The Synthes reaming system

Surgical Technique
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Warning
This description is not sufficient for an immediate application of the instrumentation.
Instruction by an experienced surgeon in handling this instrumentation is highly recommended.
SynReam – The Synthes reaming system

Introduction

There are various intramedullary nailing indications where reaming of the medullary cavity is required. In these indications, reaming and the use of the appropriate nail can achieve high stability for an early functional rehabilitation, which is the most important aim of internal fixation. 1–4

In their study, Müller et al. 5 have proved that the reaming process causes significant important intramedullary pressure increases. An important aim in the development of SynReam was therefore the reduction of pressure during reaming. The diameter of the shaft and the geometry of the reamer heads have considerable influence on the pressure in the medullary canal. 6–11. The geometry of the SynReam reamer heads has been designed according to the most recent research findings and the use of superelastic NITINOL has reduced the shaft diameter considerably. This ensures an optimal clearance of chips and an important pressure and temperature reduction compared to conventional reaming systems.

Standard instruments

Flexible Shaft (352.040)

The NITINOL shaft allows driving all reamer-head sizes with one shaft diameter only. Due to the closed cross section, the shaft can be used both clockwise and counter-clockwise, and is easy to clean. The front coupling has a hexagon for torsional transmission. In addition, the shaft is equipped with a click-on mechanism that primarily fixes the reamer heads onto the flexible shaft.

Pass the reaming rod through the shaft and reamer or reduction head to ensure a secure, positive connection between both parts. The insertion of the reaming rod connects both parts firmly to one another.

Caution: Never ream without using a reaming rod, as it secures the connection between the reamer head and the flexible shaft.

The coupling of the machine corresponds to that of the standard system (large Synthes quick coupling) and allows coupling with the attachment for medullary reaming as well as with the angular drive.

Use the individual reamer heads to ream in 0.5mm increments.

Reamer Heads (352.085–352.170)

The chip spaces ensure an optimal chip flow. The 8.5mm reamer head is equipped with front-cutting edges. For this reason, this diameter should be selected as the starting diameter. Reamer heads are available in diameters of 8.5 to 17mm (in 0.5mm increments).

Note: Inspect the reamer heads for damages, as blunt reamer heads can increase intramedullary pressure and temperature significantly. For technical reasons (cutting geometry), the reamer heads cannot be resharpened. Damaged reamer heads have to be replaced.
Reaming Rod, 2.5mm dia., length 1150mm (352.033)

The length of the reaming rod has been increased by 200mm to allow the use of a new motor with attachment for medullary reaming instead of the angular drive. The reaming rod has a diameter of 2.5mm.

The reaming rod is pushed in to the medullary cavity and helps to guide the flexible shaft over the reduced fracture. The olive at the tip of the reaming rod prevents the flexible shaft from being pushed over the reaming-rod tip. It also helps to remove a jammed reamer head. The flattened end of the reaming rod provides a holding surface for the reaming rod holding forceps.

Note: – Check the reaming rod for damages before using it. Otherwise, both the reamer heads and the flexible shaft cannot advance smoothly, and the reaming rod might end up in the knee or the ankle joint.
– A reaming rod of 950 mm is also available (352.032).

Tray for Reaming Heads (675.504)

The click-on connection of SynReam allows the reamer heads to click directly onto the shaft. It avoids the manual insertion of the heads. Place the reamer heads; tip downward, into the holder. The reamer head can now be clipped onto the shaft. Always make sure that the reamer head is fully engaged.
Removing Tool (351.783)

A used reamer head can be removed from the flexible shaft without handling it. Keep the reaming rod in the medullar cavity and remove the shaft. Remove the used reamer head by pulling it through the recess of the removing tool.

**Caution:** The reamer head can only be disengaged from the shaft if the reaming rod has been removed.

Reduction Head, straight (352.050)

The straight reduction head helps to reduce the fracture.

Reduction Head, displacement 2.5mm (352.055)

The 2.5mm displacement of the reduction-head tip helps to reduce displaced fragments.

T-Handle (351.150)

Mounting the T-handle onto the shaft allows optimal handling for reduction.
Holding Forceps for Reaming Rods (351.782)

The holding forceps for reaming rods combines three instruments of the current reaming system. It combines the function of the following products:

- Vice Grip (391.880)
- Universal Chuck with T-Handle (393.100)
- Holding Forceps (351.780)

Handling

1. Insertion
   Insert the reaming rod into the medullary cavity using the holding forceps for reaming rods coupled parallel to the reaming rod.

2. Holding
   For reaming, use the holding forceps to hold the end of the reaming rod parallel or lengthwise. This prevents the withdrawal of the reaming rod when pulling the flexible shaft out of the medullary canal. Once the reamer head has been removed from the bone, the reaming rod can be grasped between the reamer head and the canal entry point.

3. Emergency application
   Should a reamer head get jammed, use the holding forceps for reaming rods to take hold of the back end of the reaming rod, and remove the jammed reamer with light hammer blows on the holding forceps.
**Optional instruments**

**Universal Chuck with T-Handle (393.100)**

This handle is used to push the centering pin and the reaming rod into the medullary canal.

**Hand Reamers, 6, 7, and 8mm dia. (351.920, 351.930 & 351.940)**

These reamers are used when the medullary canal is too small to accommodate the 8.5mm starting reamer.

**Tissue Protector (351.050)**

The tissue protector is used to protect the soft tissues when reaming. Hold the tissue protector at the insertion point between soft tissue and flexible shaft.

**Reamer Heads (352.175 – 352.190)**

The chip spaces ensure an optimal chip flow. The 8.5mm reamer head is equipped with front-cutting edges. For this reason, this should be the first reamer used.

In addition to standard reamer heads (see page 5), there are also 17.5 to 19mm reamer heads (in 0.5mm increments) available.
Air Jet to clean instruments (351.800)

The air jet is made of synthetic material that cannot be sterilized. It is used together with the air tube to clean the inside of the flexible shaft. It can be coupled to the compressed-air supply using an air hose with quick coupling.

Air Tube, 2.0mm dia. (351.810) for use with the air jet

To connect the tube to the air jet, remove the head of the air jet, push the tube through the head, and screw the head back onto the jet.

Cleaning Brush (352.041)

Use this cleaning brush to clean the cannulation of the flexible shaft. In case of an obstructed cannulation, use the reaming rod to push through it.
The cleaning brush cannot be autoclaved.
Surgical technique

The reduction aid can be used after opening of the medullary canal (see surgical technique of the corresponding implant system).

Reduction

Mount one of the Reduction Heads (352.050 or 352.055) and the T-Handle (351.150) onto the Flexible Shaft (352.040). For the fixation of the reduction head, insert the Reaming Rod (352.033 or 352.032) until the olive touches the reduction head. During reduction, the reaming rod must be held in situ to ensure that it does not miss the displaced fragment.

Important: A secure fixation of the reduction head is not guaranteed if the reduction system is used without the reaming rod. The reduction head may be lost in the medullary canal.
Insert the reduction system into the medullary cavity, and reduce the fragments using image-intensifier control.

After reduction, remove the reduction system, and leave the reaming rod in the medullary cavity.

**Note:** As each manipulation in the fat-filled medullary cavity causes an intramedullary pressure increase, reduction with the reduction system also increases the pressure. Manipulations should therefore be minimized. As an alternative, reduction can also be carried out using the reaming rod only.
Medullary reaming

Use the Holding Forceps for Reaming Rods (351.782) or the Universal Chuck with T-Handle (393.100) to push the Reaming Rod (352.033 or 352.032) into the medullary canal.

Important: The reaming rod is already in the medullary canal, if the reduction has been achieved by means of the reduction system.

In sclerotic medullary canals, the reaming rod or the reduction system cannot pass the fracture zone. Start by opening these sclerotic zones with the hand reamer. 6.0mm, 7.0mm, and 8.0mm Hand Reamers (351.920, 351.930 & 351.940) are available.

Now the Reaming Rod (352.033 or 352.032) or the reduction system can be pushed into the medullary cavity. Use the image intensifier to check the correct central position of the reaming rod in two planes.
For the initial reaming, the flexible Shaft (352.040) is usually equipped with the 8.5mm Reamer Head (352.085). Clip the shaft onto the reamer head in the Tray for Reaming Heads (675.504). If the click-on connection does not fit, turn the shaft slightly until the hexagon matches.

**Important:** This is only a primary connection. Always ream over the reaming rod to ensure a secure connection.

Use the Compact Air Drive II (511.701) or the Power Drive (530.100) with the Attachment for Medullary Reaming (511.785) as the driving unit. Guide the reaming system over the reaming rod. Do not rotate the reamer head when inserting it into the medullary canal. The Tissue Protector (351.050) protects the soft tissues. Use the highest speed and slight but uniform force to advance the reamer head in the medullary canal. Move the reaming shaft backwards and forwards to remove the bone chips from the reamer head. This prevents jamming of the reamer head in the medullary cavity.

After full-length reaming of the medullary cavity, withdraw the reaming shaft until the entire reamer head is visible. To prevent a loss of reduction, the assistant should grasp the reaming rod at the canal entry point, and hold the rod in place using the Holding Forceps for Reaming Rods (351.782).

If a reamer head gets jammed while reaming, disconnect the Attachment for Medullary Reaming (511.785). Mount the holding forceps onto the reaming rod (in the countersinking). Light hammer blows on the holding forceps allow drawing the jammed reamer head from the medullary canal using the reaming rod. As an alternative, release the reamer head by turning the shaft backwards.
A used reamer head can be removed from the flexible shaft without touching it, by pulling the reamer head through the recess of the Removing Tool (351.783).

Use sideways cutting reamer heads for the subsequent reaming steps. Use the click-on connection to click the next-in-size reamer head onto the shaft directly from the holder for reamer heads. This can be done without having to touch the reamer heads. Insert the reaming shaft and the reamer head over the reaming rod into medullary cavity. Reaming to the desired diameter is normally done in 0.5mm increments.

**Important:** The subsequent surgical steps are carried out according to the corresponding surgical technique of the implant system used. In cannulated intramedullary nails, the nail can be inserted directly over the Reaming Rod (352.033 or 352.032) into the reamed medullary cavity.

**Important:** Remove the reaming rod before locking the intramedullary nail.
**Set list**

**SYNCASE without contents**

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<th>Description</th>
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**SYNCASE with contents**

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<td>T-Handle with quick coupling, L 85mm</td>
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<td>351.782</td>
<td>Holding Forceps for 2.5mm Reaming Rods</td>
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352.033 Reaming Rod, 2.5mm dia., L 1150mm
352.040 Flexible Shaft
352.050 Reduction Head, straight
352.055 Reduction Head, displacement 2.5mm
352.085 Reamer Head, 8.5mm dia.
352.090 Reamer Head, 9.0mm dia.
352.095 Reamer Head, 9.5mm dia.
352.100 Reamer Head, 10.0mm dia.
352.105 Reamer Head, 10.5mm dia.
352.110 Reamer Head, 11.0mm dia.
352.115 Reamer Head, 11.5mm dia.
352.120 Reamer Head, 12.0mm dia.
352.125 Reamer Head, 12.5mm dia.
352.130 Reamer Head, 13.0mm dia.
352.135 Reamer Head, 13.5mm dia.
352.140 Reamer Head, 14.0mm dia.
352.145 Reamer Head, 14.5mm dia.
352.150 Reamer Head, 15.0mm dia.
352.155 Reamer Head, 15.5mm dia.
352.160 Reamer Head, 16.0mm dia.
352.165 Reamer Head, 16.5mm dia.
352.170 Reamer Head, 17.0mm dia.
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<td>351.800</td>
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SynReam – The Synthes reaming system
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- 351.810 Air Tube, 2.0mm dia.
- 351.920 Hand Reamer, 6.0mm dia.
- 351.930 Hand Reamer, 7.0mm dia.
- 351.940 Hand Reamer, 8.0mm dia.
- 352.041 Cleaning Brush for Flexible Shaft
- 352.175 Reamer Head, 17.5mm dia.
- 352.180 Reamer Head, 18.0mm dia.
- 352.185 Reamer Head, 18.5mm dia.
- 352.190 Reamer Head, 19.0mm dia.
- 393.100 Universal Chuck with T-Handle
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