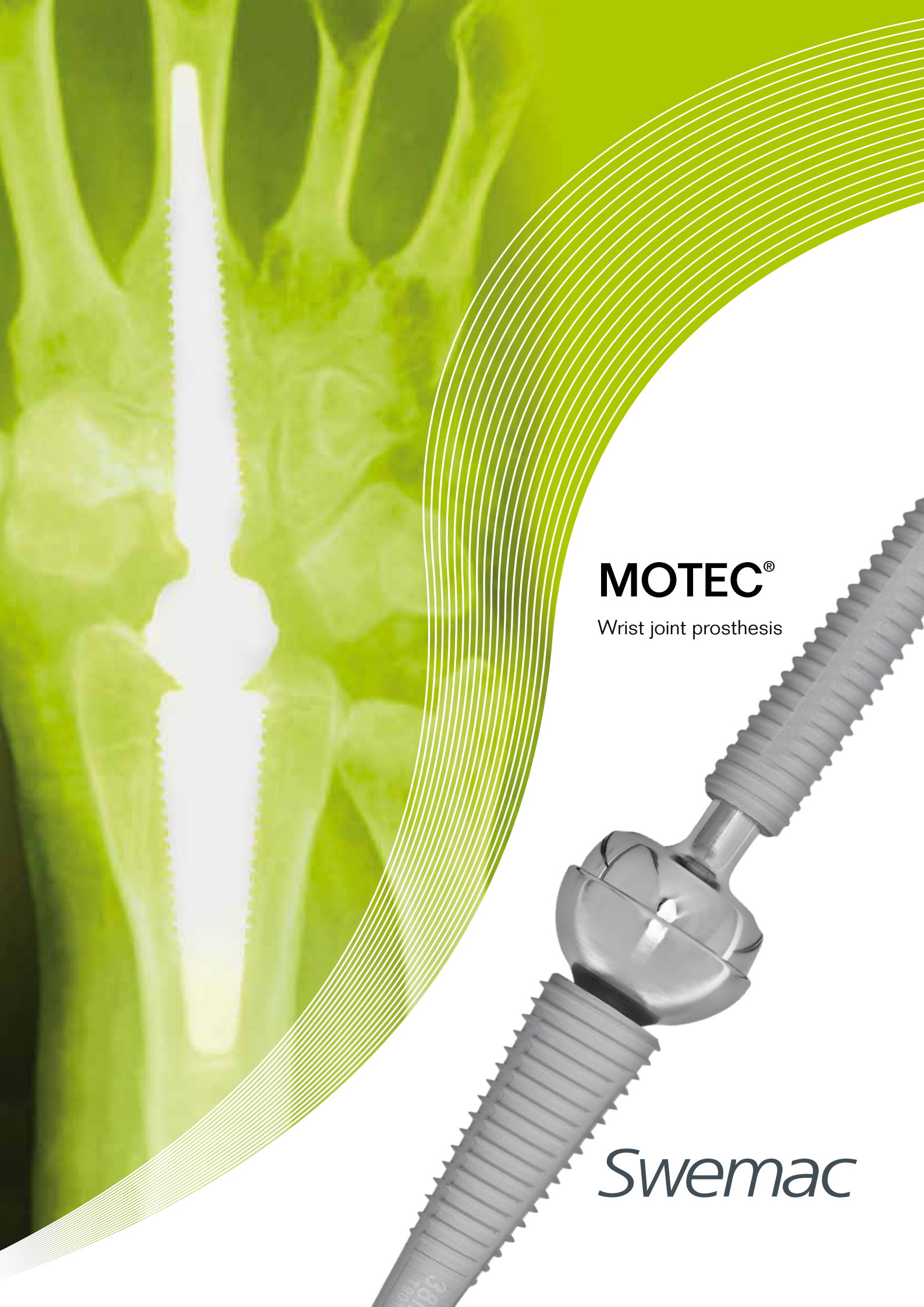


MOTEC®

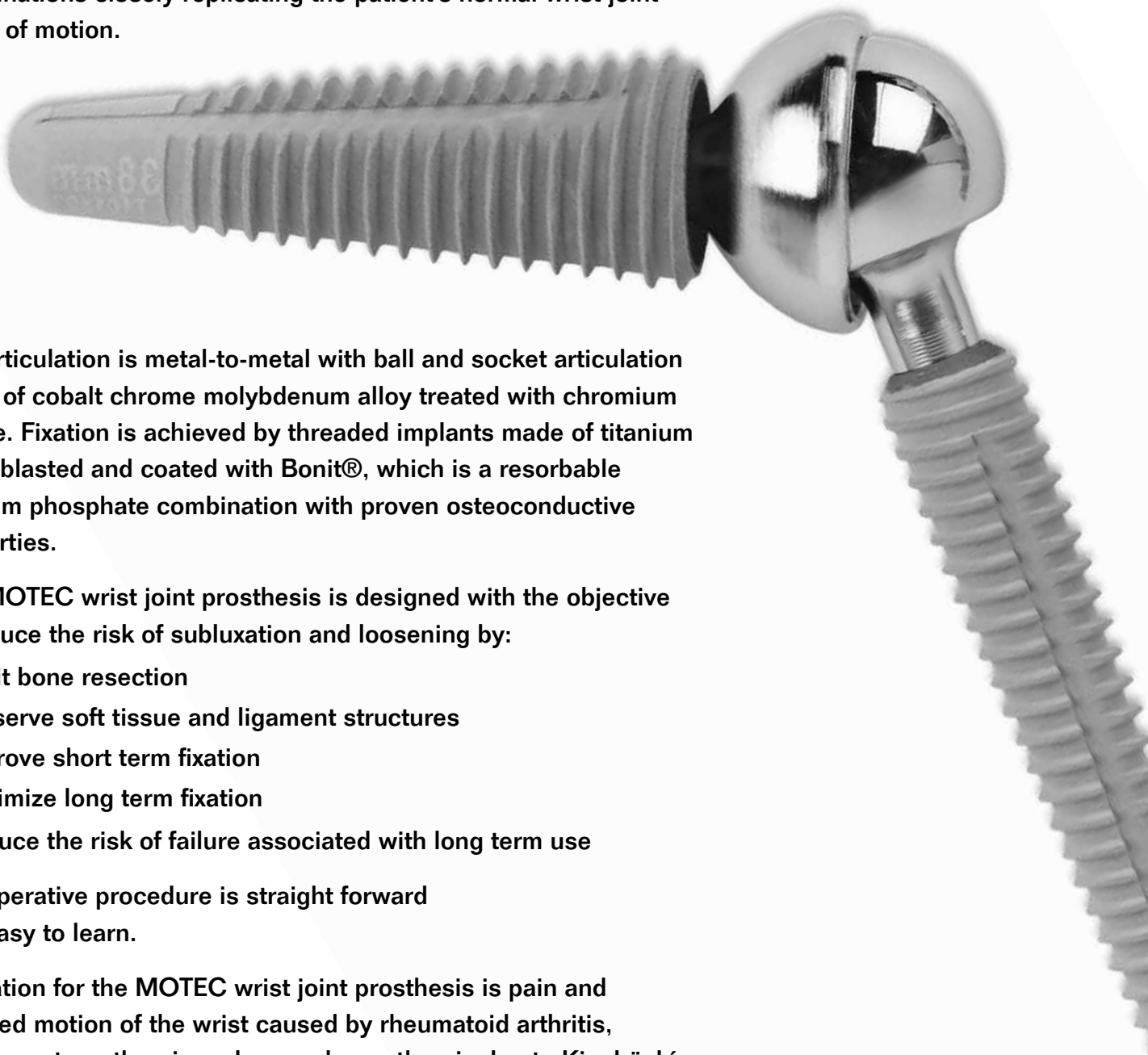
Wrist joint prosthesis

Swemac

MOTEC®

Wrist joint prosthesis

The MOTEC® wrist joint prosthesis is a modular prosthesis consisting of four parts, providing the surgeon with 162 combinations closely replicating the patient's normal wrist joint range of motion.



The articulation is metal-to-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.

The MOTEC wrist joint prosthesis is designed with the objective to reduce the risk of subluxation and loosening by:

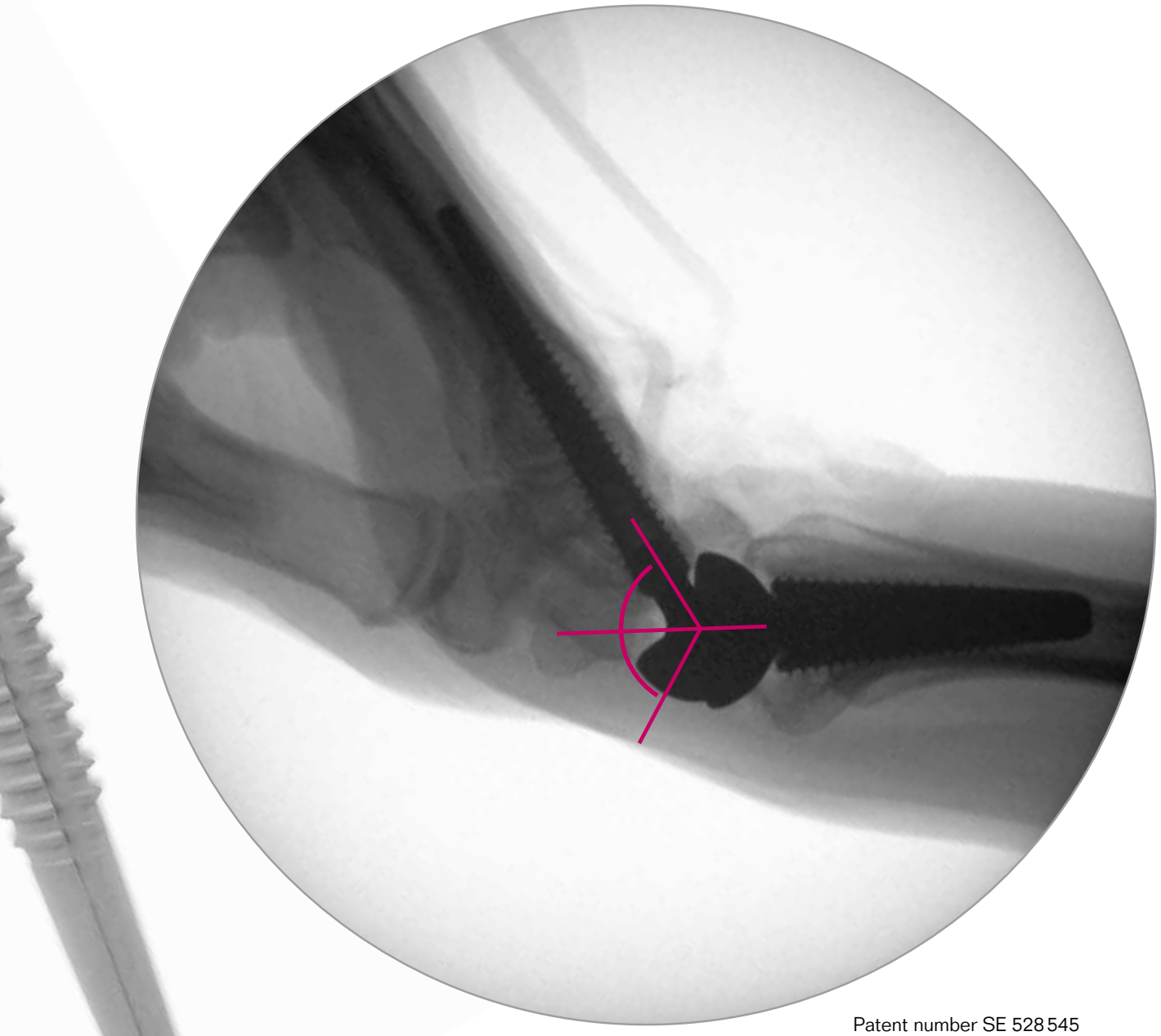
- **Limit bone resection**
- **Preserve soft tissue and ligament structures**
- **Improve short term fixation**
- **Optimize long term fixation**
- **Reduce the risk of failure associated with long term use**

The operative procedure is straight forward and easy to learn.

Indication for the MOTEC wrist joint prosthesis is pain and reduced motion of the wrist caused by rheumatoid arthritis, primary osteoarthrosis and secondary arthrosis due to Kienböck´s disease of the lunate, non-unions of fracture of the scaphoid, wrist instability, and fracture of the distal radius.

The ball and socket design have several advantages

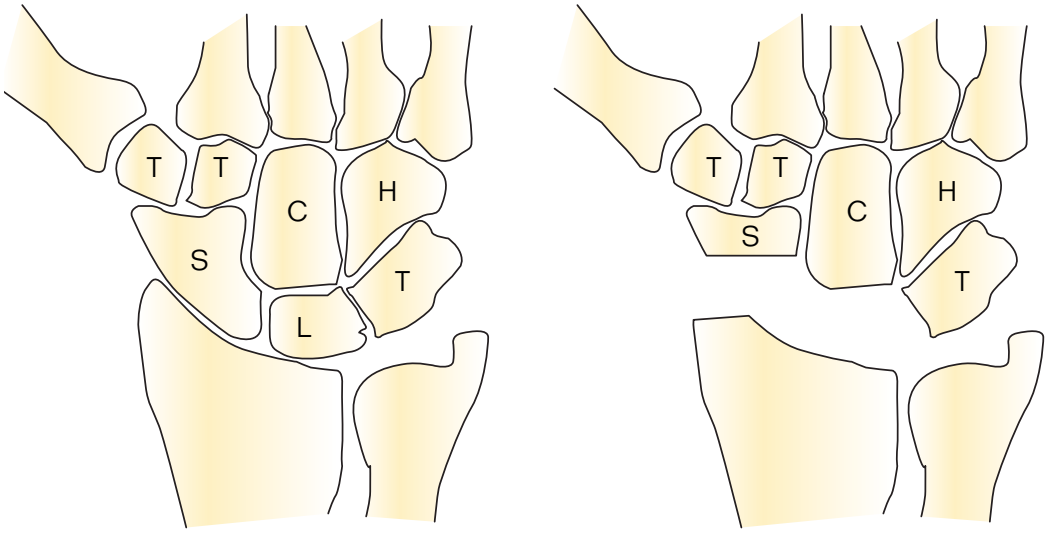
- **Increased range of motion (ROM) 136°–160°.**
- **Increased stability, especially in patients with poor soft tissue.**
- **The MOTEC wrist joint prosthesis is closely replicating the anatomical center of rotation during both flexion/extension and ulna/radial deviation** (Ref. 1)**.**
- **The ball and socket articulation diverts rotational forces from the bone implant interface that can cause loosening.**
- **Can resist forces that cause subluxation (no subluxations have been reported in more than 250 patients).**



Patent number SE 528 545
Patent number EP 1 848 378

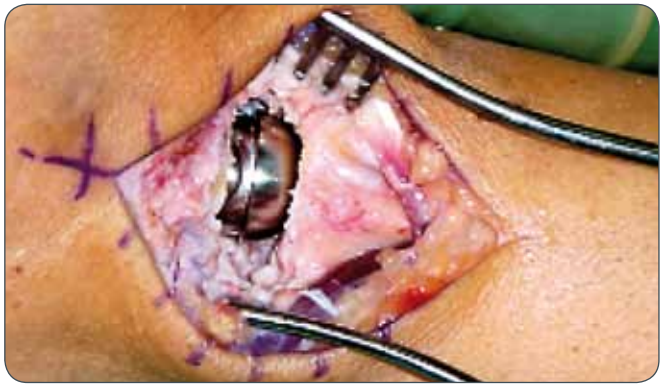
Limited bone resection

- **The ball and socket metal-to-metal articulation saves joint space compared to polyethylene-to-metal. The only bone that needs to be removed is the lunatum, half the scaphoid and the tip of the radial styloid. Wrist arthrodesis as a salvage procedure is possible to perform without difficulty due to the limited bone removal.**



Preserves soft tissue and ligament structures

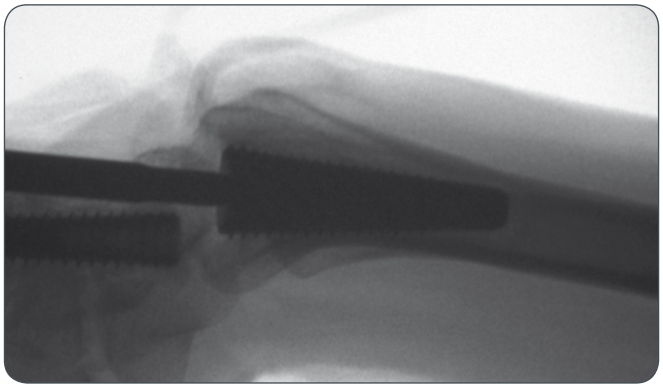
- **Most of the soft tissue and ligament structures between the radius, ulna and the carpal bones are preserved, maintaining the natural stability of the wrist. The distal radio-ulnar joint may function unaffected of the prosthesis. The peripheral rim of the distal radius with its important ligamentous and soft tissue attachments are preserved.**



Improved short term fixation

■ **Immediate primary fixation is achieved by threaded implants. The design of the threaded radius implant has been optimized for maximum bone purchase. The rounded tip reduces stress concentration.**

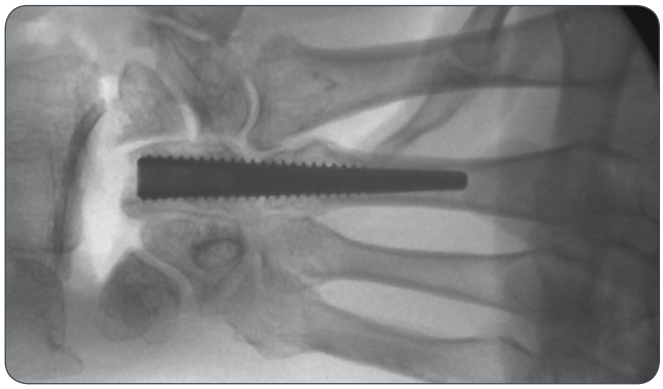
Threaded radius implant



The threads of the conical radius implant engages into the cortical bone, volarly and dorsally, preventing the implant from sinking.

■ **The cementless fixation of the components makes the operation easier to perform and eliminates potential cement related complications.**

Threaded metacarpal implant



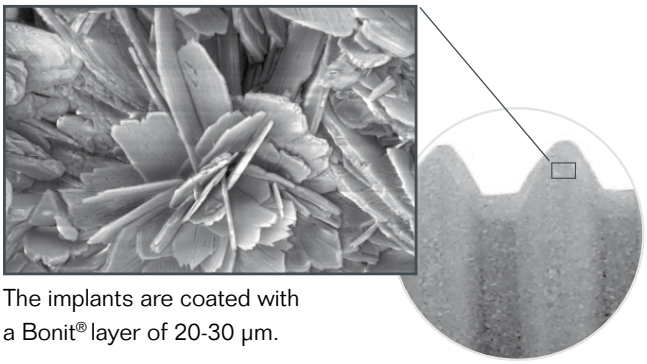
The threads of the conical metacarpal implant engage into the cancelleous and cortical bone of the capitate and the third metacarpal, ensuring a stable fixation. Fusion of the midcarpal bones is only needed between the capitate and the third metacarpal.

Optimized long term fixation and osseointegration

■ **Optimal blasting of titanium alloy implants improves long term fixation and osseointegration** (Ref. 2,3)**.**

The titanium surface is blasted with extra pure $Al_2 O_3$ using a specific technique and to a specific roughness value to maximize the bone ingrowth.

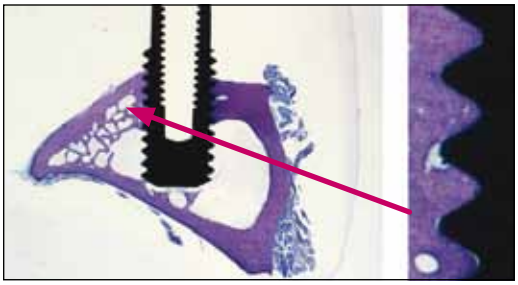
■ **The titanium alloy threaded implants are coated with Bonit®, a resorbable calcium phosphate combination with proven osteoconductive properties, improving long term fixation.**



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

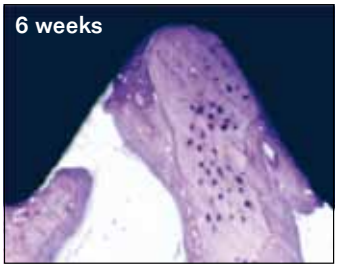
In vivo biomechanical comparison

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. 4 and 5).

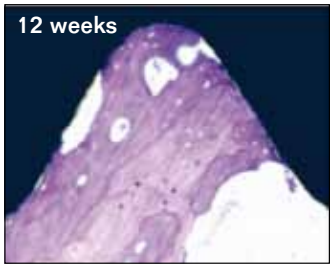


Implant in black and bone in purple.

Bonit®

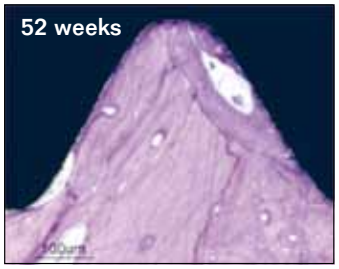


Bonit®



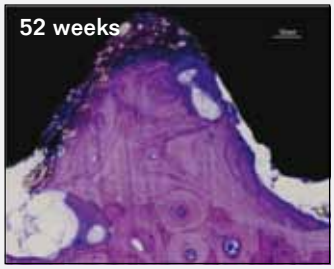
The Bonit layer is partly resorbed.

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.

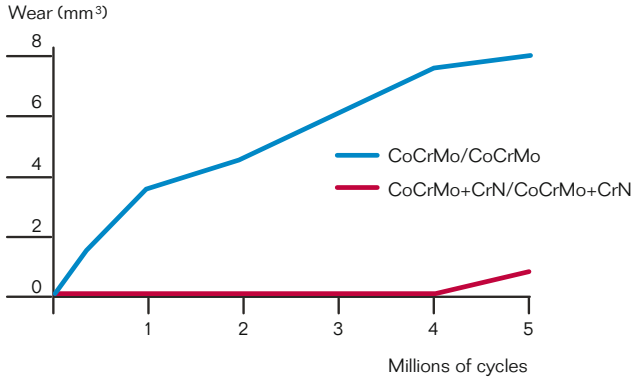
Problems with long term fixation using HA coating on implants have been shown in a thesis by Magne Røkkum (Ref. 6).

Reduced risk of failure associated with long term use

- **The modular cup and head are made of cobalt-chrome-molybdenum (CoCrMo) alloy, minimizing the risk of osteolysis associated with polyethylene bearings.**

  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 7, 8, 9 and 10)**.**

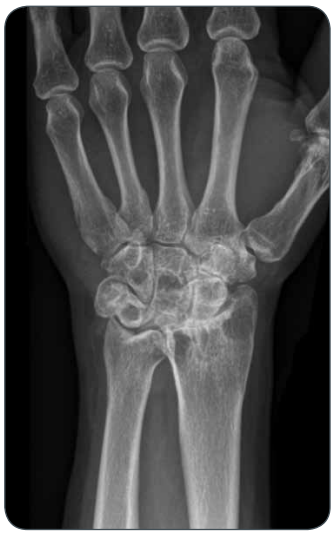
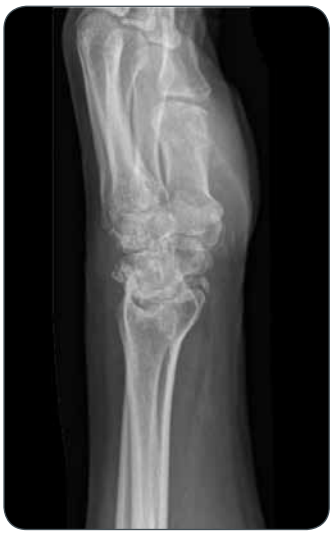
- **The modular cup and head have also been coated with chromium nitride (CrN). When using chromium nitride, the wear rate is reduced by a factor of 40 compared to a standard cobalt-chrome-molybdenum articulation** (Ref. 11)**.**



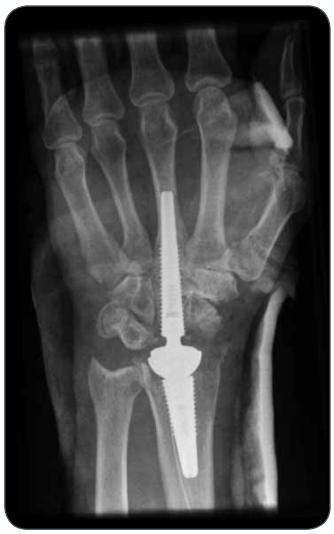
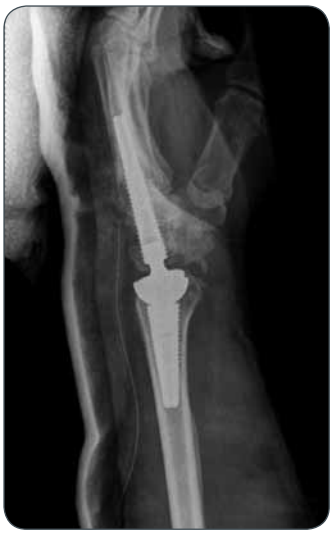
Total wear loss of standard prosthesis CoCrMo/CoCrMo bearing, and Motec Wrist CoCrMo+CrN/CoCrMo+CrN bearing.

- **No risk of severely worn or broken polyethylene bearings** (Ref.12)**.**

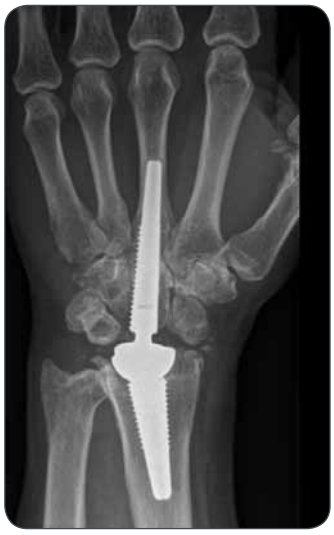
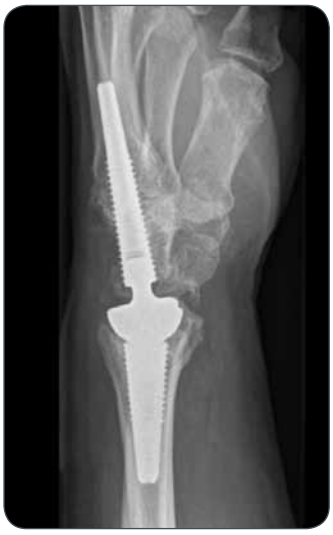
Case I

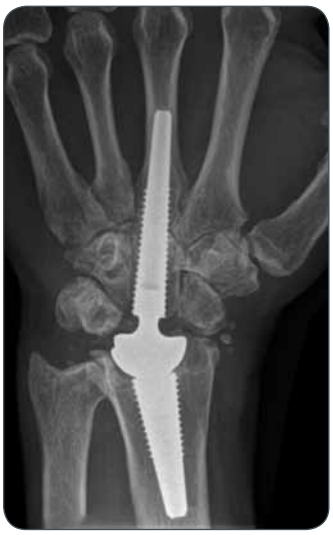
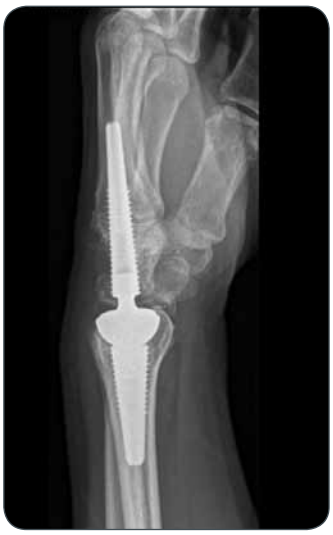
Pre-op. Male 66 years old. Previously operated with lunatum silicon prosthesis. AROM 98°. Jamar: 22 kg grip strength in the operated hand and 38 kg in the other hand.

Post-op.

2 years post-op. Jamar: 36 kg grip strength. AROM 124°.

3 years post-op. Same score as the 2 years follow-up.The patient has regained his grip strength, has no pain and is very pleased.

The preliminary results achived with the MOTEC wrist joint prosthesis are looking very promising. Up to now, more than 250 patients have been operated. The longest follow-up time is eight years.

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Surgical technique

Indication

The MOTEC is indicated as a total joint replacement of the wrist joint in cases with pain or reduced motion caused by rheumatoid arthritis, primary osteoarthrosis and secondary arthrosis due to Kienböck´s disease of the lunate, non-unions of fracture of the scaphoid, wrist instability, and fracture of the distal radius.

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 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.

Anaesthesia and antibiotics

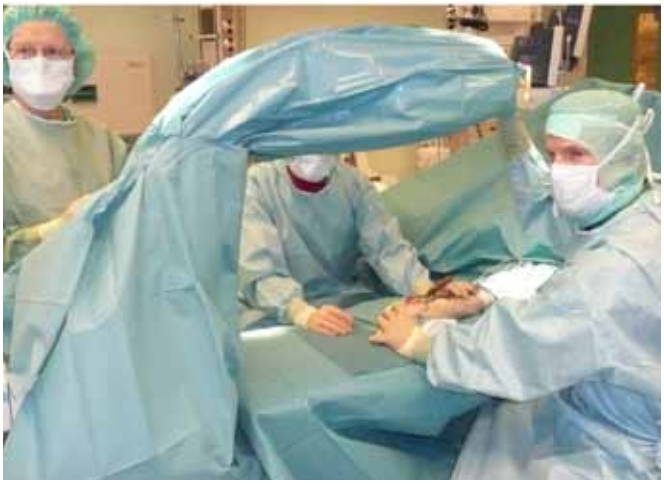
Either axillary block or general anaesthesia is recommended. Preoperative antibiotics are recommended.

Pre-operative planning

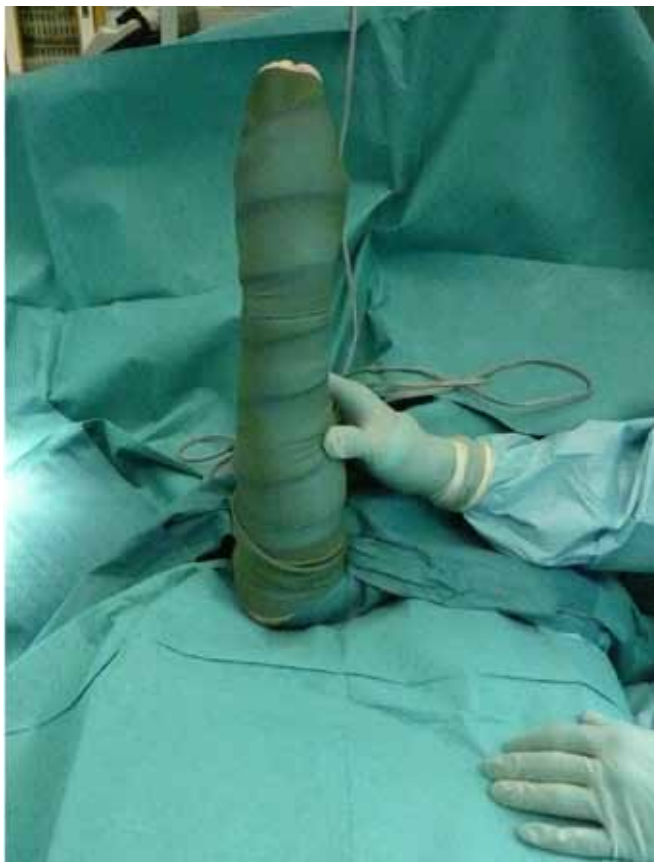
It is recommended as an important part of the preoperative planning process that the surgeon should be familiar with the anatomy of the carpal area with special attention to the neuromuscular system.

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

Patient positioning

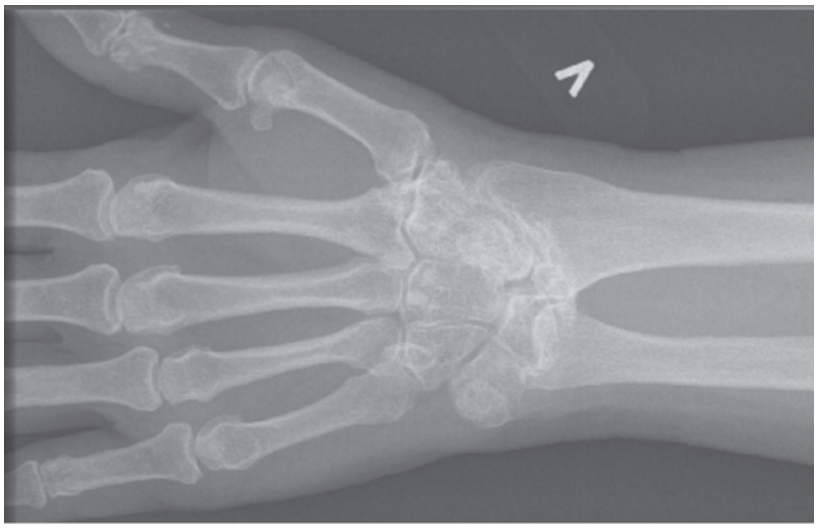


The patient is placed supine on the operating table with the arm abducted 90 degrees over an arm table. The C-arm is placed at the end of the operating table.

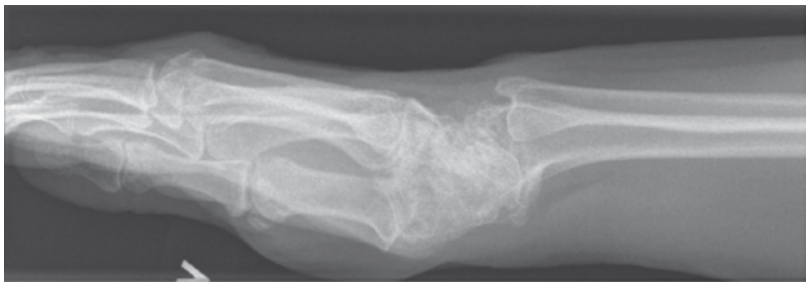


A tourniquet is applied and inflated. The patients arm is prepared and and draped in the usual sterile manner.

Pre operative x-ray

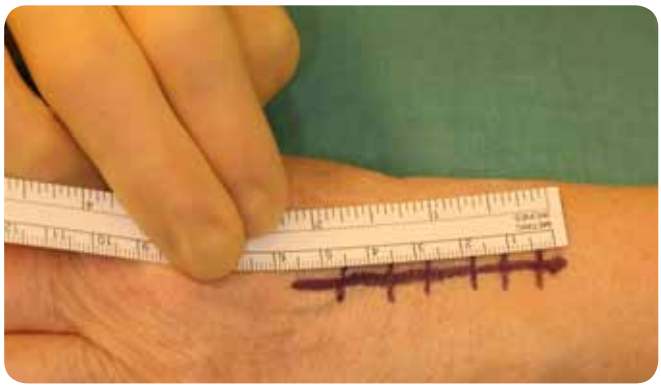


The patient is 50 years of age and suffering from secondary arthrosis due to a fracture of the scaphoid. An arthrodesis was performed between the scaphoid and trapezium.

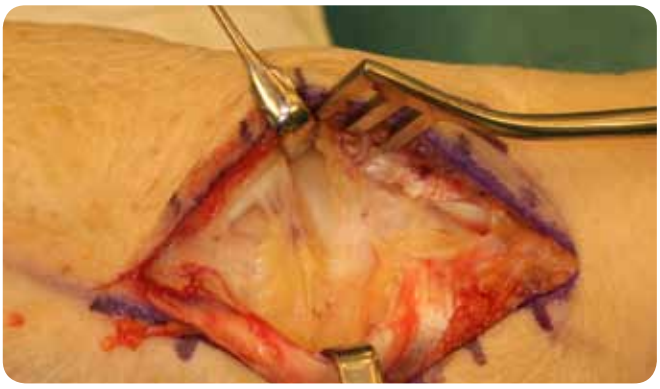


The carpus has luxated volarly and ulnarly. The patient has severe pain and can only move her wrist a few degrees. The intramedullary channel of the third metacarpal is very tight. There is a large ongrowth of bone at the volar ridge of the radius.

1. Surgical approach

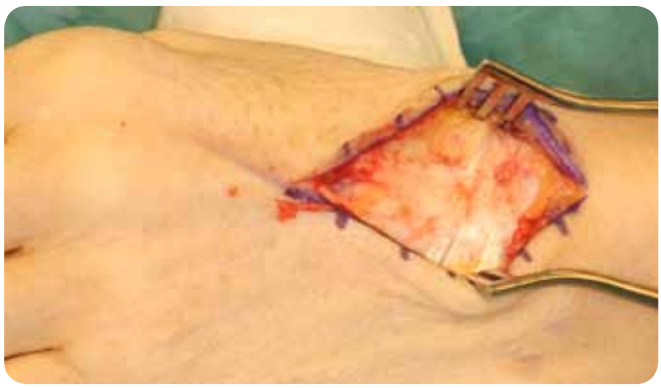


Make a 60 mm dorsal incision.

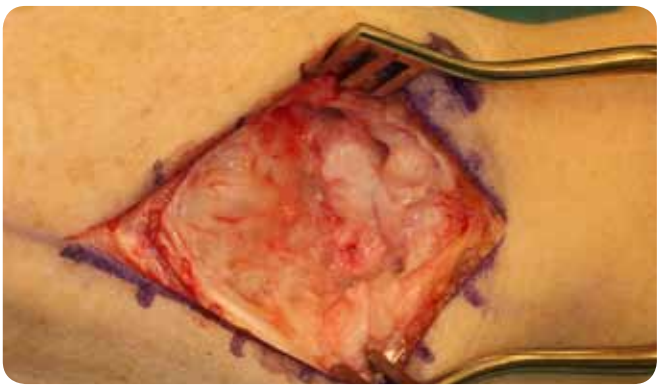


The two radial wrist extensors and the long thumb extensor are held radially and the finger extensors ulnarly.

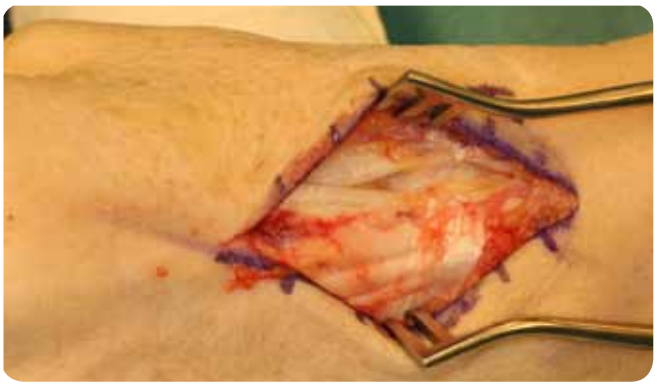
The capsule is freed dorsally and ready to be opened.



The extensor retinaculum is exposed.

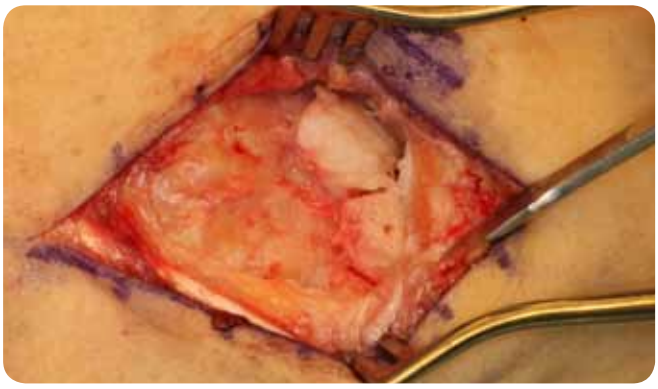


The capsule is opened.

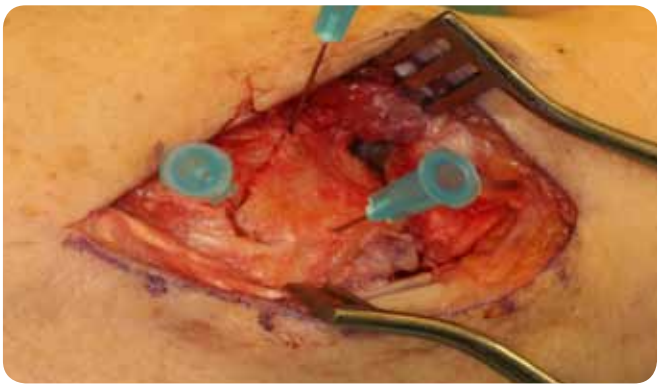


The extensor retinaculum is splitted at the listers tubercle.

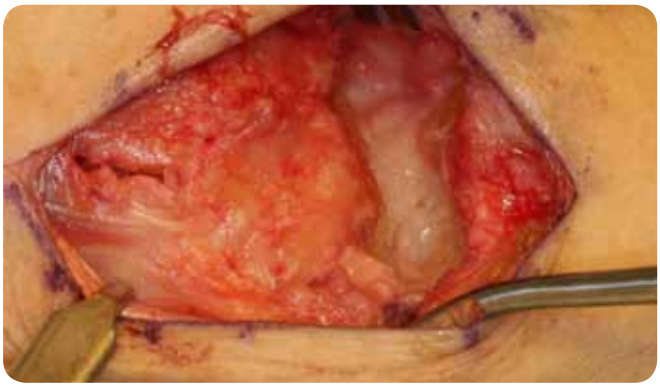
2. Bone resection



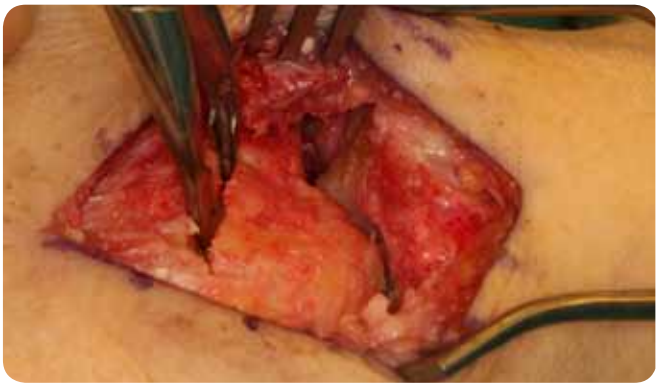
In this case a substantial bone ongrowth of the volar ridge of the radius is resected.



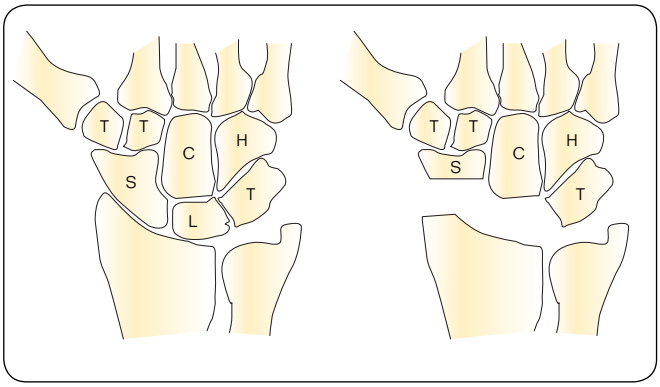
The border of the capitatum is marked with injection needles.

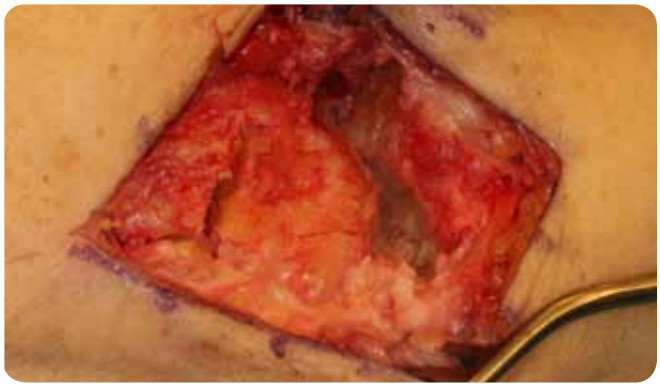


The lunatum, 2/3 of the scaphoid and the tip of radial styloid are removed.



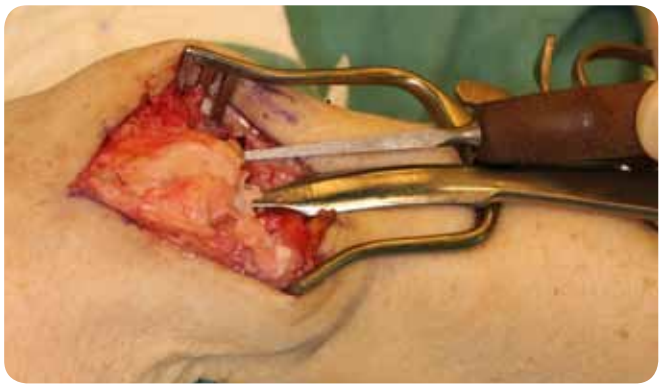
There is a 30 degree volar angle between the third metacarpal and the capitatum. The third CMC-joint is chiselled and cut open dorsally until all cartilage and subchondral sclerosis is gone.





There should be no angle between the capitatum and the third metacarpal when the above procedure is completed.

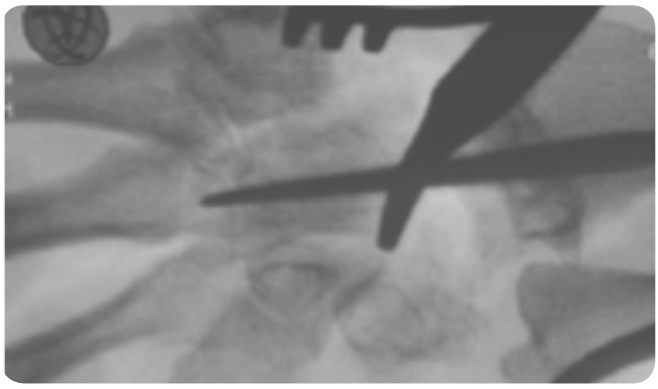
3. Preparation of the capitatum and third metacarpal



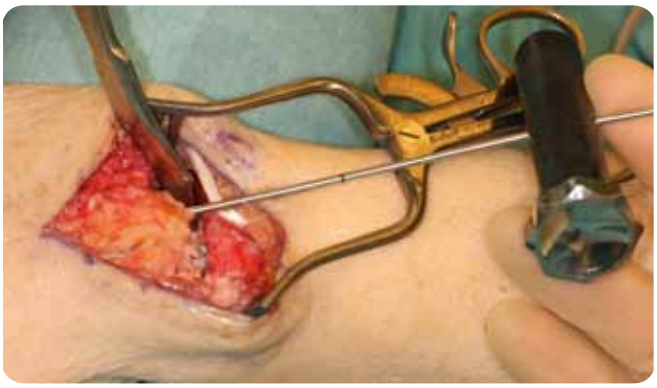
The wrist is angled volarly and a Hohmann-retractor is placed beneath the capitatum to lift it up (this will close the angle between the capitatum and the third metacarpal).

An awl is used to create a central hole through the capitatum and further into the intramedullary channel of the third metacarpal bone.

To ensure proper orientation of the awl, it is important to have a true A/P and lateral view.

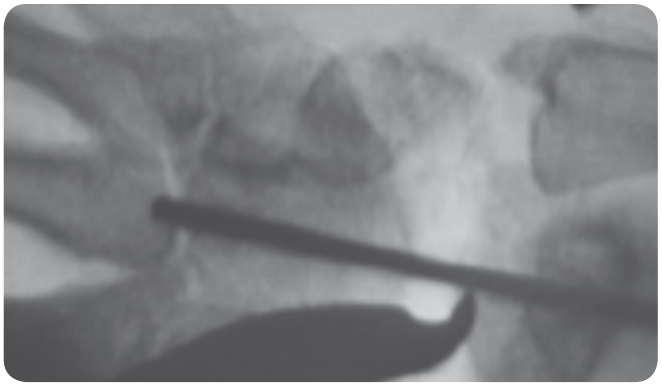


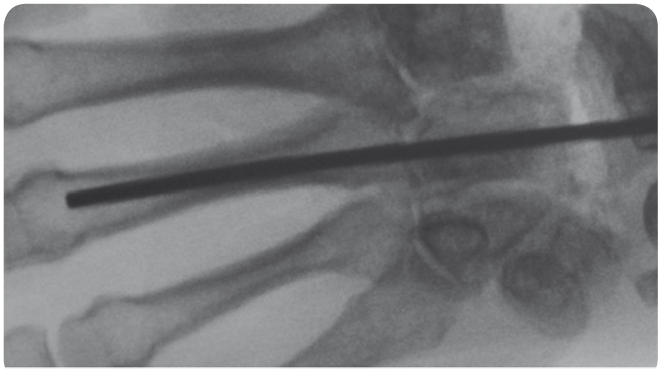
4. Guide wire insertion



The positioning of the guide wire through the capitatum and the third metacarpal is the most critical step in the whole procedure.

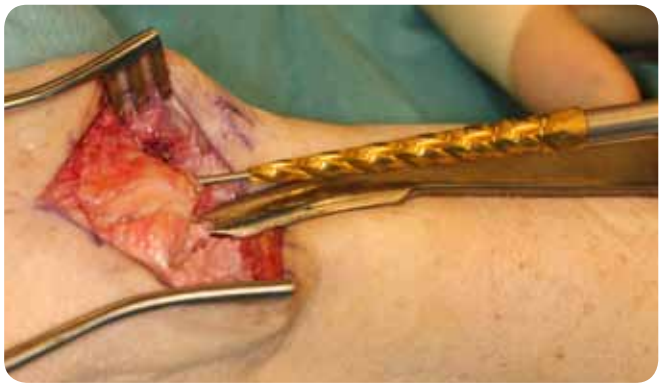
A guide wire with a blunt end is introduced by hand through the capitatum and into the intramedullary channel of the third metacarpal.



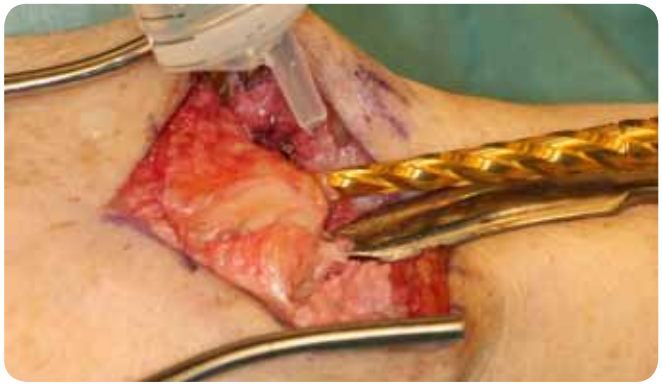


The guide wire is introduced until the end of the intramedullary channel.

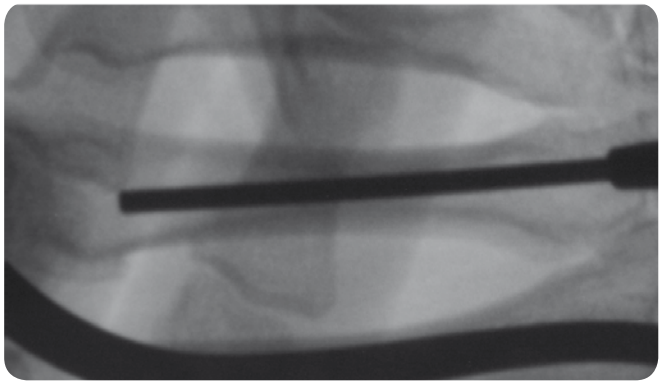
5. Drilling of the capitatum and the third metacarpal



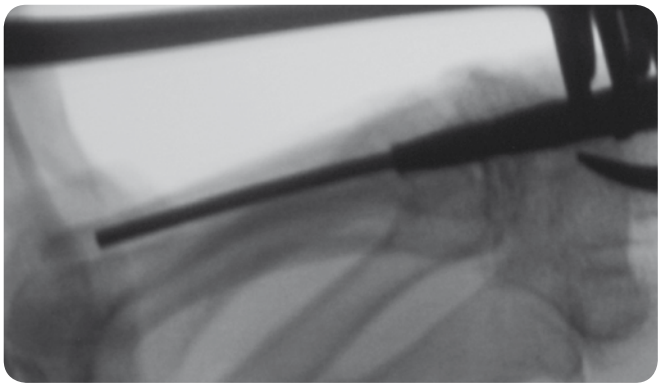
Start by drilling with the small diameter cannulated drill. The drill is introduced over the guide wire and advanced using reamer speed.



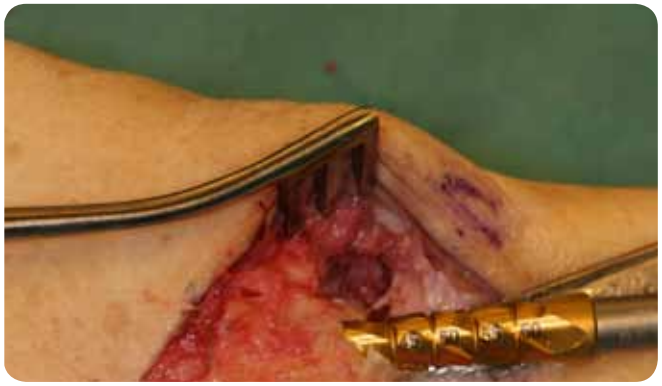
Keep the drill cold by spraying sterile water on it. It is easy to drill through the capitatum but the hard bone in the third metacarpal is difficult to open up. The drill must be cleaned several times. It is recommended to drill further than the isthmus.



To ensure proper orientation of the drill, it is important to have a true A/P ...



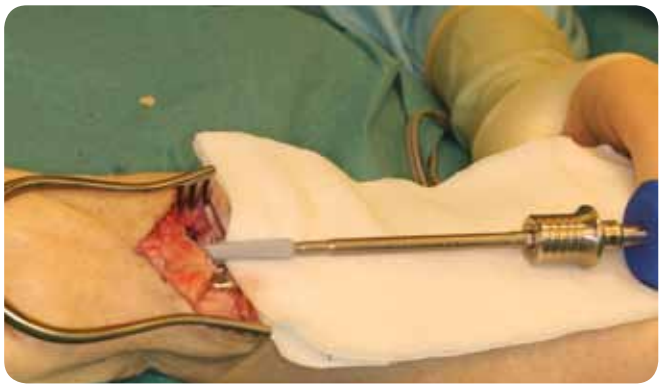
... and lateral view.



Drill depth is taken directly from the measurement from the drill cutting flutes. If no cortical resistance is felt during drilling of the third metacarpal, the drill should be exchanged to the large diameter drill.

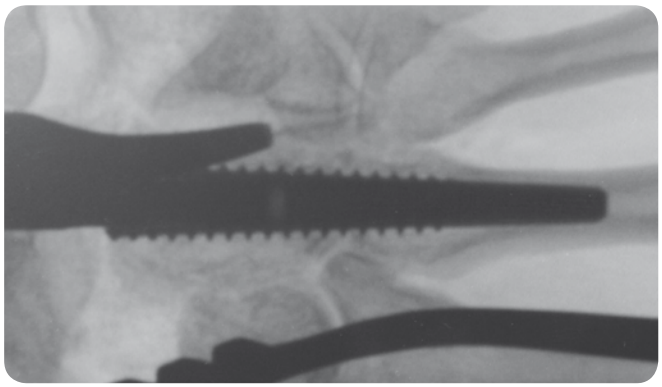
It is better to have a long and small diameter metacarpal implant, than a short and large diameter metacarpal implant.

6. Introduce the metacarpal implant

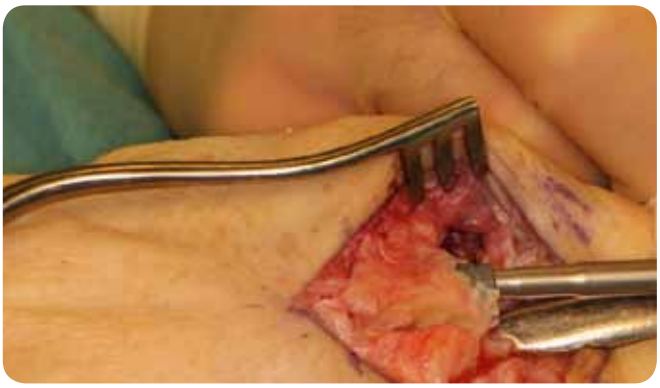


The metacarpal implant should always be implanted at this stage. This will minimise any possible damage to the bone during the preparation of the radius.

The guide wire is removed and the chosen metacarpal implant is inserted without touching the skin.

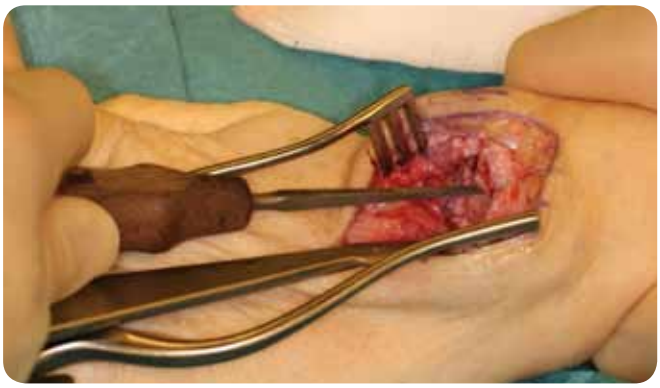


The metacarpal implant is inserted until its edge is flush with the surface of the capitatum. Insertion is carried out by hand only.



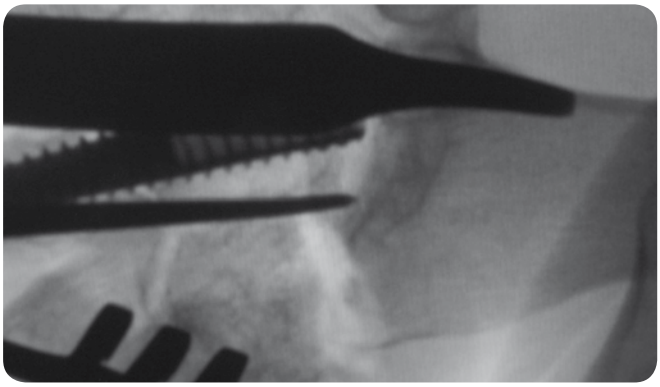
Sometimes, the metacarpal implant will not be completely covered by bone on the dorsal side of the proximal capitatum.

7. Preparation of the radius

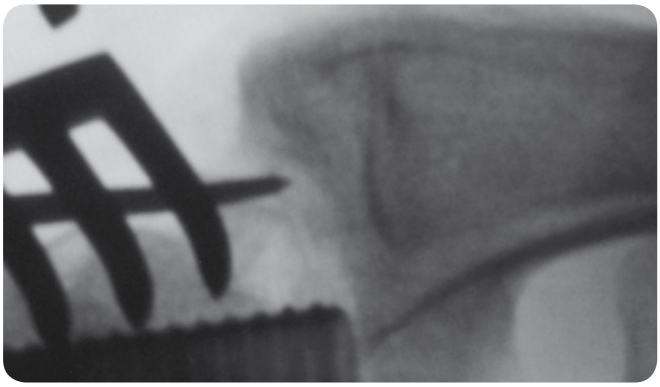


A Hohmann-retractor is placed beneath the edge of the volar ridge to lift the radius

.

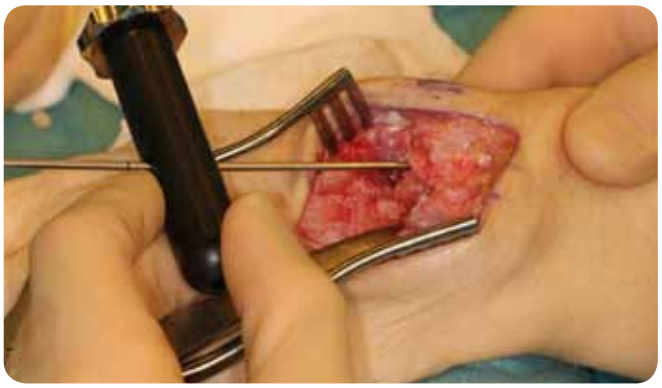


An awl is introduced under image intensification through the joint surface of the radius. It should be placed central in the A/P view ...

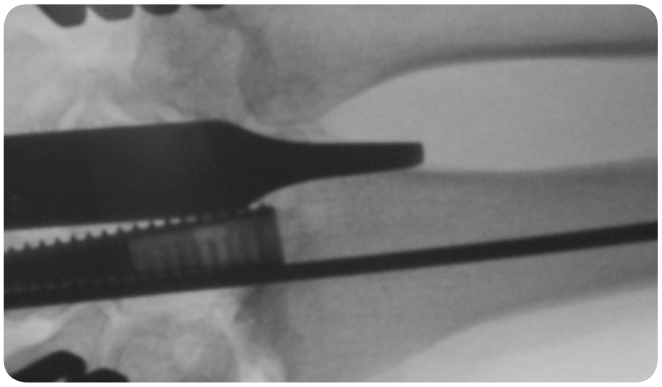


... and slightly volar in the lateral view.

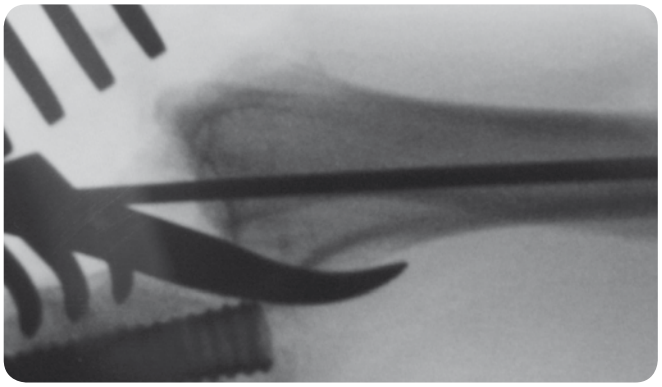
8. Guide wire insertion



The guide wire is introduced through the hole in the joint surface of the radius.

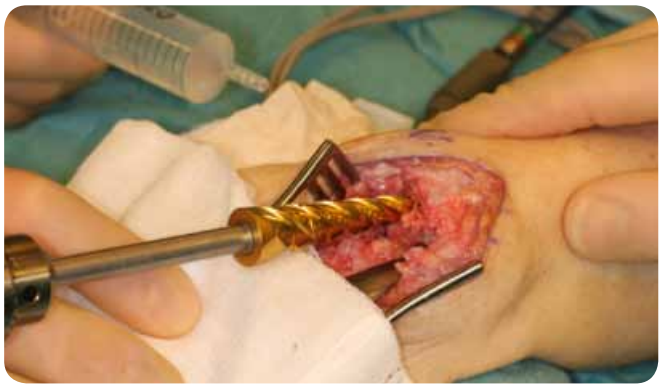


The orientation of the guide wire is checked under image intensification in both A/P view ..

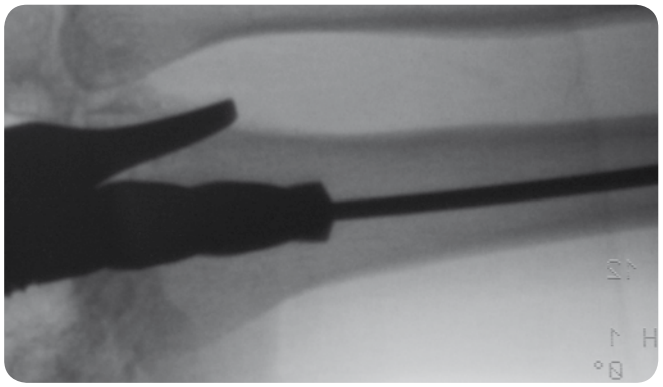


... and lateral view.

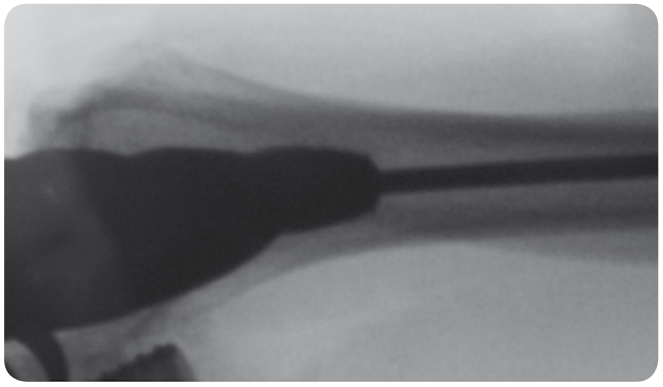
9. Drilling of the radius



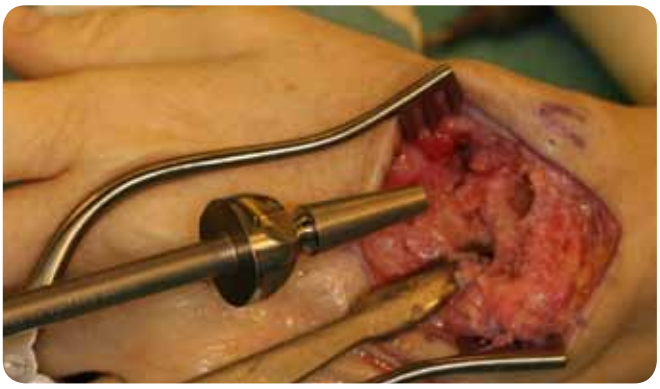
The cannulated drill for the radius is introduced over the guide wire and drilling is carried out at reamer speed.



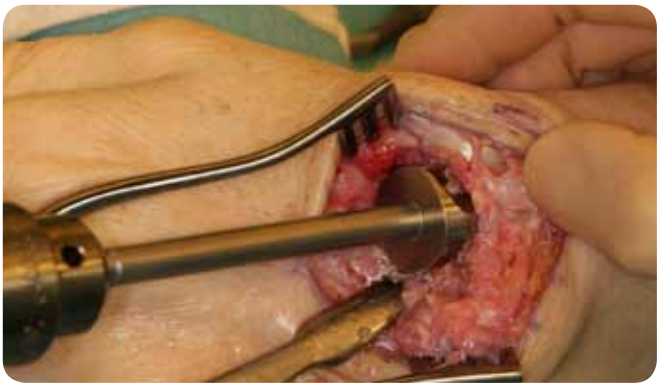
To ensure proper orientation of the drill it is important to check the position under image intensification during drilling. Continue drilling until cortical resistance is felt.



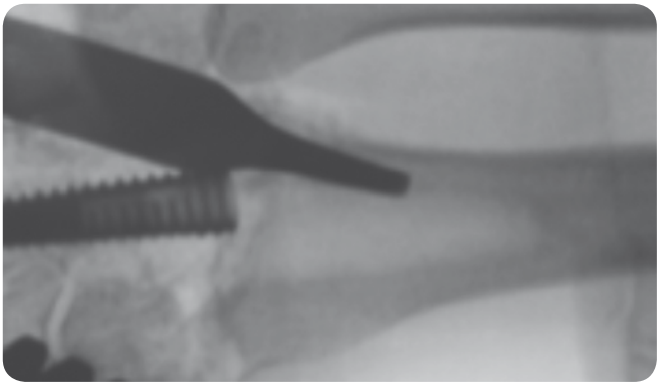
10. Reaming of the radius



A decision is made regarding which size of the cup (15 or 18) that should be used.

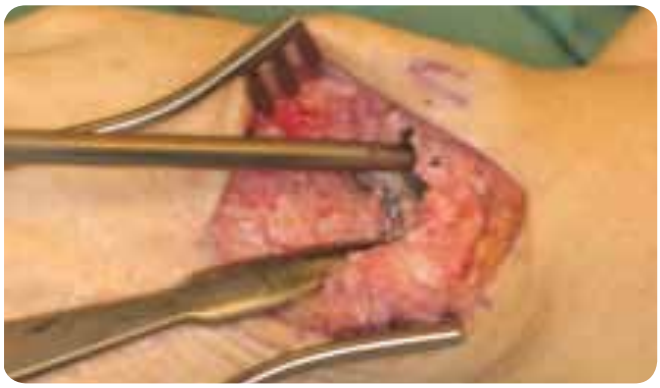


The corresponding radius spherical drill is used to ream a cavity for the cup.

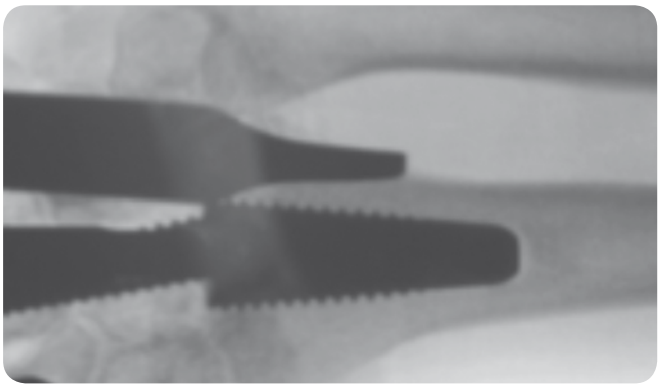


The drill is reinserted and the drill depth is taken directly of the measurement of the drill cutting flutes. It is important to measure at a inner cutting edge created by the radius spherical drill.

10. Insertion of the radius implant

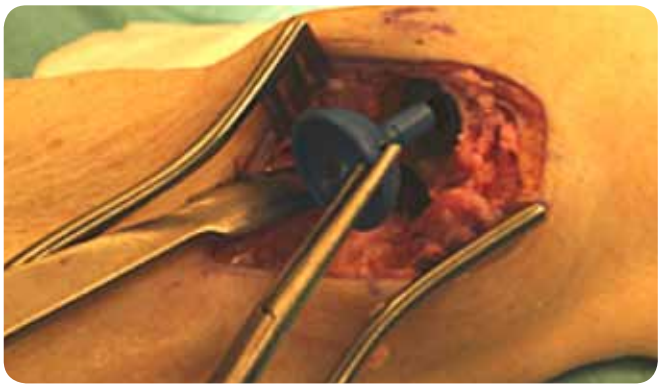


The chosen radius implant is introduced as far as it will go.

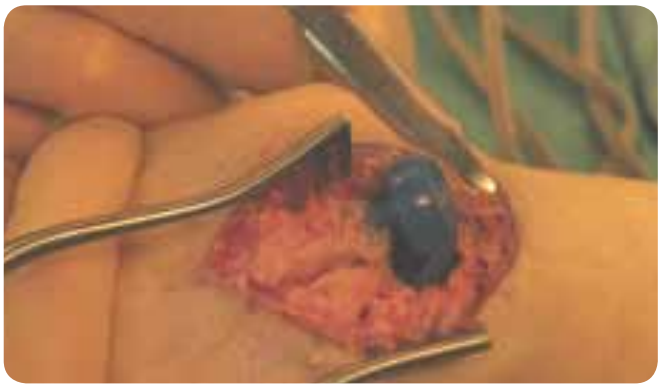


The radius implant is almost inserted all the way. The picture taken by the image intensifier shows that there is still some space between the tip of the radius implant and the cancellous bone.

11. Insertion of the trials



The radius cup trial is placed in the radius implant.

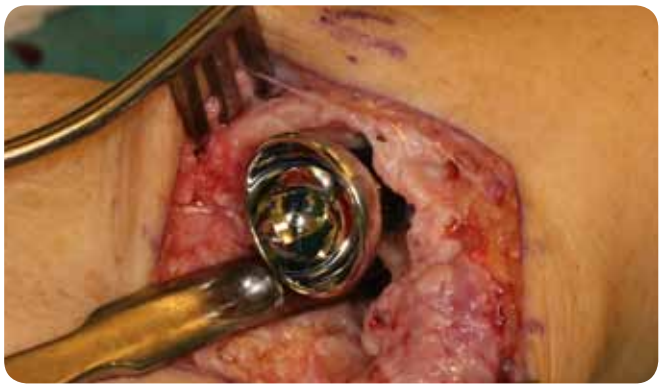


To determine the correct metacarpal head trial, you must start by inserting the shortest head trial. Increase the trial size until the right tension has been achieved. The impactor should not be used with the trials.

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

When the correct metacarpal head trial is determined the metacarpal head trial is removed.

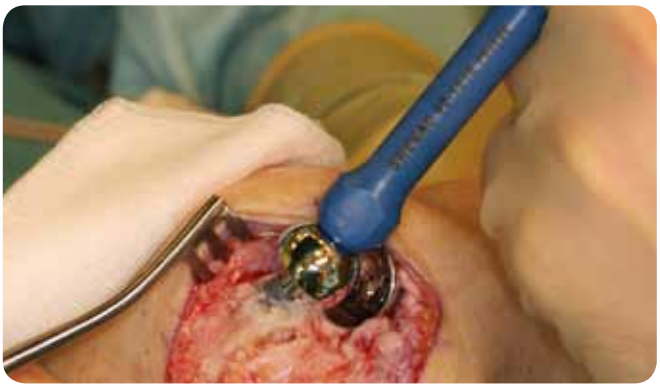
12. Insertion of the radius cup



Before introducing the chosen radius cup, make sure that the internal Morse cone of the radius threaded implant is clean. The radius cup is inserted into the radius threaded implant.

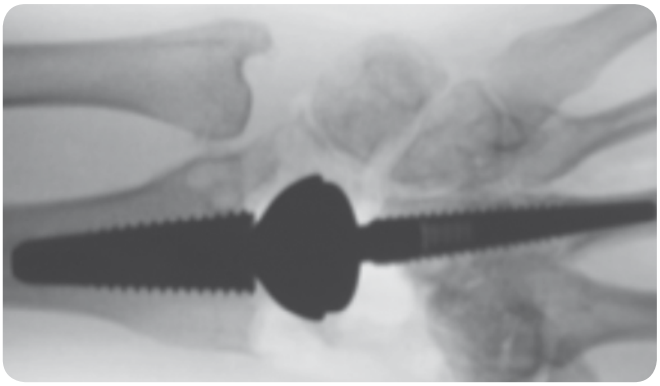
Tap the impactor gently.

13. Insertion of the metacarpal head



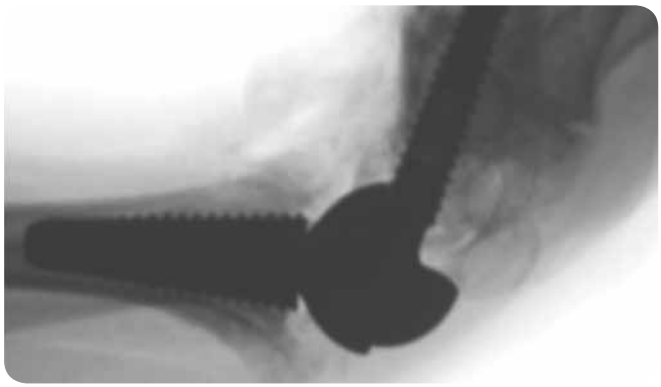
Before introducing the chosen metacarpal head, make sure that the internal Morse cone of the metacarpal threaded implant is clean. The metacarpal head is inserted into the metacarpal threaded implant. When the head is in position tap the impactor gently.

The joint is reduced and stability and range of motion are evaluated under image intensification.

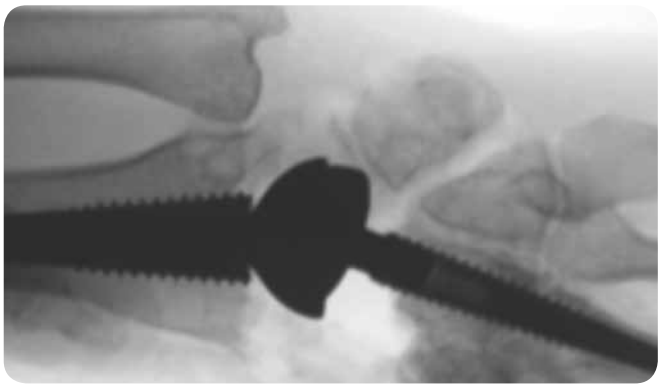


The position of the implant is good but there is still bone that needs to be removed between the radius and the triqeutrum.

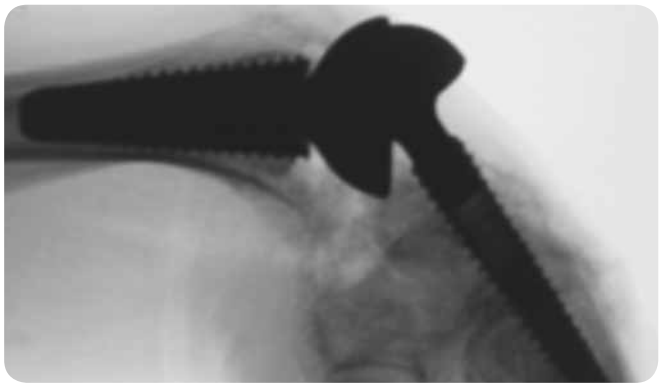
14. Final reduction



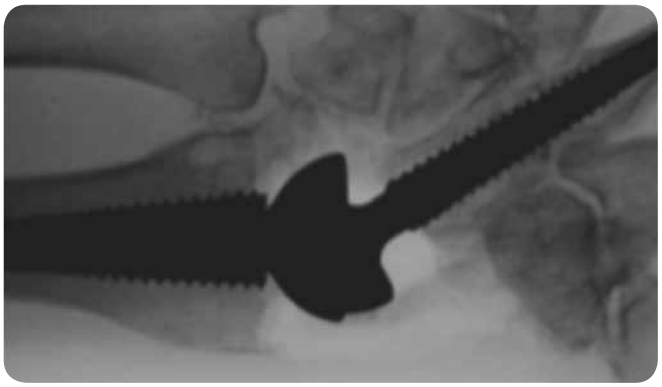
Extension.



Radial deviation.

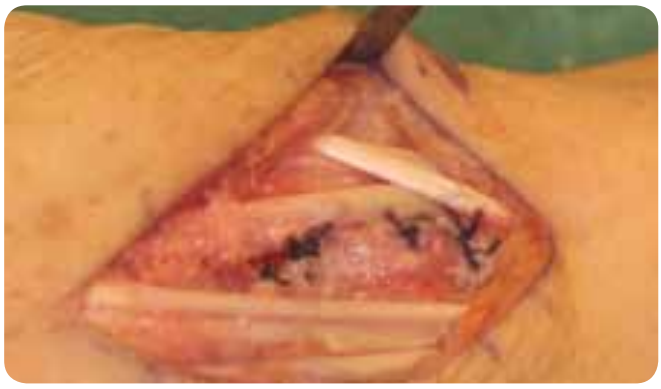


Flexion.

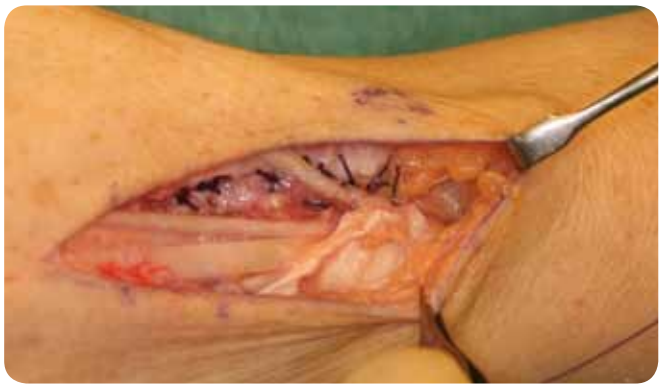


Ulnar deviation.

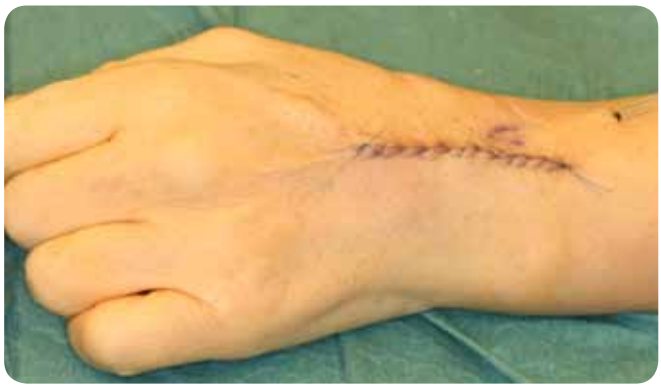
15. Closure



The dorsal capsule is closed as good as possible.



The extensor retinaculum is sutured back and a subcutanous drainage is introduced before the incision is closed.



Post operative care

A post operative plaster is applied to immobilize the wrist. The lower arm should be splinted in this fashion for 3 weeks. Active motion without load is then started with a removable protective resting splint used for 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
40-1015	Radius Cup Ø15	CoCrMo	Ø15 mm
40-1018	Radius Cup Ø18	CoCrMo	Ø18 mm
40-1332	Radius Threaded Implant	Ti6Al4V	Length 32 mm
40-1338	Radius Threaded Implant	Ti6Al4V	Length 38 mm
40-1344	Radius Threaded Implant	Ti6Al4V	Length 44 mm
40-1118	Metacarpal Head – Short	CoCrMo	Ø18, Short Neck
40-1718	Metacarpal Head – Medium	CoCrMo	Ø18, Medium Neck
40-1218	Metacarpal Head – Long	CoCrMo	Ø18, Long Neck
40-1115	Metacarpal Head – Short	CoCrMo	Ø15, Short Neck
40-1715	Metacarpal Head – Medium	CoCrMo	Ø15, Medium Neck
40-1215	Metacarpal Head – Long	CoCrMo	Ø15, Long Neck
40-1445	Metacarpal III Threaded Implant – Large	Ti6Al4V	Length 45 mm
40-1450	Metacarpal III Threaded Implant – Large	Ti6Al4V	Length 50 mm
40-1455	Metacarpal III Threaded Implant – Large	Ti6Al4V	Length 55 mm
40-1460	Metacarpal III Threaded Implant – Large	Ti6Al4V	Length 60 mm
40-1475	Metacarpal III Threaded Implant – Small	Ti6Al4V	Length 45 mm
40-1480	Metacarpal III Threaded Implant – Small	Ti6Al4V	Length 50 mm
40-1485	Metacarpal III Threaded Implant – Small	Ti6Al4V	Length 55 mm
40-1490	Metacarpal III Threaded Implant – Small	Ti6Al4V	Length 60 mm
40-1495	Metacarpal III Threaded Implant – Small	Ti6Al4V	Length 65 mm

Radius
threaded implant
(3 sizes)

Radius Cup
(2 sizes)

Metacarpal head
implant (6 sizes)

Metacarpal threaded implant (9 sizes)

CAT. NR.	INSTRUMENTS	MATERIAL	DIMENSION
40-1562	Measuring Sleeve	Stainless Steel	Ø2 mm
40-1561	Guide Wire	Stainless Steel	Ø2 mm Sharp Tip
40-1563	Guide Wire	Stainless Steel	Ø2 mm Round Tip
40-1516	Impactor Head & Cup	Plastic	Ø15 – Ø18
40-1531	Radius Cup Trial	Plastic	Ø18 mm
40-1532	Radius Cup Trial	Plastic	Ø15 mm
40-1536	Metacarpal Head Trial	Plastic	Ø18, Long Neck
40-1537	Metacarpal Head Trial	Plastic	Ø18, Short Neck
40-1538	Metacarpal Head Trial	Plastic	Ø15, Long Neck
40-1539	Metacarpal Head Trial	Plastic	Ø15, Short Neck
40-1533	Metacarpal Head Trial	Plastic	Ø18, Medium Neck
40-1534	Metacarpal Head Trial	Plastic	Ø15, Medium Neck
40-1513	Hex Driver Tip (Quick-Lock)	Stainless Steel	3.5 mm HEX
40-1551	Cannulated Metacarpal III Drill – Large	Stainless Steel	45 – 60 mm
40-1552	Cannulated Metacarpal III Drill – Small	Stainless Steel	45 – 60 mm
40-1546	Cannulated Radius Drill	Stainless Steel	32 – 44 mm
40-1566	Radius Spherical Drill	Stainless Steel	Ø18
40-1567	Radius Spherical Drill	Stainless Steel	Ø15
23-4997	Awl	Stainless Steel	
40-1518	Holder for Guide Wire	Stainless Steel	
45-2585	Driver Handle (Quick Lock)	Elastosil	
40-1501	Tray & Lid	Stainless Steel	

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

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Motec Wrist Joint Prosthesis

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