Motec®
Wrist Joint Arthrodesis
Metacarpal Nail and Radius Connector
Motec®

Wrist Joint Arthrodesis

The Motec Wrist Joint Arthrodesis has been developed as a part of the Motec Wrist Prosthesis family to enable easy conversion of the prosthesis to a total wrist fusion, if the need should arise.

The Motec Wrist Arthrodesis implant is intended to be used as a salvage procedure for the Motec Wrist System, using the pre-existing prosthesis implants. Removal of bone during primary procedures, bony erosion, and bone loss during implant extraction will otherwise decrease the bone stock that is available for arthrodesis.

The intramedullary Motec Wrist Arthrodesis System has been developed to overcome the problem of soft tissue irritation in wrist fusions and thereby minimize the need for unnecessary implant removal.

The Motec Wrist Arthrodesis is a patented product with worldwide protection.

The different techniques of Motec Wrist Joint Arthrodesis

The Motec Wrist Joint Arthrodesis is suitable in several cases. When the Metacarpal Threaded Implant is loose, the first option is always to insert a new, longer Metacarpal Threaded Implant, if prosthesis still is the optimal choice for the patient.

Depending on the patient and the implant situation, three different options of Motec Wrist Joint Arthrodesis are available. The physician’s education, training and professional judgement must be relied upon to choose the most appropriate device and treatment.

Metacarpal Taper & Radius Connector

Requirements: Fixed Radius Threaded Implant and fixed Metacarpal Threaded Implant.

- Fixation of the Radius Threaded Implant and Metacarpal Threaded Implant but failure of the Motec Wrist Prosthesis for other problems such as continuing pain or abnormal soft tissue balance.

Straight Double Taper

Requirements: Fixed Radius Threaded Implant and fixed Metacarpal Threaded Implant.

- Fixation of the Radius Threaded Implant and Metacarpal Threaded Implant but failure of the Motec Wrist Prosthesis for other problems such as continuing pain or abnormal soft tissue balance.

Metacarpal Nail & Radius Connector

Requirements: Fixed Radius Threaded Implant.

- If the Metacarpal Threaded Implant is loose or otherwise unsuitable.
This surgical technique only covers the conversion of a Motec Wrist Prosthesis to a Motec Wrist Arthrodesis using a Metacarpal Nail and Radius Connector.

Features and benefits

- Fully compatible salvage procedure.
- Minimizes the need for unnecessary implant removal procedures.
- Minimally invasive, only a 4-6 cm incision.
- No tension on soft tissue during surgery.
- Adjustable rotation angle
- The angle of the arthrodesis can be set at 0°, 15° or 30° in extension (or 0°, 15° or 30° in flexion).
- The angle of arthrodesis can be decided at any stage in the operation procedure.
- Rigid fixation.
- Medium to large space in the joint.
- The Radius Connector is available in two sizes; Medium and Long. The Metacarpal Nail is available in two lengths with three different top-diameters each.
- Manufactured from blasted Ti6Al4V to optimize osseointegration.
Product description

The Motec Wrist Arthrodesis system, Metacarpal Nail and Radius Connector solution, consists of a fixed bone screw from the Motec Wrist Prosthesis and an adjustable connection of tapers and lock screws.

All implants are made from titanium alloy (Ti6Al4V) and available sterile for immediate use. All components are designed and manufactured for maximal osseointegration with surrounding bones in the wrist joint. The implants are MRI compatible.

**The Metacarpal Nail** is inserted into the Metacarpal III bone and fixed in the cavity from the removed Metacarpal Threaded Implant. The Metacarpal Nail is attached to the bone from the dorsal side, by cortical screws. The distal hole of the Metacarpal Nail is the centre of rotation of the system, and one of the proximal holes sets the angle of the wrist fusion. The Metacarpal Nail is available in six sizes; two different lengths with three different top-diameters each.

**The distal Lock Screw** is the rotation axis when the angle of the wrist shall be set. It is important to not tighten the distal screw before the proximal one.

**The proximal Lock Screw** is inserted when the angle of the wrist is definite. When this screw is tightened, do the final tightening of the distal screw.

**The Radius Connector** is available in two sizes; Medium and Long (Medium is presented in this picture). The orientation of the Radius Connector is very important, the countersunk holes must be visible from the radial side (right picture). It is possible to rotate the Radius Connector slightly clockwise or slightly counterclockwise before the long Lock Screw is tighten in the Radius Threaded Implant.

**Cortical screws Ø2,7 mm** for bicortical fixation of the Metacarpal Nail, tightened from the dorsal side of the hand. The recommended Cortical screws shall fulfill the requirements in ISO 5835 HA 2.7.

**Material:** Ti6Al4V

**Diameter of screw head:** Ø5 mm

**Diameter of thread:** Ø2.7 mm

**Screw driver, hex tip:** 2.5 mm

**Note!** Only use Cortical screws in Ti6Al4V together with the Metacarpal Nail, not stainless steel.

**The Radius Threaded Implant** from the Motec Wrist prosthesis has to be fully osseointegrated in the radius bone. This is a requirement for all three variants of Motec Wrist Arthrodesis.
Angular flexibility

The angle of the Metacarpal Nail in relation to the Radius Connector is stepwise set by the proximal Lock Screw. It is important to not tighten the distal Lock Screw before the angle is decided.

Rotational flexibility

To achieve a slight ulnar deviation, it is possible to rotate the Radius Connector slightly clockwise or slightly counterclockwise before the Lock Screw is tightened in the Radius Threaded Implant.
Selection of size

<table>
<thead>
<tr>
<th>Size of Metacarpal Threaded Implant</th>
<th>Corresponding size of Metacarpal Nail</th>
<th>Cat.no &amp; Product name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td></td>
<td>41-0604S Metacarpal Nail Top Ø 4,7 mm Short</td>
</tr>
<tr>
<td></td>
<td></td>
<td>41-0614S Metacarpal Nail Top Ø 4,7 mm Long</td>
</tr>
<tr>
<td>Large</td>
<td></td>
<td>41-0606S Metacarpal Nail Top Ø 6,1 mm Short</td>
</tr>
<tr>
<td></td>
<td></td>
<td>41-0616S Metacarpal Nail Top Ø 6,1 mm Long</td>
</tr>
</tbody>
</table>

- Use Trials to make the best suitable choice of model
Case

Pre-op; Motec Wrist Prosthesis. Female, 75 years old (age at revision). Diagnosis: RA/Sequelae distal radius fracture.

Post op; 0,5 years. Motec Wrist Arthrodesis, Straight Double Taper. The pain at rest has decreased from 4 to no pain at all and pain during activity; from 5 to no pain at all (scale 0-10).

Pre-op; Motec Wrist Prosthesis. Male, 32 years old (age at revision). Diagnosis: SNAC.

Post op; 4,3 years. Motec Wrist Arthrodesis, Straight Double Taper. The pain during activity has decreased from 8 to 5 (scale 0-10).

Conversion of a failed total wrist arthroplasty to arthrodesis can be difficult. A custom made titanium alloy peg was constructed to enable arthrodesis with the original arthroplasty components in situ. Two out of three patients were especially challenging cases with little bone available. Bony union was achieved in 2 to 3 months. The peg simplified a difficult revision situation and gave good, predictable results at follow-up.

Reigstad O, Røkkum M.

Conversion of Total Wrist Arthroplasty to Arthrodesis with a Custom-Made Peg
References

Articles


Pre-operative planning

Make sure that the instrumentations for both Motec Wrist Prosthesis system and for Motec Wrist Arthrodesis system are available in the operation theatre.

To use Motec Wrist Arthrodesis system safely the surgeon is required to have extensive knowledge about the implant, the methods of application, instrumentation and the recommended surgical technique for the implant.

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.

For detailed information about the position of the patient and incision see the Motec Wrist Prosthesis surgical technique.

Indication

- Conversion from a Motec Wrist Prosthesis

Contraindications

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:

- Any active or suspected latent infection, sepsis or marked local inflammation in or around the surgical area.
- Severe osteoporosis, insufficient quantity or quality of bone/soft tissue.
- Material sensitivity, documented or suspected.
- Physical interference with other implants during implantation or use.
- Compromised vascularity, inadequate skin or neurovascular status.
- Compromised bone stock that cannot provide adequate support and/or fixation of the device due to disease, infection or prior implantation.
- Patients who are unwilling or incapable of following post-operative care instructions.
- Other physical, medical or surgical conditions that would preclude the potential benefit of surgery.
- Previous open fracture or infection in the joint
Surgical Technique

1. Motec Wrist Prosthesis

For detailed information about the position of the patient, incision and the Motec Wrist Prosthesis, see the Motec Wrist Prosthesis system brochure and the surgical technique.

2. Remove the Metacarpal Threaded Implant

Gently pull the hand downwards until the Metacarpal Head luxates from the Radius Cup.

Keep the wrist in maximum flexion and remove the Metacarpal Threaded Implant.
3. Remove the Radius Cup

Use the Cup Remover to release the Radius Cup from the Radius Threaded Implant. The Cup Remover is compatible with both metal- and PEEK Cup. Place the tips of the Cup Remover between the Radius Threaded Implant and the Radius Cup. Keep the Cup Remover perpendicular to the Radius Threaded Implant and tap gently with the Hammer. The Radius Cup will release from the conical press-fit inside the Radius Threaded Implant. Remove the Radius Cup.

Remove proximal and distal cartilage, and all cartilage between the small bones in the radius joint. These preparations will provide good conditions for bone ingrowth and facilitates the fusion of the wrist.

4. Trials

The Trials will be used to determine the correct size of implants for the joint. Start by inserting the shortest and narrowest Metacarpal Nail Trial in the cavity from the Metacarpal Threaded Implant. Increase the size until the right stability is achieved. The Metacarpal Nail is available in six sizes; two different lengths with three different top-diameters each.

Note: Make sure that the bone canal in the metacarpal bone is clear before inserting the Trials.

The Metacarpal Nail Trials shall be used together with the Radius Connector Trials to get the right tension in the joint. The Radius Connector is available in size Medium and Long. Always start by inserting the shortest Trial. The angle of the metacarpal side can also be tried out with the Trials.

Note: Do not use the impactor when inserting the Trials.
5. Insert the Radius Connector

Remove the Trials and start by inserting the corresponding Radius Connector implant. Before introducing the Radius Connector, make sure that the internal Morse taper of the Radius Threaded Implant is clean.

**Note:** Place the countersunk holes on the radial side.

It is possible to adjust the Radius Connector by rotation before it is attached to the Radius Threaded Implant. When the orientation is definite, tap the connector gently with the Impactor to ensure firm seating.

6. Introduce the Lock Screw

Assemble the Hex Driver Tip and the Tri-Lobe Handle. Use the screwdriver to lock the Radius Connector into the Radius Threaded Implant using the Lock Screw.

Occasionally a Metacarpal Threaded Implant, size Small, might be used for fixation in the radius bone. Those implants are missing the internal thread for tightening the Lock Screw. In such special cases the fixation between the Threaded Implant and the Radius Connector achieved by the Morse tapers will be enough.
7. Insert the Metacarpal Nail

Choose a Metacarpal Nail corresponding to the Trials. Connect the Metacarpal Nail to the Drill Guide for Nail. Use the assembled Screwdriver to tighten the Lock Screw for Drill Guide.

Insert the Metacarpal Nail into the metacarpal bone. Tap the Metacarpal Nail gently with the Impactor to ensure firm seating.

8. Introduce the distal Screw

Align the distal holes of the Radius Connector and the Metacarpal Nail. Use the assembled screwdriver to introduce a short Screw into the distal hole, make sure the threads are engaged but do not tighten the screw.

Note: Countersunk holes on the radial side.

The distal screw has to be un-tightened until the angle of the Metacarpal Nail, in relation of the Radius Connector, is set.
9. Prepare for Cortical Screws

When the Radius Connector and the Metacarpal Nail is connected to each other, the Metacarpal Nail will be fixed inside the Metacarpal bone. Introduce the Measurement Sleeve through the Drill Guide until it reaches the Metacarpal bone. Use the Drill Ø2 mm to prepare for the Cortical screws.

**Note:** The Metacarpal Nail Long with a 3.3 mm top diameter has only 6 holes for Cortical screws, unlike the other long Nails which have 7 screw holes.

Use the assembled Countersinker to make sure the screw heads of the Cortical screws will be aligned with the dorsal side of the Metacarpal bone.

10. Introduce the Cortical Screws

Introduce the first Cortical screw. Start in the centre hole which is marked with slots. The slots indicate the compression hole in the Metacarpal Nail. Before the second Cortical screw is inserted, it is possible to compress the joint to decrease the space.

The distal screw has to remain un-tightened until the angle of the Metacarpal Nail, in relation to the Radius Connector, is set. The recommended number of screws for fixation of the Metacarpal Nail in the bone cavity is: 1 Cortical screw in the Capitate and 2 Cortical screws in the Metacarpal III bone (one of them in the compression hole). To avoid dorsal irritation, use the image intensifier to make sure the Cortical screws are properly countersunk.
11. Choose angle

Decide which angle is best suited for the patient’s needs (0°, 15° or 30° in extension).

12. Introduce the proximal Screw

When the best suited angle is definite, introduce a second Screw into the proximal holes of the Metacarpal Nail and Radius Connector, using the assembled screwdriver. Lock it in place using forward rotation. If there are problems to align the Screwdriver and the proximal screw, because of an impingement on the radial side, it is possible to use the Drill Sleeve Ø4 mm and the Drill Ø4 mm. Make a small incision (1-2 cm) on the radial side. Drill through the Radial Styloid and then insert the Screwdriver in the cavity and connect to the Screw. Finally tighten the distal Screw.
13. Use bone to fill the wrist cavity

Make sure that the cartilage is removed both distally and proximally. Also remove the cartilage between the small bones in the joint, as in the traditional preparation of a wrist arthrodesis. All bone surfaces have to be rough. Fill the wrist cavity with autograft bone to get maximum stability and optimal conditions for fusion.

Observe: The implant is only for initial fixation. The bone ingrowth provides long term stability of the wrist.

14. Closure

The dorsal capsule is closed. The extensor retinaculum is sutured back and a subcutaneous drainage is introduced before the incision is closed.

Postoperative care

0-6 weeks: Casting for 6 weeks is recommended (first 2 weeks a plaster slab is used) with the wrist excluding the elbow, and allowing free forearm rotation, thumb and finger motion. Depending on the surgeon's judgement, additional weeks might be preferred. Start early hand therapy during the hospital stay, with finger, forearm, elbow and shoulder motion. At approximately 2 weeks the slab and sutures are removed and a circular cast applied for additional 4 weeks. If there is any problem with upper extremity motion the patient shall receive hand therapy.

6 weeks: The cast is removed (and radiographs are taken). Start with limited weight bearing and gradually increase the weight. Free weight-bearing is allowed if possible.
### Product information

#### CAT. NO. **IMPLANTS**

<table>
<thead>
<tr>
<th>CAT. NO.</th>
<th>Description</th>
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<tbody>
<tr>
<td>41-0602S</td>
<td>Metacarpal Nail</td>
</tr>
<tr>
<td>41-0604S</td>
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</tr>
<tr>
<td>41-0606S</td>
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<td>41-0616S</td>
<td>Metacarpal Nail</td>
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<tr>
<td>41-0712S</td>
<td>Metacarpal Connector/Taper</td>
</tr>
<tr>
<td>41-0724S</td>
<td>Radius Connector</td>
</tr>
<tr>
<td>41-0726S</td>
<td>Radius Connector</td>
</tr>
<tr>
<td>41-3001S</td>
<td>Straight Double Taper</td>
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<tr>
<td>41-3002S</td>
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<tr>
<td>41-3003S</td>
<td>Straight Double Taper</td>
</tr>
<tr>
<td>41-3004S</td>
<td>Straight Double Taper</td>
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#### CAT. NO. **CORTICAL SCREWS**

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<tbody>
<tr>
<td>3.120.10</td>
<td>Cortical screw Ø 2,7 mm Ti6Al4V</td>
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<td>3.120.12</td>
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</tr>
<tr>
<td>3.120.24</td>
<td>Cortical screw Ø 2,7 mm Ti6Al4V</td>
</tr>
</tbody>
</table>

*Needed for Metacarpal Nail and Radius Connector surgical technique. (Suggested Cortical Screws can be ordered from Swemac for the Scandinavian market)*
### CAT. NO. | TRIALS
---|---
41-1702 | Metacarpal Nail | Top Ø 3.3 mm | Short
41-1704 | Metacarpal Nail | Top Ø 4.7 mm | Short
41-1706 | Metacarpal Nail | Top Ø 6.1 mm | Short
41-1712 | Metacarpal Nail | Top Ø 3.3 mm | Long
41-1714 | Metacarpal Nail | Top Ø 4.7 mm | Long
41-1716 | Metacarpal Nail | Top Ø 6.1 mm | Long
41-1791 | Straight Double Taper | Short
41-1792 | Straight Double Taper | Medium
41-1793 | Straight Double Taper | Long
41-1794 | Straight Double Taper | Extra Long
41-1724 | Radius Connector | Medium
41-1726 | Radius Connector | Long
41-1722 | Metacarpal Connector/Taper

### CAT. NO. | INSTRUMENTS
---|---
52-2207 | Drill with AO-coupling | Ø 2 mm
41-1720 | Lock screw for Drill Guide
41-1740 | Hex Driver Tip w. Quick-Lock | 6k-2,5 mm
41-1750 | Measurement Sleeve
41-1756 | Drill Guide for Metacarpal Nail
49-2504 | Handle Tri-Lobe with Quick-Lock
300.00.105 | Drill with AO-coupling | Ø 4 mm
41-1752 | Drill Sleeve Ø4 mm
41-1760 | Countersinker for Ø5 mm Screw Head
41-1730 | Tweezers for Cortical Screw
41-1700 | Motec Wrist Arthrodesis Tray

**Complete Motec Wrist Prosthesis Instrumentation**
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.

IFU

For the latest version of the Instruction For Use. Please visit: http://download.swemac.com/Motec-Wrist-Arthrodesis