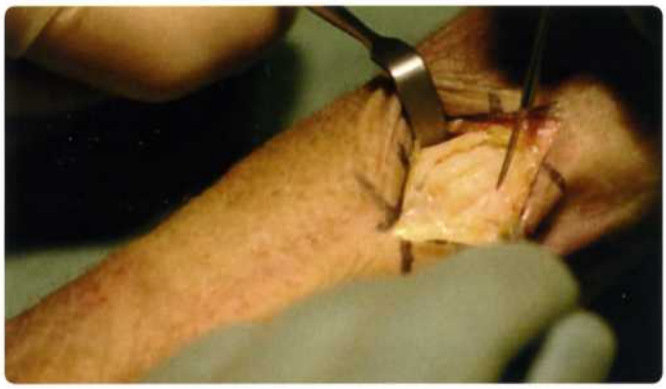


Optimal implant position



1. Surgical approach

A dorsoradial approach centred on the trapezio-metacarpal articulation is used. Branches of the superficial radial nerve lie in the subcutaneous fat layer and should be carefully protected. The interval between the abductor pollicis longus and extensor pollicis brevis is used to gain access to the dorsal capsule. The carpometacarpal joint is identified.



Sharply divide the capsule longitudinally and elevate the adherent soft tissue envelope from the base of the first metacarpal, exposing the trapeziometacarpal joint. The APL which inserts on the base of the metacarpal should be freed from its insertion and tagged for later repair.

A 360 degree subperiosteal circumferential dissection of the proximal part of the metacarpal is performed in order to facilitate access to the trapezium and to release any adduction

2. Metacarpal base resection

A 2-4 mm resection of the metacarpal base is performed using an oscillating saw. The bone cut is performed perpendicular to the metacarpal axis.

The volar lip and the ulnar prominence are then removed. They can act as levers and cause dislocation after the metacarpal has been realigned with the implant.

Metacarpal bone after final resection.

3. Drilling and measuring of the metacarpal

The solid conical drill is inserted down the centre of the medullary canal. Its conical shape will automatically align with the axis of the canal.

Drilling is carried out by hand under image intensification. When resistance from the cortical bone is felt, the proper insertion depth has been reached. If no cortical resistance is felt, a wider XL metacarpal implant should be used. The wider XL metacarpal implants are only available in 32 and 36 mm length.

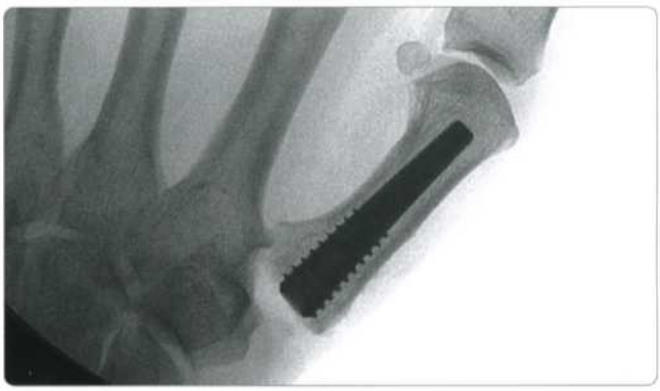
Be sure not to penetrate the MCP-joint and do not drill further than 36 mm as that is the longest metacarpal implant available. Drill depth is taken directly from the measurements on the drill's cutting flutes.

The metacarpal bone is prepared and ready for insertion of the metacarpal implant.

4. Insertion of the metacarpal implant

The chosen metacarpal implant is inserted until its edge is flush with the cut surface. Insertion is carried out by hand only.

The metacarpal implant is flush with the cut surface of the metacarpal bone.



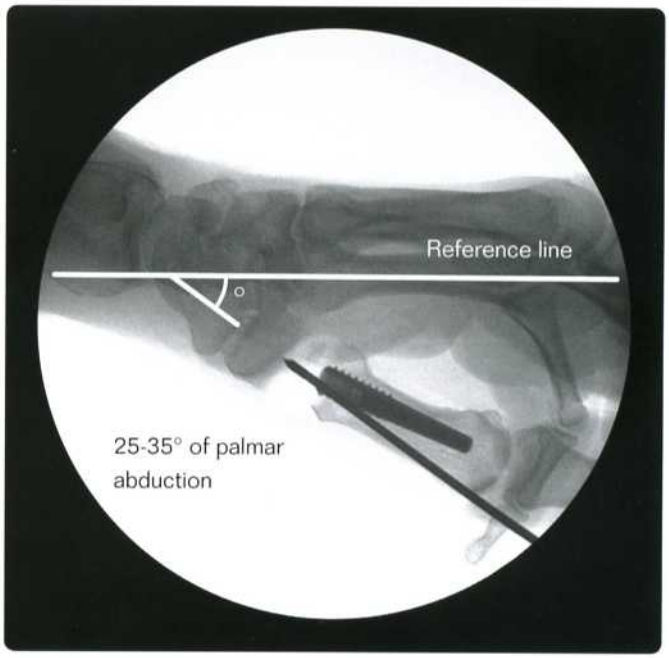
The metacarpal implant should always be implanted at this stage, this will minimise any possible damage to the bone during the preparation of the trapezium.

5. Preparation of the trapezium

A small Hohman retractor is used to pull the metacarpal volarly and ulnarly allowing access to the trapezium. To evaluate the true trapezial joint surface, all osteophytes must be removed.

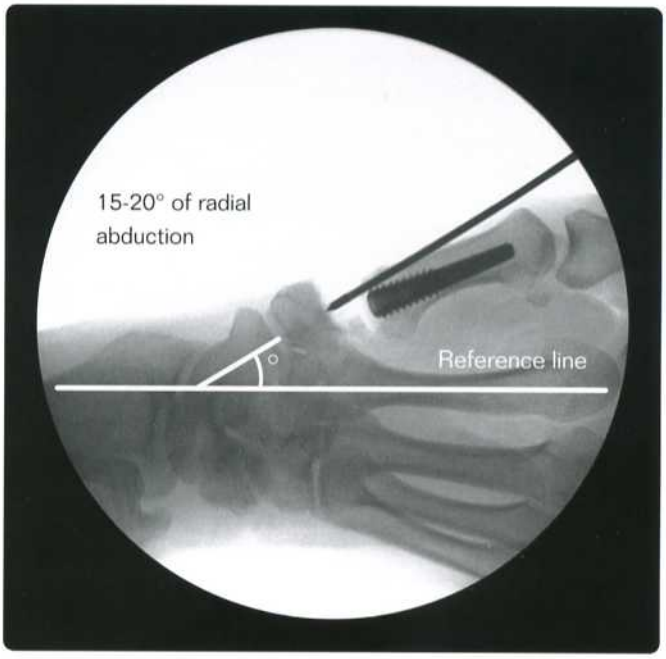
Place the centering guide on the trapezium to define the radial, ulnar and palmar limits to properly align the guide wire down the centre axis.

6. Orientation of the guide wire in the trapezium

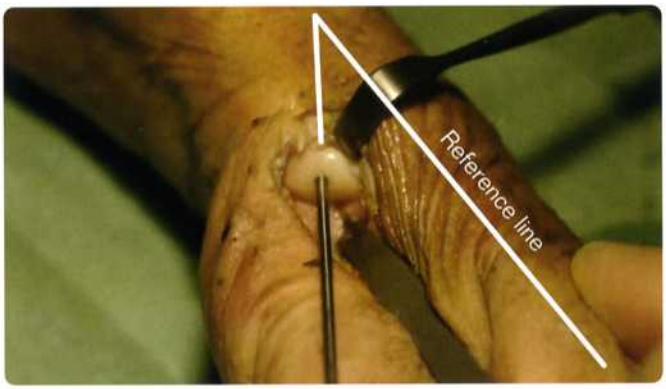


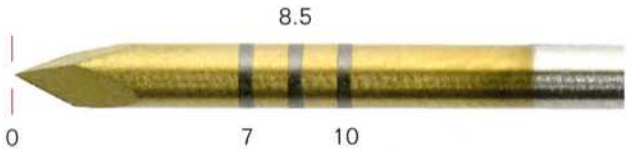
The positioning of the guide wire in the trapezium is the most critical step in the whole procedure.

To ensure proper orientation of the guide wire, it is important to have a true A/P and lateral view. Using the second metacarpal as a reference, the guide wire is inserted in approximately 25-35° of palmar abduction and 15-20° of radial abduction.



7. Insertion of the guide wire



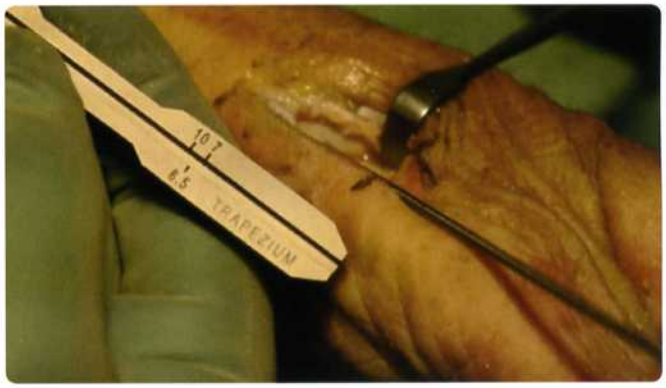


Laser lines indicate drilling depth.

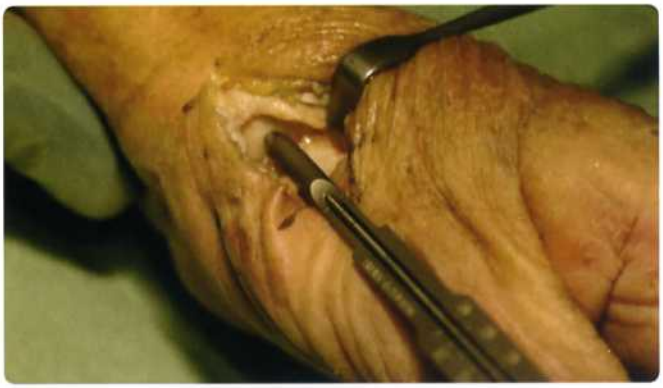
The guide wire is advanced under power up to the first laser mark, at this point check the insertion angle, if incorrect remove the wire and re-introduce at the correct angle. Using image intensification the guide wire is now driven to within 1.5 mm of the subchondral bone. If the wire depth corresponds exactly to one of the 3 laser marks – 7 mm, 8.5 mm or 10 mm – then that is the size of stop drill selected (depth can be double-checked by using the measuring sleeve as described in the following section).

Once the depth is determined advance the guide wire into subchondral bone, this will help prevent the wire from spinning during drilling.

8. Measuring with the measuring sleeve



If the depth cannot be determined exactly from the guide wire then the measuring sleeve is used. Slide the sleeve over the wire until it rests against the trapezium. The depth is read off the scale at the end of the wire.
The trapezium implant is available in 3 sizes: 7 mm, 8.5 mm and 10 mm. If the wire has been advanced all the way into subchondral bone then downsize by 1.5 mm. If between sizes chose the shorter size.



9. Drilling the trapezium

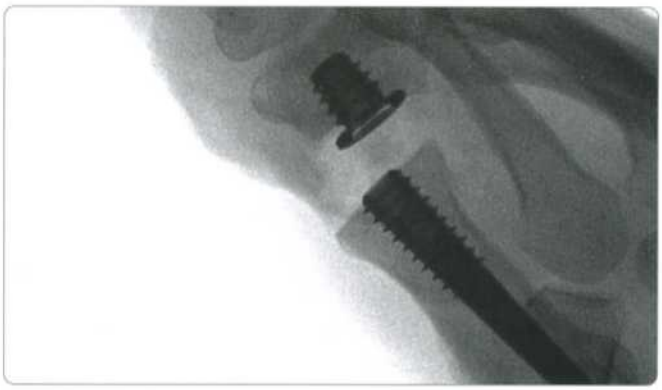
Introduce the appropriate cannulated stop drill over the guide wire and drill under power **in one single motion** until the stop drill is seated flush to the trapezium.

Remove both the guide wire and stop drill. Because of the shape of the trapezium the implant collar will not be in full contact with bone - this is normal.

Do not attempt to re-drill with a longer stop drill as this might destroy too much of the bone trabeculae and jeopardize the fixation of the trapezium implant.

10. Insertion of the trapezium implant

Irrigate the joint prior to the insertion of the trapezium implant. The appropriate implant is inserted with the screw driver until resistance is met. Check the position of the collar.



The trapezium implant is fully seated when the collar contacts the prepared trapezial bone. Forcing the trapezium implant further into the bone may compromise fixation and strip the bone. Should the bone strip a wider XL trapezium implant can be used to regain fixation. The wider trapezium implants with deeper threads can also be used in patients with severely osteoporotic bone.

11. Insertion of the trapezial cup

Ensure the internal Morse cone of the trapezium implant is washed out before inserting the cup. Use the cup introducer to insert the cup into the trapezium implant.

When the cup is in position, tap the impactor gently.

12. Trial of the metacarpal head neck length

To determine the neck length, you must start by inserting the shortest trial neck. Increase the trial size until the right tension has been achieved. The impactor should not be used with the trials.

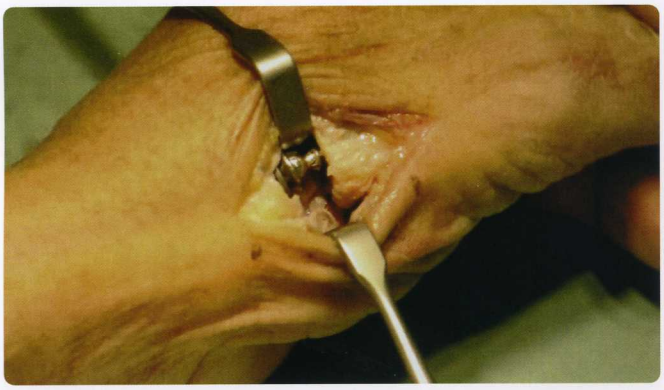
When pulling the thumb, the metacarpal head should just lift from the bottom of the cup. If one size up feels too tight, or if one size down feels too lose, it is possible to adjust the metacarpal screw slightly by introducing it further into the bone. Tension will increase when later closing the capsule.

When the correct neck length is determined the trial head is removed.

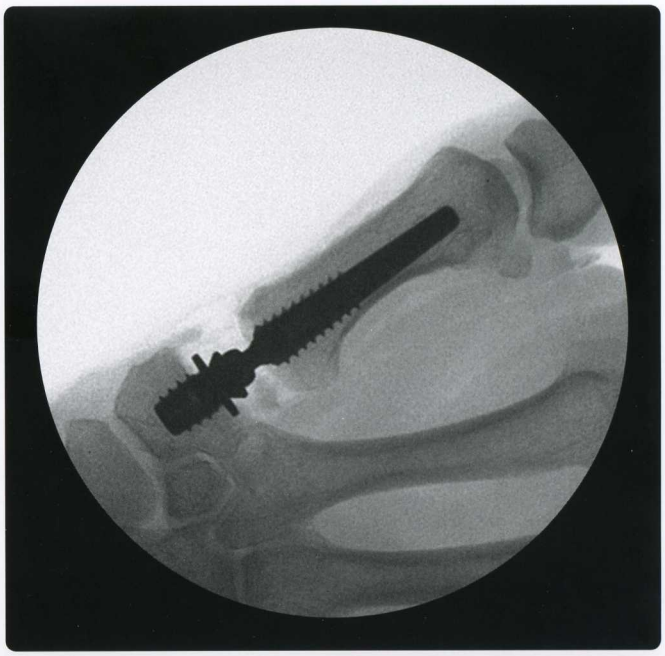
13. Insertion of the metacarpal head

Before introducing the chosen head, make sure that the internal Morse cone of the metacarpal implant is clean.
Use the head introducer to introduce the metacarpal head into the metacarpal implant.

When the head is in position, tap the impactor gently.



14. Final reduction

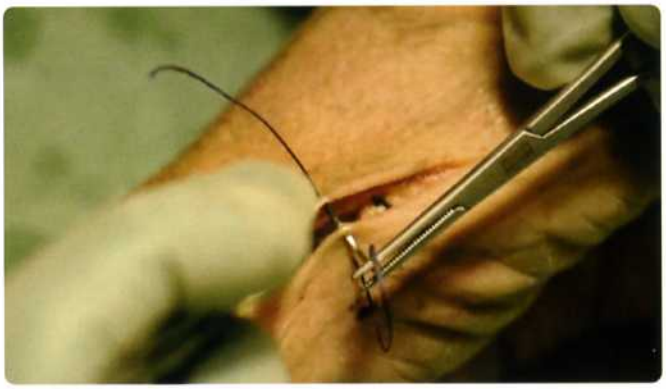


The joint is reduced and stability and range of motion are evaluated under image intensification. Haemostasis is obtained after releasing the tourniquet.

15. Closure

The APL is reattached to the metacarpal with a transosseous suture.

Carefully close the capsule with absorbable sutures..



Close the skin in the normal fashion.

Postoperative care

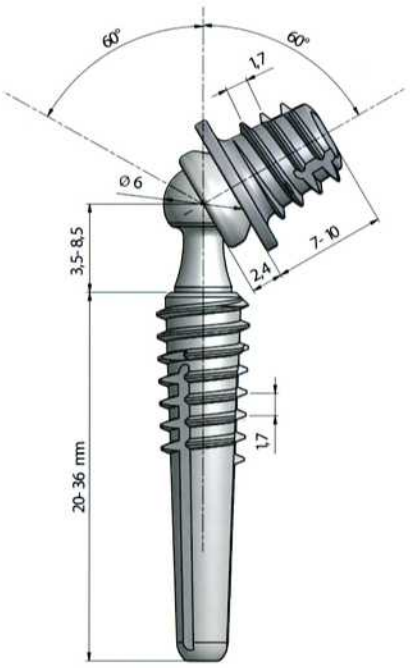
A postoperative plaster is applied to immobilize 1st CMC, 1st MCP and STT.
It is important that the plaster is applied with the 1st metacarpal in palmar and radial abduction and the MCP joint in slight flexion. Motion is allowed in the radiocarpal joint, the finger joints and the thumb IP-joints.

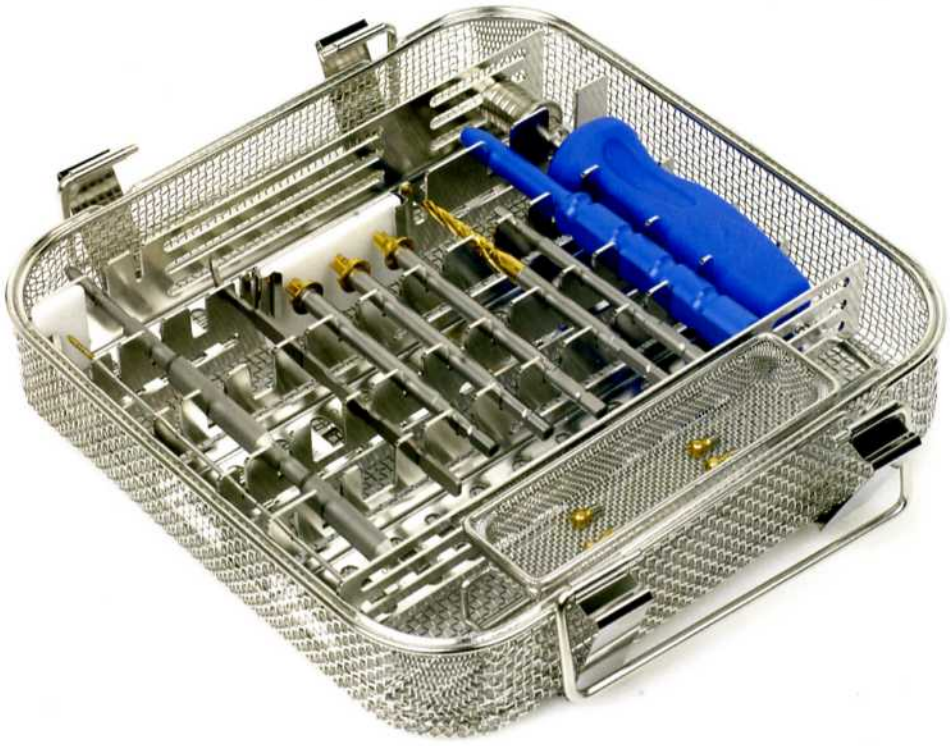
The basal thumb joint should be splinted in this fashion for ten days. Active motion without load is started at 14-30 days with a removable protective resting splint used for 6 weeks.
No load is recommended during a period of 6 weeks. Thereafter, the patient should gradually increase active motion with load. There are no restrictions after 12 weeks.

X-rays should be obtained intraoperatively, at 6 weeks, 3 months and 12 months postoperatively.

Product information

CAT. NR.	IMPLANTS	MATERIAL	DIMENSION
45-2000S	Trapezium Cup	CoCrMo	Ø 6 mm
45-2240S	Trapezium Threaded Implant	Ti6Al4V	Length 7 mm
45-2250S	Trapezium Threaded Implant	Ti6Al4V	Length 8.5 mm
45-2260S	Trapezium Threaded Implant	Ti6Al4V	Length 10 mm
45-2241S	Trapezium Threaded Implant XL	Ti6Al4V	Length 7 mm, XL
45-2251S	Trapezium Threaded Implant XL	Ti6Al4V	Length 8.5 mm, XL
45-2261S	Trapezium Threaded Implant XL	Ti6Al4V	Length 10 mm, XL
45-2005S	Metacarpal Head -Extra Short	CoCrMo	Ø 6 mm extra short neck
45-2010S	Metacarpal Head -Short	CoCrMo	Ø 6 mm short neck
45-2015S	Metacarpal Head -Medium	CoCrMo	Ø 6 mm medium neck
45-2020S	Metacarpal Head -Long	CoCrMo	Ø 6 mm long neck
45-2420S	Metacarpal I Threaded Implant	Ti6Al4V	Length 20 mm
45-2424S	Metacarpal I Threaded Implant	Ti6Al4V	Length 24 mm
45-2428S	Metacarpal I Threaded Implant	Ti6Al4V	Length 28 mm
45-2432S	Metacarpal I Threaded Implant	Ti6Al4V	Length 32 mm
45-2436S	Metacarpal I Threaded Implant	Ti6Al4V	Length 36 mm
45-2332S	Metacarpal I Threaded Implant XL	Ti6Al4V	Length 32 mm XL
45-2336S	Metacarpal I Threaded Implant XL	Ti6Al4V	Length 36 mm XL
45-2242S	Trapezium Salvage Cup	UHMWPE	Length 7 mm
45-2252S	Trapezium Salvage Cup	UHMWPE	Length 8.5 mm
45-2262S	Trapezium Salvage Cup	UHMWPE	Length 10 mm





All implants are delivered sterile for immediate use and better inventory control.

CAT. NR.	INSTRUMENTS	MATERIAL	DIMENSION
45-2510	Guide Wire	Stainless Steel	Ø2 mm
45-2515	Impactor	Radel	Ø6 mm
45-2518 ~	Head & Cup Introducer	Radel	Ø6 mm
45-2520	Measuring Sleeve	Stainless Steel	Ø2 mm
45-2530	Metacarpal Head Trial	Ti6Al4V	Ø6 mm extra short neck
45-2531	Metacarpal Head Trial	Ti6Al4V	Ø6 mm short neck
45-2532	Metacarpal Head Trial	Ti6Al4V	Ø6 mm medium neck
45-2533	Metacarpal Head Trial	Ti6Al4V	Ø6 mm long neck
45-2525	Centering Guide	Stainless Steel	Ø2 mm
45-2582	Hex Driver Tip (Quick-Lock)	Stainless Steel	3 mm
45-2560	Metacarpal Drill	Stainless Steel	Length 20-36 mm
45-2570	Cannulated Trapezium Stop Drill	Stainless Steel	Length 7 mm
45-2571	Cannulated Trapezium Stop Drill	Stainless Steel	Length 8.5 mm
45-2572	Cannulated Trapezium Stop Drill	Stainless Steel	Length 10 mm
45-2585	Driver Handle (Quick-Lock)	Elastosil	n/a

Swemac develops and promotes innovative solutions for fracture treatment and joint replacement. We create outstanding value for our clients and their patients by being the most competent and reliable partner.

Swemac

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