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SHARING EXPERTISE

AESCULAP® S4®

Modular Open Pedicle Screw System

Surgical Manual

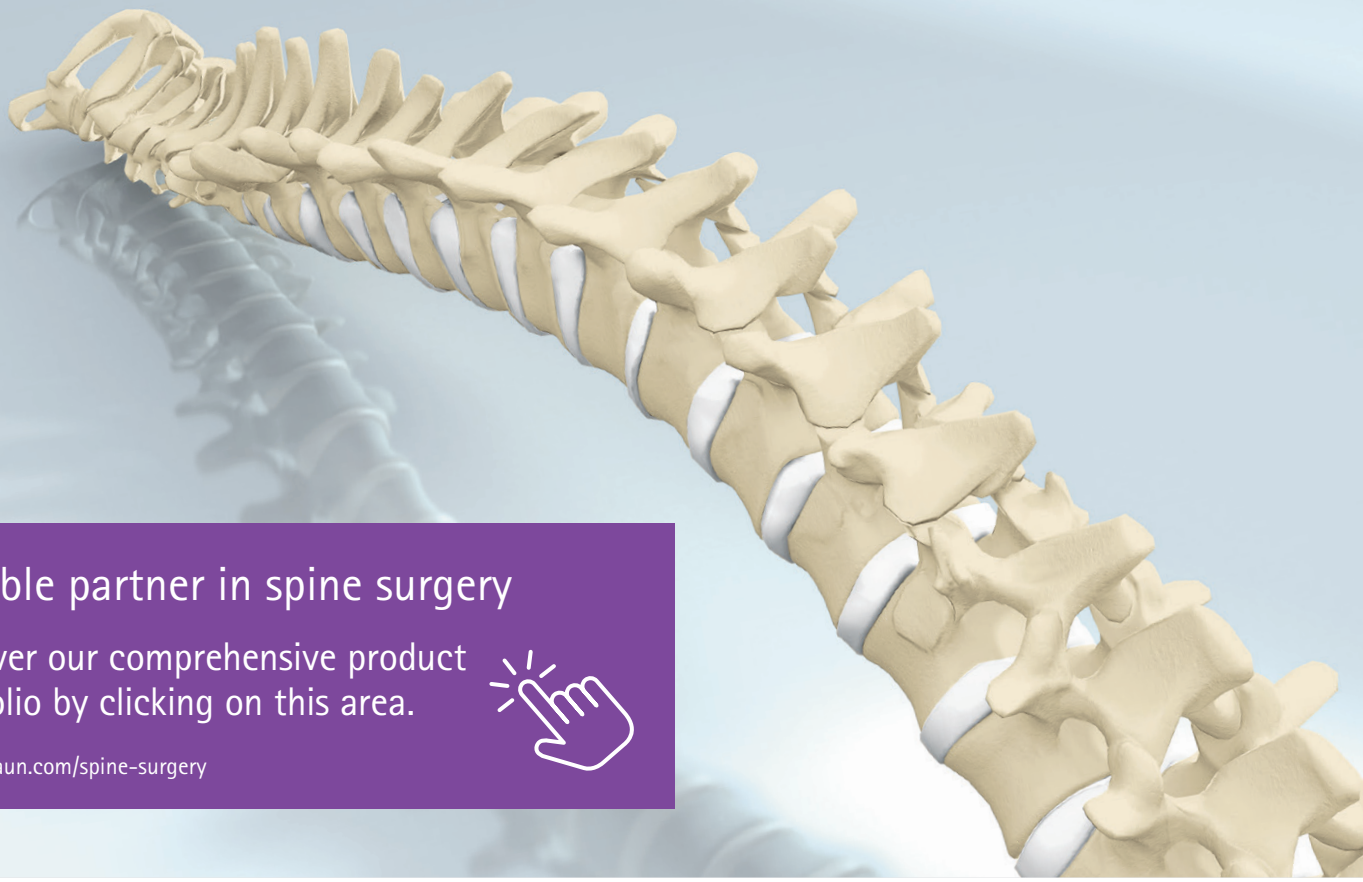
AESCULAP® S4®

Modular Open Pedicle Screw System

Protecting and preserving spinal stability

Modern life style has resulted in increasing physical inactivity among people all over the world. Of the many medical problems associated with this, spinal disorders are among the most critical. This is even more significant as the spinal column is one of the most important structures in the human body. It supports and stabilizes the upper body and is the center of our musculoskeletal system, which gives the body movement.

Our work in the field of degenerative spinal disorders is dedicated to protecting the spinal column and preserving its stability. We support spine surgeons with durable, reliable products and partner services for safe procedures and outstanding clinical outcomes.[1-6] Our philosophy of sharing expertise with healthcare professionals and patients allows us to develop innovative implant and instrument systems that help to preserve stability and stabilize the cervical and thoracolumbar spine.



Reliable partner in spine surgery

Discover our comprehensive product portfolio by clicking on this area.

www.bbraun.com/spine-surgery

Chapters

AESCULAP® S4®

System Overview

Trusted Experience

The unique slim profile technology of S4® blends the experience of more than ten years of clinical application and continuously updated technologies, making it a reliable posterior spinal fixation system for a vast range of indications.

Modular Versatility

The S4® is based on Aesculap's proven and versatile platform technologies that are especially designed for the requirements and needs in spinal surgery. As a result, the system is individually configurable and adaptable to a comprehensive range of pathologies and approach techniques, giving you the benefit to work with one system.

Cutting-Edge Dimensions

The outstanding slim profile technology allows for a implant diameter of only 10.5 mm and a lean instrument design for true MIS skin incisions and effective instrument manipulation in tight anatomical spaces.

Lean Surgical Workflow

The contents of the individual implant and instrument modules are defined in a way that an intuitive and streamlined instrumentation can be supported throughout the whole hospital workflow.


6
5
4
3
2

AESCULAP® S4®

A | Surgical Technique – Degenerative Spine

Trusted Experience

Degenerative Spine

AESCULAP® S4®

A | Surgical Technique – Degenerative Spine

Fig. 1

A.1. Pedicle Preparation

- Determine the pedicle entry point and perforate the cortex using the Bone Awl (SZ241R alternative FW190R).
- Use the Pedicle Probe to open the pedicle canal. The Pedicle Probes are available straight or curved blunt-tip (SZ242R or SZ263R alternative FW188R or FW189R) and straight or curved Lenke (FW248R or FW249R).
- The Pedicle Probes have ruled markings to determine the depth measurement in the pedicle canal.
- If necessary, single or dual band Pedicle Markers (SZ249R or SZ248R alternative FW191R or FW192R) can be used to identify proper anatomic location on intra-operative imaging.
- Utilize the straight or curved Pedicle Sounder (FW146R or FW147R) to confirm the patency of the pedicle and vertebral body cortex.

Fig. 2

A.2. Pedicle Tapping

Although the S4® Spine System screws are self-tapping, Screw Taps are available in all diameters if desired.

- To tap, attach the straight Ratchet Handle or the T-Handle (FW165R or FW167R) to the appropriate Screw Tap (FW194R – FW198R or FW356R – FW357R) based on the screw diameter.

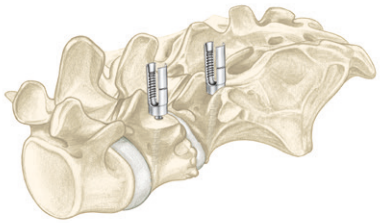


Fig. 3

A.3. Screw Placement

- For polyaxial screws, attach and fully engage the hexagonal tip of the Screw Driver (FW270R) into the body of the screw.
- For monoaxial screws, insert und fully seat the rounded tip of the Screw Driver (FW262R) into the slot of the monoaxial screw.
- Thread the screw into the prepared pedicle and release the Screw Driver from the screw body by pulling it back.
- If needed, the Screw Body Manipulator (FW180R) can be used to adjust the height of monoaxial screws as well as the alignment of the polyaxial screw bodies.
- In case of soft tissue impingement, the Marnay Lever (FW154R) can be used to retract soft tissue.
- If revision is necessary, use the Screw Body Manipulator to release the axial lock of the screw body and then use the Screw Driver (FW174R) for the removal of polyaxial screws. Monoaxial screws can be removed using the Screw Driver (FW262R).

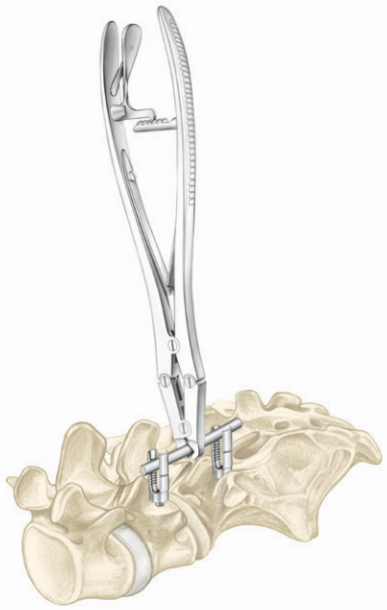


Fig. 4

A.4. Rod Placement

- The flexible Rod Trial (SZ072SU, SZ073SU or SZ074SU) can be used as a guide for rod bending and measuring correct rod length.
- Both pre-bent and straight rods are available.
- If needed, the rod length can be adapted using the Rod Cutter (FW206R).
- All rods may be contoured using the French Rod Bender (SZ330R alternative FW206R).
- To contour the rod, place the rod on the French Rod Bender and squeeze the handle until the desired curvature is achieved. If needed, the Rod Holding Forceps (FW012R) can be used for rotational stability.
- Use the Rod Holding Forceps to assist with rod placement or rod manipulation.

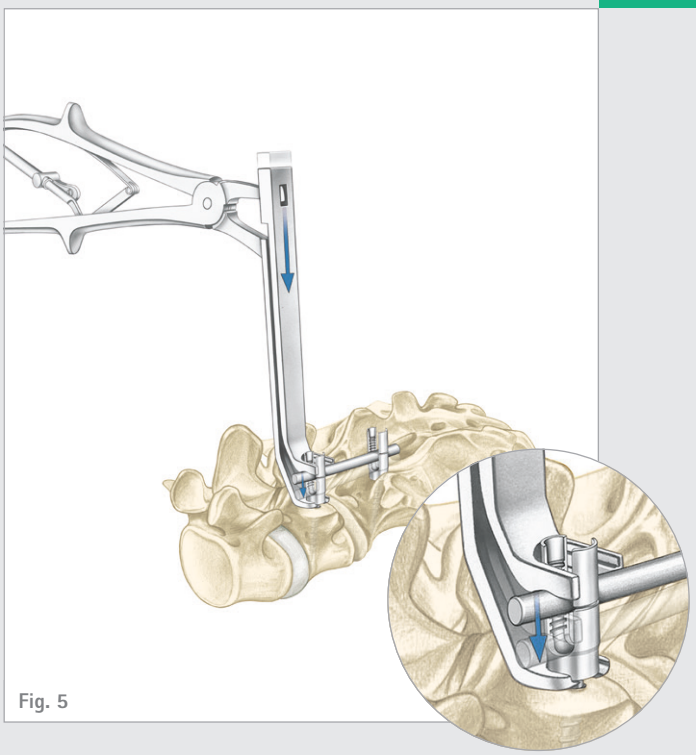


Fig. 5

A.5. Rod Reduction

a) Reduction by Rod Persuader

- Place the Rod Persuader (FW208R) under the screw body and ensure the tip of the Rod Persuader is fully engaged to the body of the implant.
- Squeeze the handle of the Rod Persuader to seat the rod into the body of the pedicle screw.

b) Reduction by Rod Pusher

- Place the Rod Pusher (FW513R) on the rod and push the rod manually into the screw body.

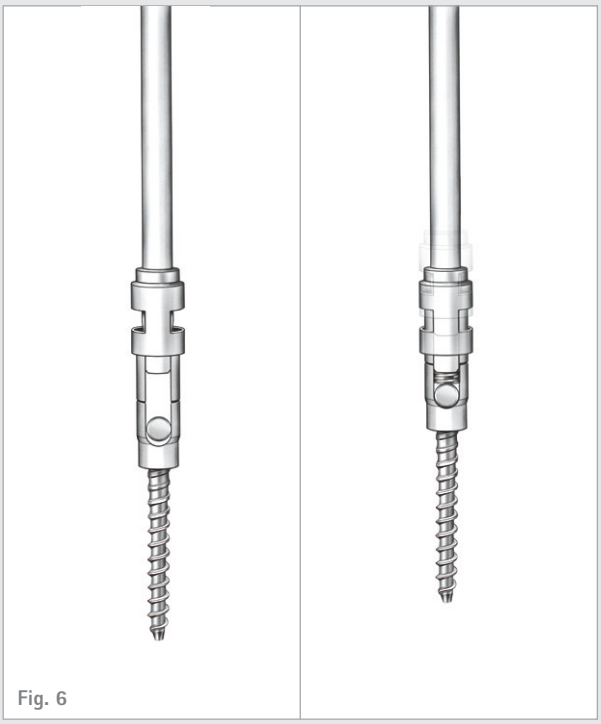


Fig. 6

A.6. Set Screw Placement

- Insert the Set Screw Starter (FW177R) firmly into the set screw and remove the set screw from the caddy. Ensure the set screw is fully engaged to the Set Screw Starter.
- The outer ring of the Set Screw Starter fits onto the flanks of the screw body to ensure the set screw trajectory is correct during initial threading.
- Finger tighten the set screw into the screw body until it contacts the rod.
- Use the Set Screw Revision Screw Driver (FW193R) to remove a tightened set screw.

Note:

The Set Screw Starter is designed to tighten the Set Screw to a depth that still allows compression and distraction maneuvers to be performed.

Fig. 7

A.7. Compression Maneuver

Use the Compression Forceps (FW184R or FW210R) to compress the construct.

- Fully tighten one set screw to create a fixed point for compression.
- Fully seat the Counter Torque Handle (FW178R) on the unlocked screw body and perform the compression maneuver.
- Once the desired compression is achieved, fully tighten the remaining set screw.

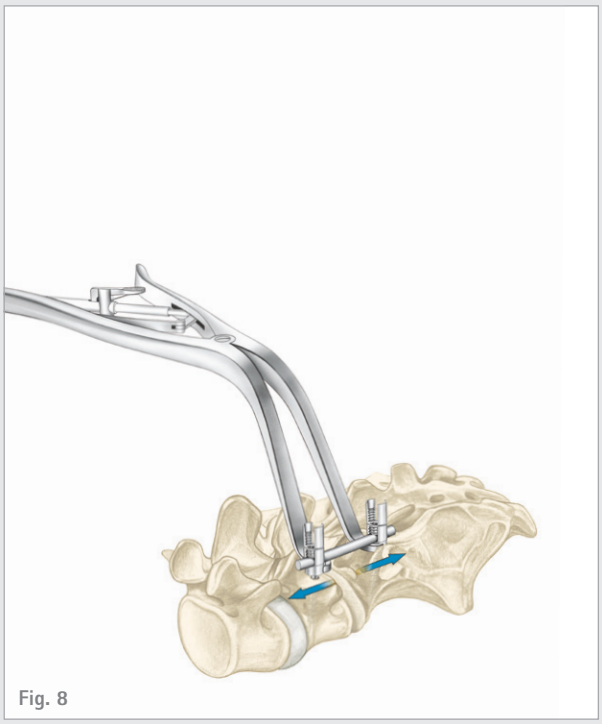


Fig. 8

A.8. Distraction Maneuver

Use the Distraction Forceps (FW181R or FW023R) to distract the construct.

- Fully tighten one set screw to create a fixed point for distraction.
- Fully seat the Counter Torque Handle (FW178R) on the unlocked screw body and perform the distraction maneuver.
- Once the desired distraction is achieved, fully tighten the remaining set screw.

A.9. Derotation Maneuver

Use the Derotation Sleeves (FW183R) and the Counter Torque Handle (FW178R) to rotate the rod.

- Place the Derotation Sleeves over the pedicle screws that contain the rod to be rotated.
- Connect the Counter Torque Handle to one of the Derotation Sleeves to perform the rotation maneuver.
- Once the desired rotation is achieved, fully tighten the set screws.

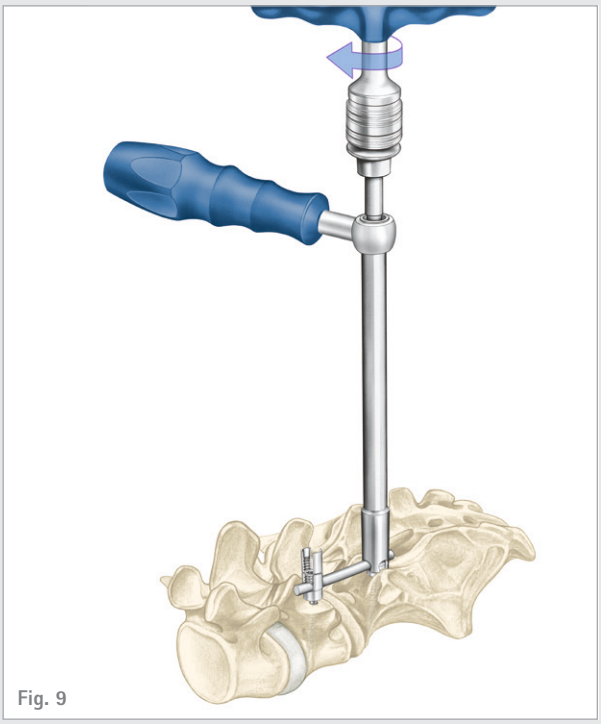


Fig. 9

A.10. Final Tightening

Final tightening of each set screw is completed using the Torque Wrench (FW170R) along with the Counter Torque Handle (FW178R).

- Insert the Torque Wrench through the tube of the Counter Torque so the tip is exposed.
- Fully seat the tip of the Torque Wrench into the socket of the set screw. Engage the Counter Torque tip with the rod.
- Turn the Torque Wrench in a clockwise direction while firmly holding the Counter Torque. Ensure the arrows on the Torque Wrench line up with each other.

Caution:

Do not use the Torque Wrench without the Counter Torque Handle. Over tightening the set screw more than the specified setting of 10 Nm (90 in/lbs) could lead to implant failure. Damaged set screws must be replaced.

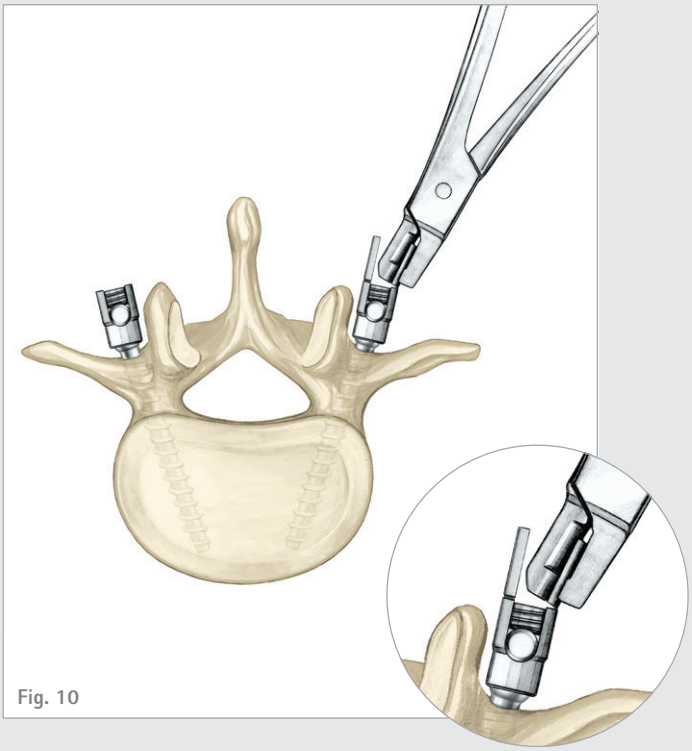


Fig. 10

A.11. Tab Removal

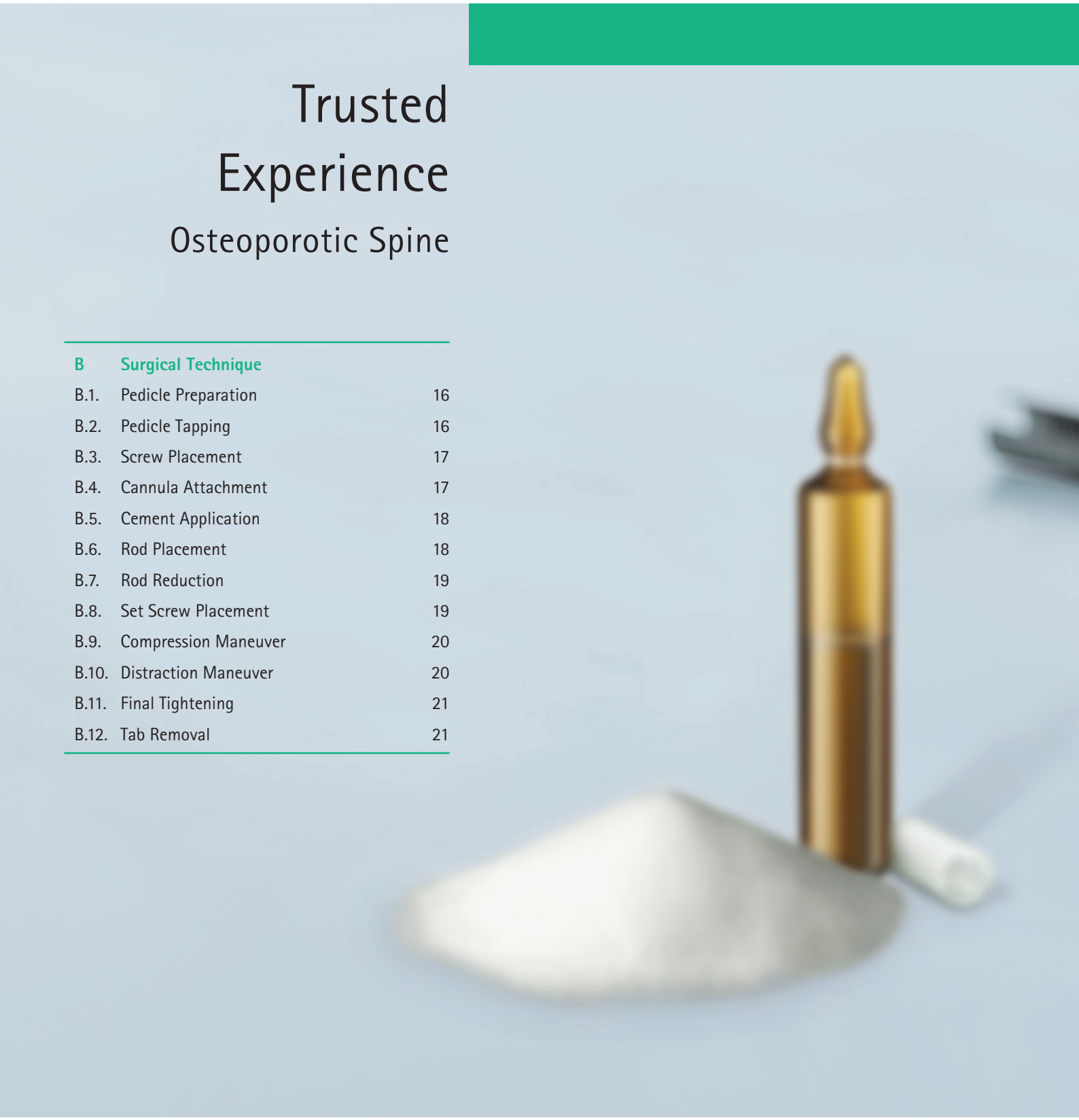
- After verifying that all screws are placed and tightened, remove the tabs with the Tab Breaker (FW179R).

AESCULAP® S4®

B | Surgical Technique – Osteoporotic Spine

Trusted Experience

Osteoporotic Spine




AESCULAP FW012R

AESCULAP® S4®

B | Surgical Technique – Osteoporotic Spine

Fig. 1

B.1. Pedicle Preparation

- Determine the pedicle entry point and perforate the cortex using the Bone Awl (SZ241R alternative FW190R).
- Use the Pedicle Probe to open the pedicle canal. The Pedicle Probes are available straight or curved blunt-tip (SZ242R or SZ263R alternative FW188R or FW189R) and straight or curved Lenke (FW248R or FW249R).
- The Pedicle Probes have ruled markings to determine the depth measurement in the pedicle canal.
- If necessary, single or dual band Pedicle Markers (SZ249R or SZ248R alternative FW191R or FW192R) can be used to identify proper anatomic location on intra-operative imaging.
- Utilize the straight or curved Pedicle Sounder (FW146R or FW147R) to confirm the patency of the pedicle and vertebral body cortex.

Fig. 2

B.2. Pedicle Tapping

Although the S4® Spine System screws are self-tapping, Screw Taps are available in all diameters if desired.

- To tap, attach the straight Ratchet Handle or the T-Handle (FW165R or FW167R) to the appropriate Screw Tap (FW194R – FW198R or FW356R – FW357R) based on the screw diameter.

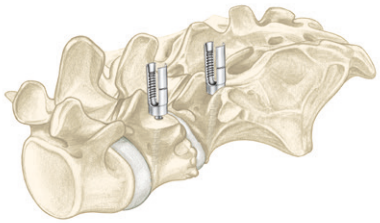


Fig. 3

B.3. Screw Placement

- For polyaxial screws, attach and fully engage the hexagonal tip of the Screw Driver (FW270R) into the body of the augmentation screw.
- For monoaxial screws, insert und fully seat the rounded tip of the Screw Driver (FW262R) into the slot of the monoaxial augmentation screw. Ensure that the Screw Driver is fully engaged onto the screw.
- Thread the screw into the prepared pedicle and release the Screw Driver from the screw body by pulling it back.
- Slide the K-Wire (FW247S) into the cannulation of the screw and check its patency, in order to avoid unwanted penetration of bone into the augmentation area of the screw.
- If needed, the Screw Body Manipulator (FW180R) can be used to adjust the height of the monoaxial screws as well as the alignment of the polyaxial screw bodies.

Fig. 4

B.4. Cannula Attachment

- The Augmentation Cannula (SR146SU) is placed over the K-Wire, connected with the augmentation screw and hand tightened. The K-Wire is removed afterwards.
- When introducing the Augmentation Cannula it is important to align the polyaxial screw vertically in order to avoid cross threading.
- In order to avoid unwanted cement leakage make sure that there is a tight connection between Augmentation Cannula and the augmentation screw.

B | Surgical Technique – Osteoporotic Spine

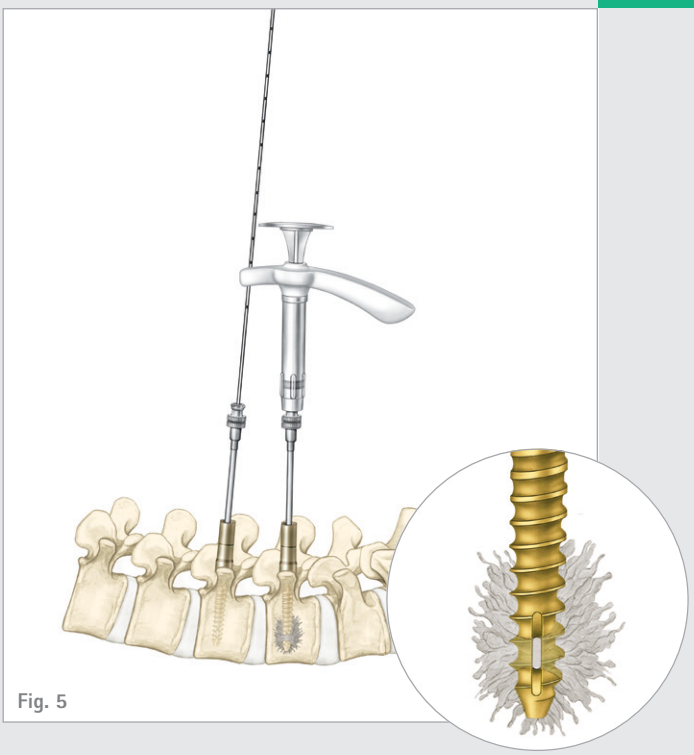


Fig. 5

B.5. Cement Application

- Ensure, that there is no cement at the connection between the Cement Applier and Augmentation Cannula.
- Attach the Cement Applier to the Augmentation Cannula. For cement application make sure that the consistency of the cement is pasty (see manufacturers specifications).
- Inject cement until it extrudes from the slots. Check that no cement leakage occurs. Cement injection should be effected under real time image intensifier control.
- Continue the injection until the adequate quantity of cement is introduced and shows a cloud pattern.
- The manufacturers specifications for the cement hardening times have to be observed.
- The Augmentation Cannula remains in the pedicle screw until the cement has hardened. Otherwise there is a risk of contamination of the screw body.

Fig. 6

B.6. Rod Placement

- The flexible Rod Trial (SZ072SU, SZ073SU or SZ074SU) can be used as a guide for rod bending and measuring correct rod length.
- Both pre-bent and straight rods are available.
- If needed, the rod length can be adapted using the Rod Cutter (SZ330R alternative FW206R).
- All rods may be contoured using the French Rod Bender (FW024R).
- To contour the rod, place the rod on the French Rod Bender and squeeze the handle until the desired curvature is achieved. If needed, the Rod Holding Forceps (FW012R) can be used for rotational stability.
- Use the Rod Holding Forceps to assist with rod placement or rod manipulation.

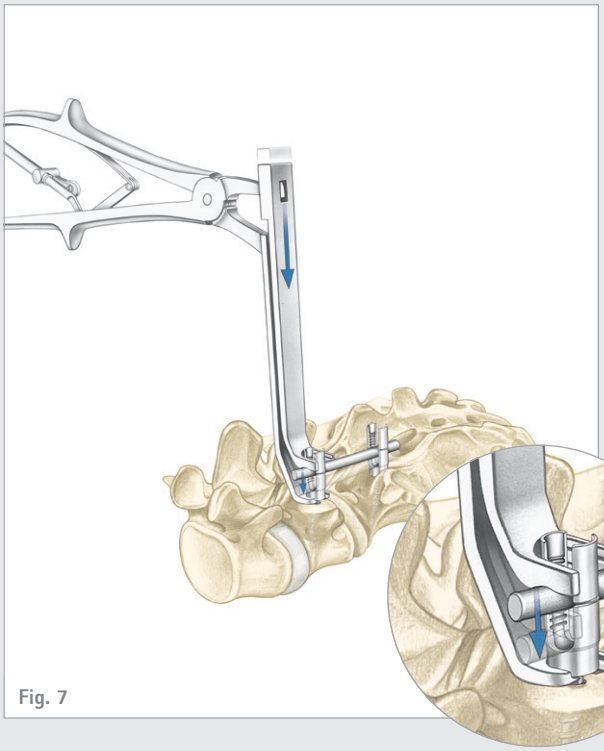


Fig. 7

B.7. Rod Reduction

a) Reduction by Rod Persuader

- Place the Rod Persuader (FW208R) under the screw body and ensure the tip of the Rod Persuader is fully engaged to the body of the implant.
- Squeeze the handle of the Rod Persuader to seat the rod into the body of the pedicle screw.

b) Reduction by Rod Pusher

- Place the Rod Pusher (FW513R) on the rod and push the rod manually into the screw body.

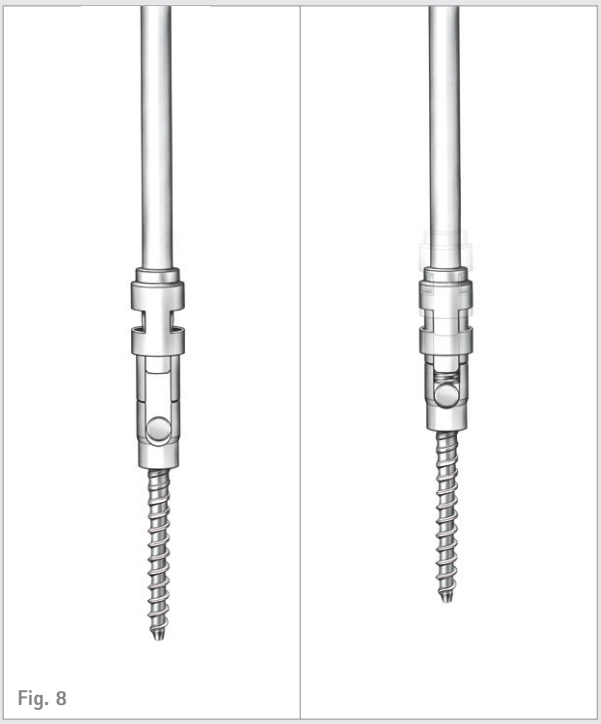


Fig. 8

B.8. Set Screw Placement

- Insert the Set Screw Starter (FW177R) firmly into the set screw and remove the set screw from the caddy. Ensure the set screw is fully engaged to the Set Screw Starter.
- The outer ring of the Set Screw Starter fits onto the flanks of the screw body to ensure the set screw trajectory is correct during initial threading.
- Finger tighten the set screw into the screw body until it contacts the rod.
- Use the Set Screw Revision Screw Driver (FW193R) to remove a tightened set screw.

Note:

The Set Screw Starter is designed to tighten the Set Screw to a depth that still allows compression and distraction maneuvers to be performed.

Fig. 9

B.9. Compression Maneuver

Use the Compression Forceps (FW184R or FW210R) to compress the construct.

- Fully tighten one set screw to create a fixed point for compression.
- Fully seat the Counter Torque Handle (FW178R) on the unlocked screw body and perform the compression maneuver.
- Once the desired compression is achieved, fully tighten the remaining set screw.

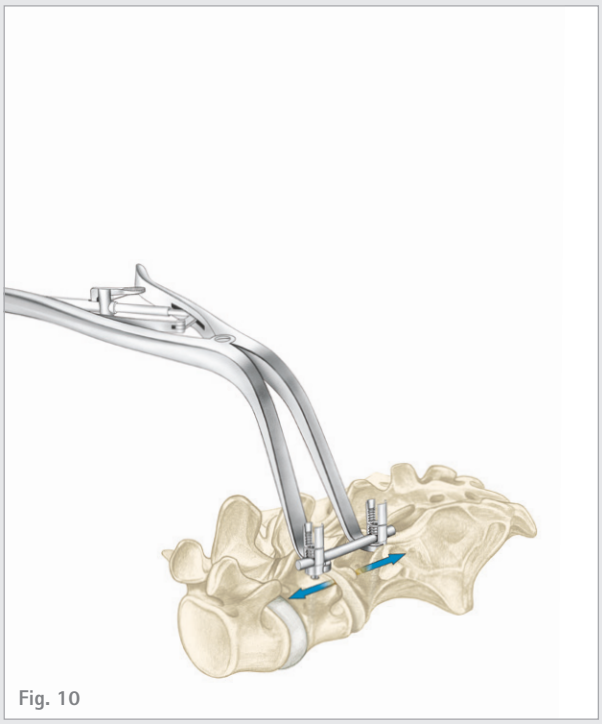


Fig. 10

B.10. Distraction Maneuver

Use the Distraction Forceps (FW181R or FW023R) to distract the construct.

- Fully tighten one set screw to create a fixed point for distraction.
- Fully seat the Counter Torque Handle (FW178R) on the unlocked screw body and perform the distraction maneuver.
- Once the desired distraction is achieved, fully tighten the remaining set screw.

Fig. 11

B.11. Final Tightening

Final tightening of each set screw is completed using the Torque Wrench (FW170R) along with the Counter Torque Handle (FW178R).

- Insert the Torque Wrench through the tube of the Counter Torque so the tip is exposed.
- Fully seat the tip of the Torque Wrench into the socket of the set screw. Engage the Counter Torque tip with the rod.
- Turn the Torque Wrench in a clockwise direction while firmly holding the Counter Torque. Ensure the arrows on the Torque Wrench line up with each other.

Caution:

Do not use the Torque Wrench without the Counter Torque Handle. Over tightening the set screw more than the specified setting of 10 Nm (90 in/lbs) could lead to implant failure. Damaged set screws must be replaced.

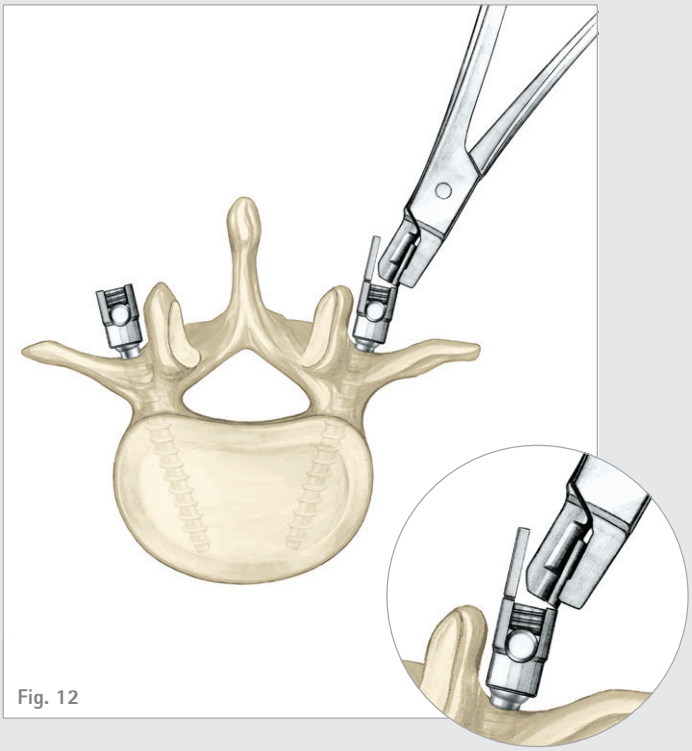


Fig. 12

B.12. Tab Removal

- After verifying that all screws are placed and tightened, remove the tabs with the Tab Breaker (FW179R).

AESCULAP® S4®

C | Surgical Technique – Spinal Fractures and Trauma

Trusted Experience

Spinal Fractures and Trauma


AESCULAP FW012R

C | Surgical Technique – Spinal Fractures and Trauma

Fig. 1

C.1. Pedicle Preparation

- Determine the pedicle entry point and perforate the cortex using the Bone Awl (SZ241R alternative FW190R).
- Use the Pedicle Probe to open the pedicle canal. The Pedicle Probes are available straight or curved blunt-tip (SZ242R or SZ263R alternative FW188R or FW189R) and straight or curved Lenke (FW248R or FW249R).
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- Utilize the straight or curved Pedicle Sounder (FW146R or FW147R) to confirm the patency of the pedicle and vertebral body cortex.

Fig. 2

C.2. Pedicle Tapping

Although the S4® Spine System screws are self-tapping, Screw Taps are available in all diameters if desired.

- To tap, attach the straight Ratchet Handle or the T-Handle (FW165R or FW167R) to the appropriate Screw Tap (FW194R – FW198R or FW356R – FW357R) based on the screw diameter.

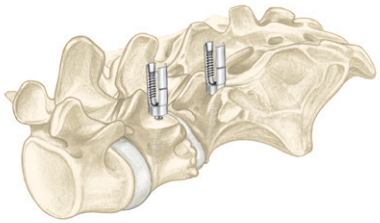


Fig. 3

C.3. Screw Placement

- For polyaxial screws, attach and fully engage the hexagonal tip of the Screw Driver (FW270R) into the body of the screw.
- For monoaxial screws, insert und fully seat the rounded tip of the Screw Driver (FW262R) into the slot of the monoaxial screw.
- Thread the screw into the prepared pedicle and release the Screw Driver from the screw body by pulling it back.
- If needed, the Screw Body Manipulator (FW180R) can be used to adjust the height of monoaxial screws as well as the alignment of the polyaxial screw bodies.
- In case of soft tissue impingement, the Marnay Lever (FW154R) can be used to retract soft tissue.
- If revision is necessary, use the Screw Body Manipulator to release the axial lock of the screw body and then use the Screw Driver (FW174R) for the removal of polyaxial screws. Monoaxial screws can be removed using the Screw Driver (FW262R).

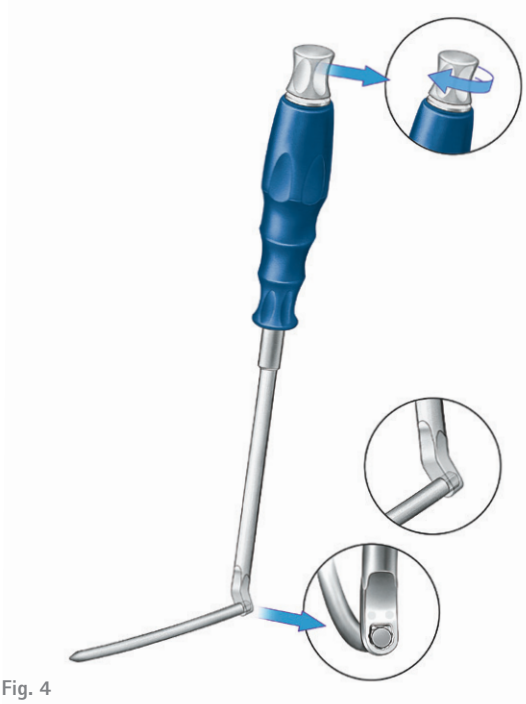


Fig. 4

Fig. 5

C.4. Rod Placement

- The flexible Rod Trial (SZ072SU, SZ073SU or SZ074SU) can be used as a guide for rod bending and measuring correct rod length.
- Both pre-bent and straight rods are available.
- If needed, the rod length can be adapted using the Rod Cutter (SZ330R alternative FW206R).
- All rods may be contoured using the French Rod Bender (FW024R).
- To contour the rod, place the rod on the French Rod Bender and squeeze the handle until the desired curvature is achieved. If needed, the Rod Holding Forceps (FW012R) can be used for rotational stability.
- The locking mechanism of the Rod Insertion Instrument (FW240R) is released by turning the distal knob counter clockwise. The rod can now be inserted. By turning the knob clockwise the rod becomes fixed.
- The FRI Outer Sleeves (FW235R) are now placed on the screws with the long slot placed caudally.
- The rod is now inserted through the long slot of the Outer Sleeve. Make sure to press the Outer Sleeve slightly onto the screws in order to give them a firm seat during the rod insertion.
- Repeat this process on the contra-lateral side.

Fig. 6

C.5. Lever Placement

- The Screw Driver (FW228R) is now inserted into the Lever Threadpipe (FW734R) and fixed with the Spacer (FW143P).
- Pick up the set screw (SW790T or SW375T) from the storage with the Screw Driver.
- The construct is now inserted through the Outer Sleeve (FW235R) until it touches the screw body. Then screw the construct down until it blocks.
- For further manipulation of the set screw the Spacer has to be removed.

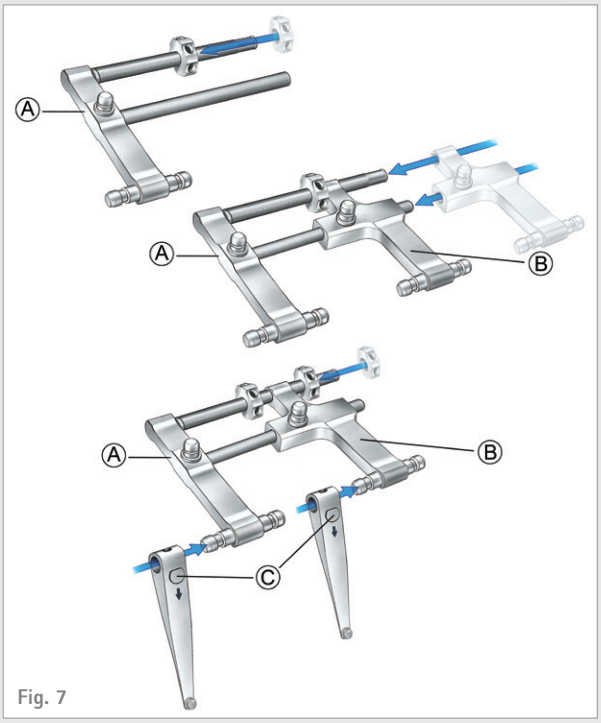


Fig. 7

C.6. Distractor Assembly

- Place the first distraction nut on the rear parallel guide of the frame (A).
- Position the free distraction portion (B) on the parallel guide.
- Place the second distraction nut on the rear parallel guide.
- Attach the Distraction Arms (FW239R) (C) on the connection parts of the Distractor (FW238R).

Fig. 8

C.7. Distractor Placement

- The Distractor (consisting of FW238R and FW239R) is now fixed to the cranial and caudal Outer Sleeves by sliding the pivots down the guiding groove. Ensure that the distraction arms are inserted parallel to the Outer Sleeve.
- Repeat this process on the contra-lateral side.

Fig. 9

- Distraction can be effected using the distraction nut. The distraction nut can be manipulated by hand or with the Fixation Nut Wrench (FW237R).
- If preferred, distraction may take place under fluoroscopic control.

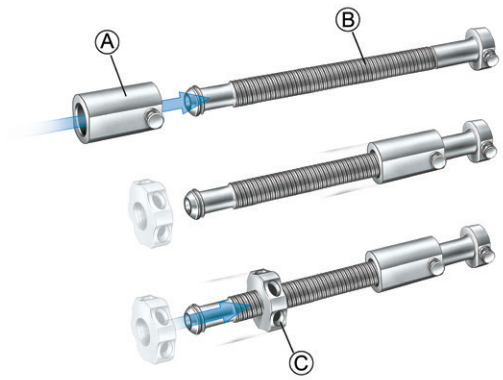


Fig. 10

C.8. Spindle Distractor Assembly

- If necessary, the natural lordosis can be restored with the Distraction Spindle (FW241R).
- The attachment jig (A) is placed on the spindle (B) with the pivot inward and fixed with the distraction nut (C).

Fig. 11

C.9. Spindle Distractor Placement

- The pins of the spindle are inserted into the groove on the upper part of the Outer Sleeves. Ensure that the Distraction Spindle is placed parallel to the Outer Sleeve to avoid tilting.
- Repeat this process on the contra-lateral side.
- Lordosis can be corrected using the distraction nut. The distraction nut can be manipulated by hand or with the Fixation Nut Wrench (FW237R).

Fig. 12

C.10. Final Tightening

- With the regulating screw of the Lever Threadpipe the Outer Sleeve is threaded down until it blocks. The rod is now seated in the screw head.
- The regulating screw of the Lever Threadpipe has to be threaded back by a quarter turn in order not to block the Screw Driver.
- Attach the Ratchet Handle to the Screw Driver and remove the Spacer. Finger tighten the set screw by turning the Ratchet Handle.
- Remove the instruments by pulling the Screw Driver out and unscrewing the Lever Threadpipe.
- Final tightening of each set screw is completed using the Torque Wrench (FW170R) along with the Counter Torque (FW236R).
- The Counter Torque is attached to the hexagonal bolt of the Outer Sleeve. Insert the Torque Wrench through the Outer Sleeve into the socket of the set screw.
- Turn the Torque Wrench in a clockwise direction while firmly holding the Counter Torque. Ensure the arrows on the Torque Wrench line up with each other.
- The locking mechanism of the Rod Inserter is opened and the rod released.

Caution:

Do not use the Torque Wrench without the Counter Torque Handle. Over tightening the set screw more than the specified setting of 10 Nm (90 in/lbs) could lead to implant failure. Damaged set screws must be replaced.

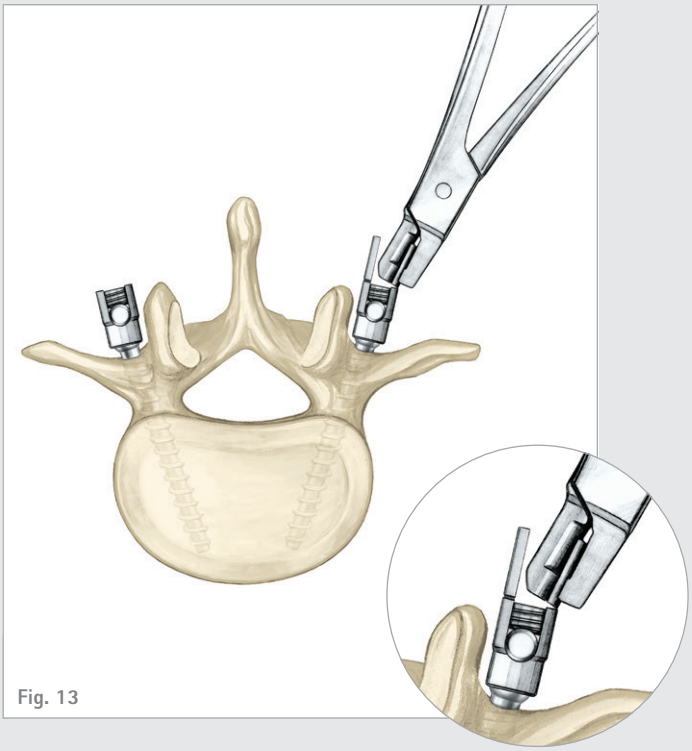


Fig. 13

C.11. Tab Removal

- After verifying that all screws are placed and tightened, dismantle the Outer Sleeve from the screws and remove the tabs with the Tab Breaker (FW179R).

Trusted Experience

Spondylolisthesis

D | Surgical Technique – Spondylolisthesis

Fig. 1

D.1. Pedicle Preparation

- Determine pedicle entry point and perforate the cortex using the Bone Awl (SZ241R alternative FW190R).
- Use the Pedicle Probe to open the pedicle canal. The Pedicle Probes are available straight or curved blunt-tip (SZ242R or SZ263R alternative FW188R or FW189R) and straight or curved Lenke (FW248R or FW249R).
- The Pedicle Probes have ruled markings to determine the depth measurement in the pedicle canal.
- If necessary, single or dual band Pedicle Markers (SZ249R or SZ248R alternative FW191R or FW192R) can be used to identify proper anatomic location on intra-operative imaging.
- Utilize the straight or curved Pedicle Sounder (FW146R or FW147R) to confirm the patency of the pedicle and vertebral body cortex.

Fig. 2

D.2. Pedicle Tapping

Although the S4® Spine System screws are self-tapping, Screw Taps are available in all diameters if desired.

- To tap, attach the straight Ratchet Handle or the T-Handle (FW165R or FW167R) to the appropriate Screw Tap (FW194R – FW198R or FW356R – FW357R) based on the screw diameter.

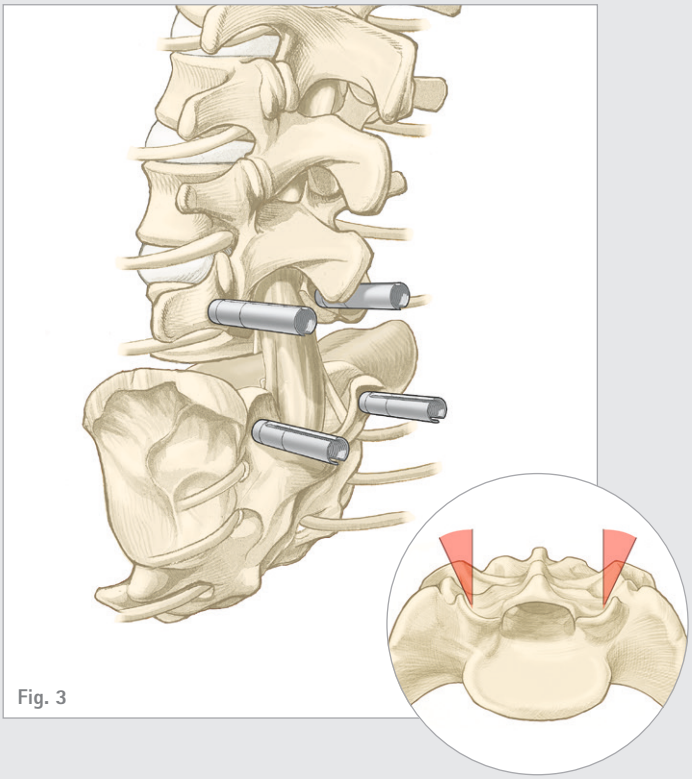


Fig. 3

D.3. Screw Placement

Within the limits of the patient's anatomy, the screws in the cephalad vertebral body are best placed parallel to its superior endplate and as parallel to each other as possible.

Place the caudal screws (monoaxial screws should be used) so that they are parallel to the cephalad screws (polyaxial screws should be used) in both planes (as compared to the standard convergent manner). Placement of screws in this way allows for optimal operation of the reduction instrument and provides for easier rod placement.

- In the case of an L5/S1 reduction, the chosen length at S1 should achieve bi-cortical purchase.

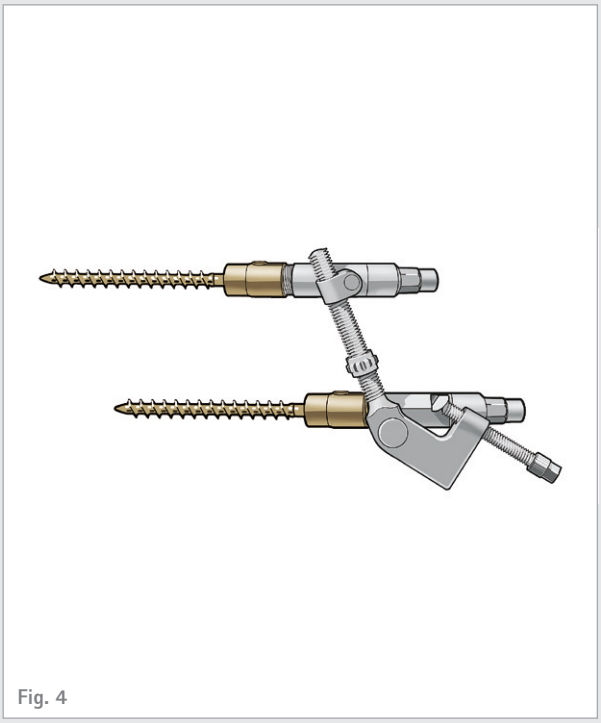


Fig. 4

D.4. SRI Attachment

The instrument has two components: a right and a left one. Each component has two pedicle screw attachments: one attaches to the cephalad screw that will be repositioned, and the other to the caudal vertebral screw.

On the caudal components, make sure the distraction nuts are at a point of minimal distraction (toward the most caudal position of the S4® SRI). Also, on the caudal components, make sure the reduction bolts are backed out to the point of minimal reduction.

D | Surgical Technique – Spondylolisthesis

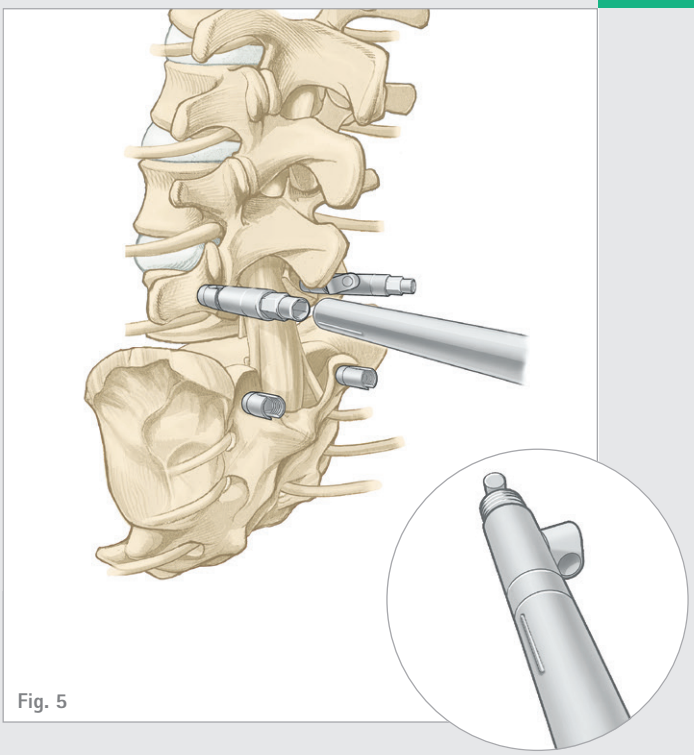


Fig. 5

- Attach the cephalad component first. Insert the mounting post into the body of the screw and finger tighten.
- Ensure that the articulated head is positioned inferiorly and insert the distraction spindle (caudal component) into the articulated head of the cephalad component.
- At the same time, insert the mounting post into the body of the pedicle screw of the caudal vertebra and finger tighten.

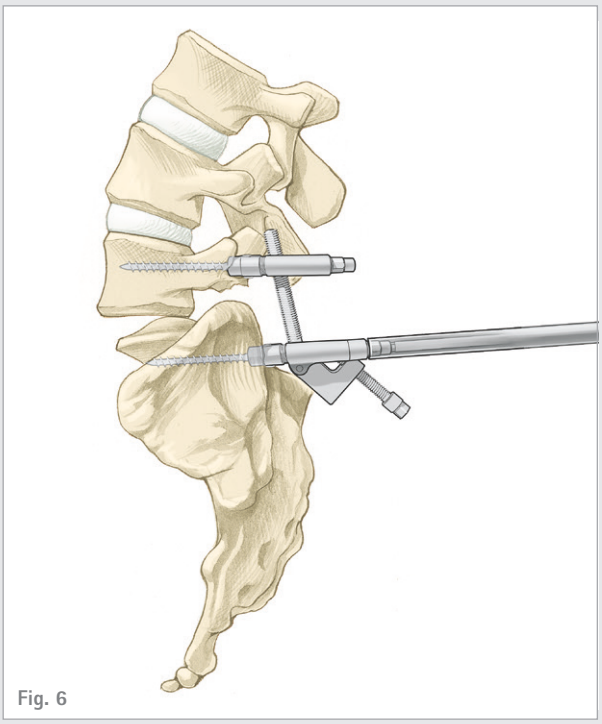


Fig. 6

- Once the instrument is attached and positioned properly tighten the caudal and cephalad components using the T-Handles. Hold the smaller inner T-Handle (FW232R) and use it to apply counter torque while tightening with the larger outer T-Handle (FW231R).
- The mounting post on polyaxial screws should be tightened enough to lock the polyaxial screw body. The mounting post on monoaxial screws need to be tightened enough to cover the break-off tabs and part of the screw body.

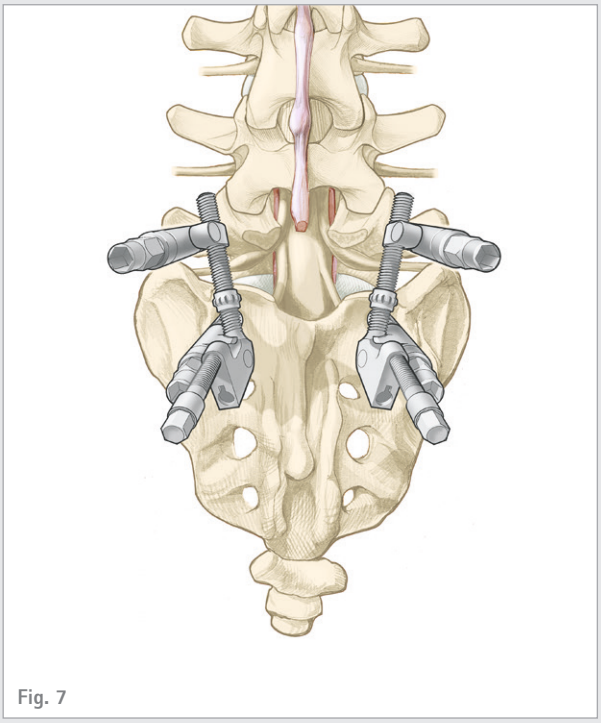


Fig. 7

- The caudal components are labeled "R" for right and "L" for left. Following this labeling leads to lateral placement of the reduction instruments. Alternatively, the devices can be placed medially to the pedicle screws by putting the right on the left and the left on the right.

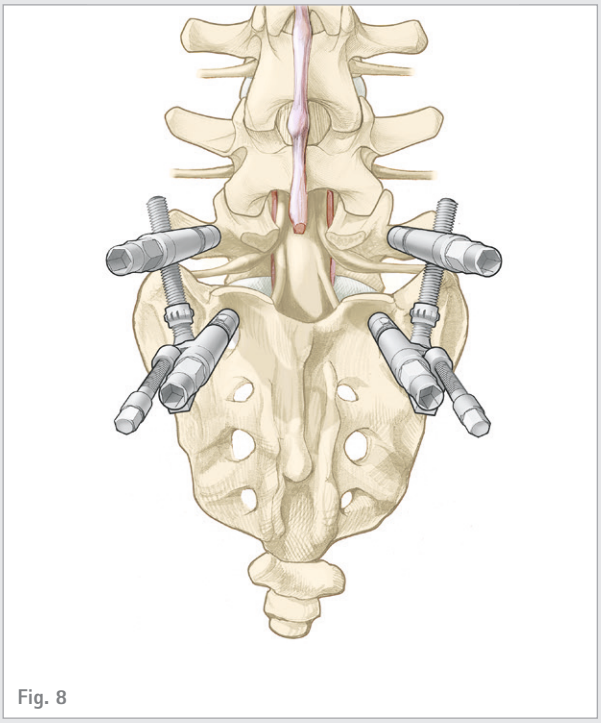


Fig. 8

- Medial placement of the reduction instrument is the preferred method because it usually allows for easier reduction and less soft tissue impingement from the device itself. Lateral placement sometimes allows an easier interbody placement, but can make the reduction maneuver more difficult.
- In order to avoid breaking of the tab during reduction, make sure to fully tighten the SRI device to the pedicle screw prior to performing the reduction.

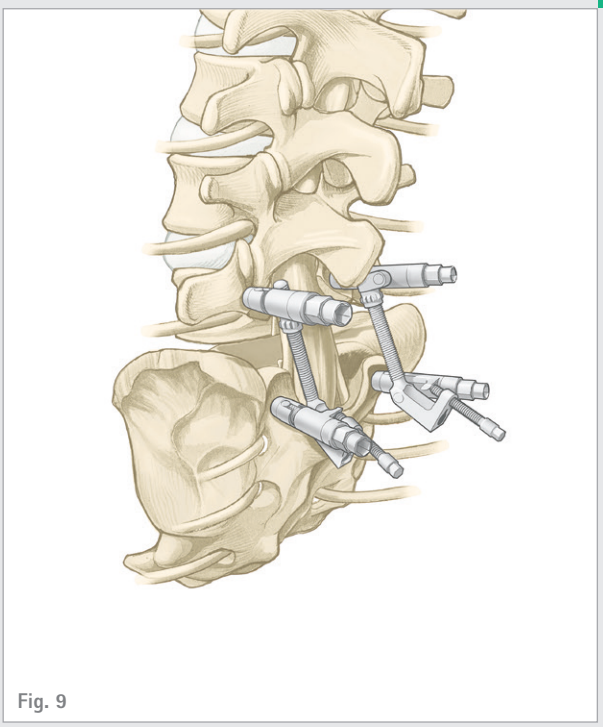


Fig. 9

D.5. Distraction Maneuver

- Using the S4® Distraction Forceps (FW181R) slowly spread the S4® SRI device to achieve the desired distraction and then lock the distraction in place with the distraction nut on the threaded distraction spindle.

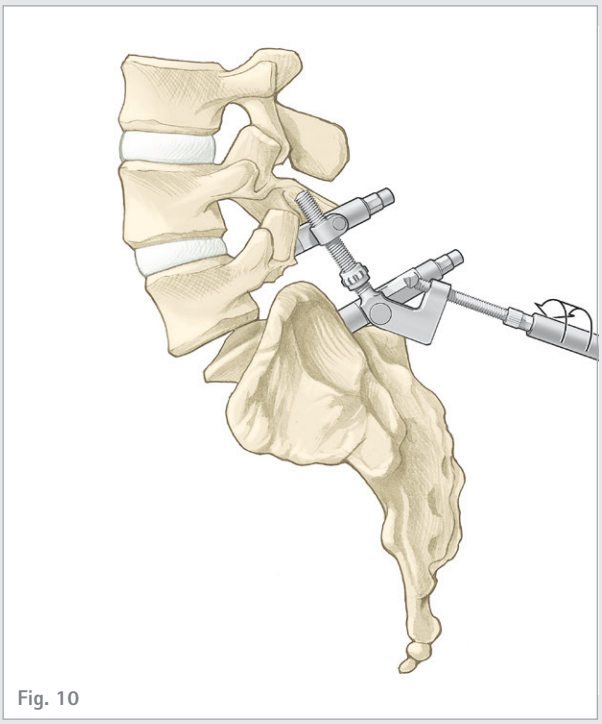


Fig. 10

D.6. Spondylolisthesis Reduction

- Using the large outer T-Handle (FW231R) on the reduction bolt, turn clockwise to carefully reduce the spondylolisthesis under C-arm control.
- Best results are usually achieved by one or two turns of the reduction bolt on alternating sides.
- Monitor the nerve root tension during reduction – typically, a decrease in the nerve root tension will be observed.

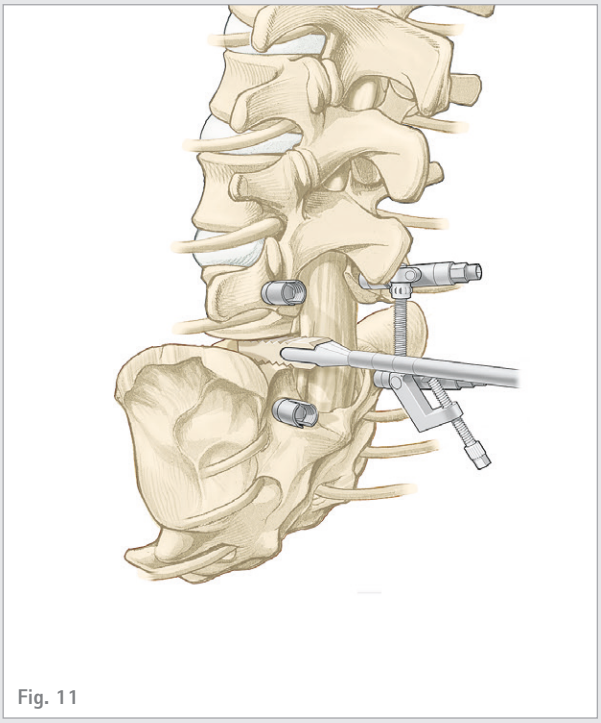


Fig. 11

D.7. Interbody Placement

- Using the T-Handles and applying counter torque, remove the S4® SRI from one side (if required to provide room to work) and perform a routine TLIF or PLIF with the Aesculap PROSPACE or TSPACE interbody fusion implant systems.
- If the S4® SRI was not removed from one side during the previous step, remove one side.

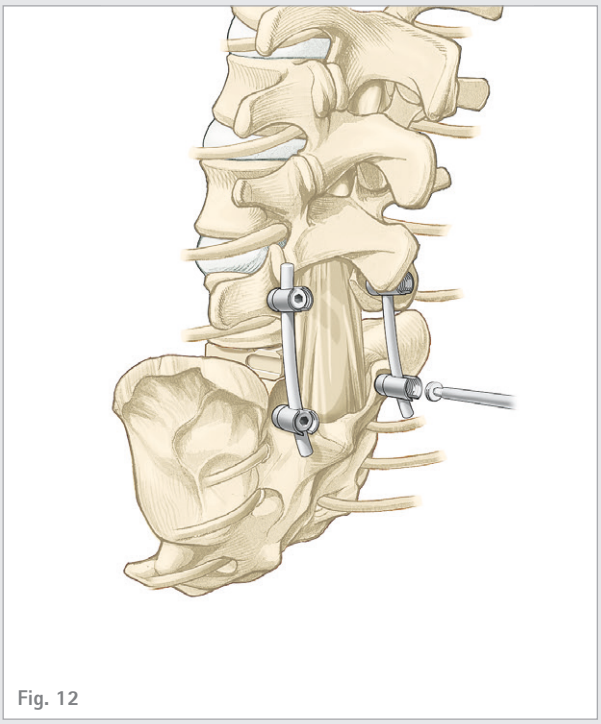


Fig. 12

D.8. Rod Placement

- The flexible Rod Trial (SZ072SU, SZ073SU or SZ074SU) can be used as a guide for rod bending and measuring correct rod length.
- Both pre-bent and straight rods are available.
- If needed, the rod length can be adapted using the Rod Cutter (SZ330R alternative FW206R).
- All rods may be contoured using the French Rod Bender (FW024R).
- To contour the rod, place the rod on the French Rod Bender and squeeze the handle until the desired curvature is achieved. If needed, the Rod Holding Forceps (FW012R) can be used for rotational stability.
- Use the Rod Holding Forceps to assist with rod placement or rod manipulation.

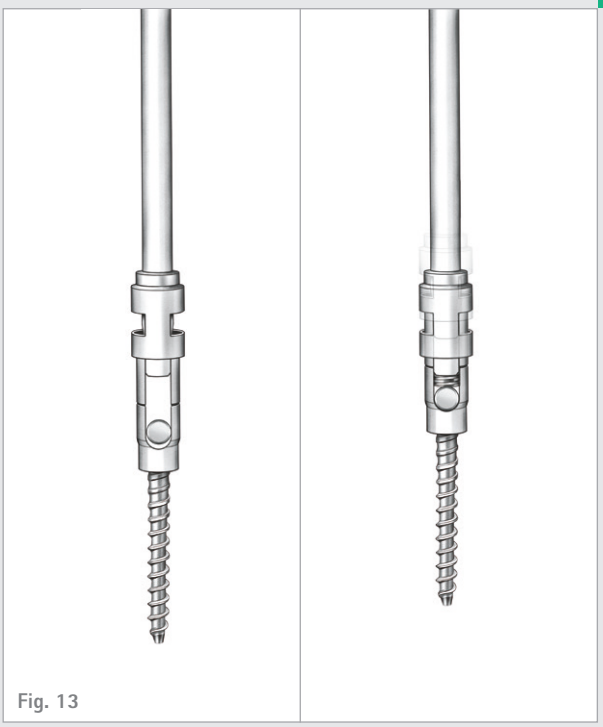


Fig. 13

D.9. Set Screw Placement

- Insert the Set Screw Starter (FW177R) firmly into the set screw and remove the set screw from the caddy. Ensure the set screw is fully engaged to the Set Screw Starter.
- The outer ring of the Set Screw Starter fits onto the flanks of the screw body to ensure the set screw trajectory is correct during initial threading.
- Finger tighten the set screw into the screw body until it contacts the rod.
- Use the Set Screw Revision Screw Driver (FW193R) to remove a tightened set screw.

Note:

The Set Screw Starter is not designed for final tightening of the construct. It is designed to tighten the Set Screw to a depth that still allows compression and distraction maneuvers to be performed.

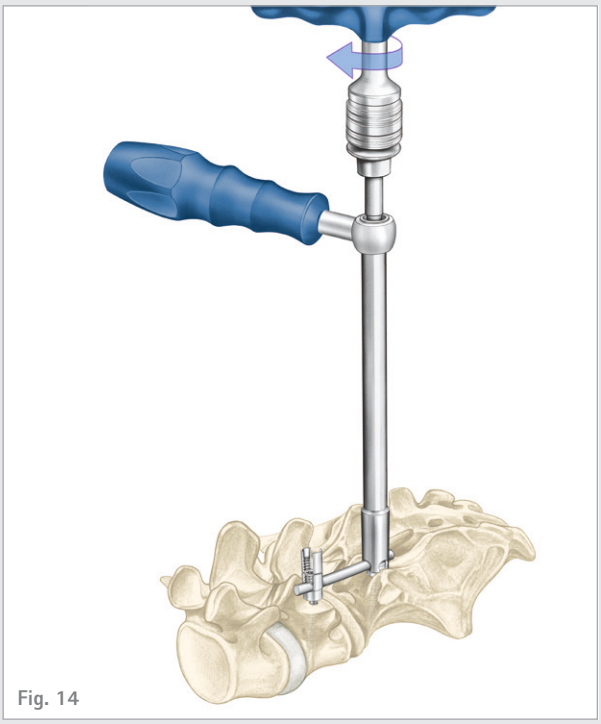


Fig. 14

D.10. Final Tightening

Final tightening of each set screw is completed using the Torque Wrench (FW170R) along with the Counter Torque Handle (FW178R).

- Insert the Torque Wrench through the tube of the Counter Torque so the tip is exposed.
- Fully seat the tip of the Torque Wrench into the socket of the set screw. Engage the Counter Torque tip with the rod.
- Turn the Torque Wrench in a clockwise direction while firmly holding the Counter Torque. Ensure the arrows on the Torque Wrench line up with each other.

Caution:

Do not use the Torque Wrench without the Counter Torque Handle. Over tightening the set screw more than the specified setting of 10 Nm (90 in/lbs) could lead to implant failure. Damaged set screws must be replaced.

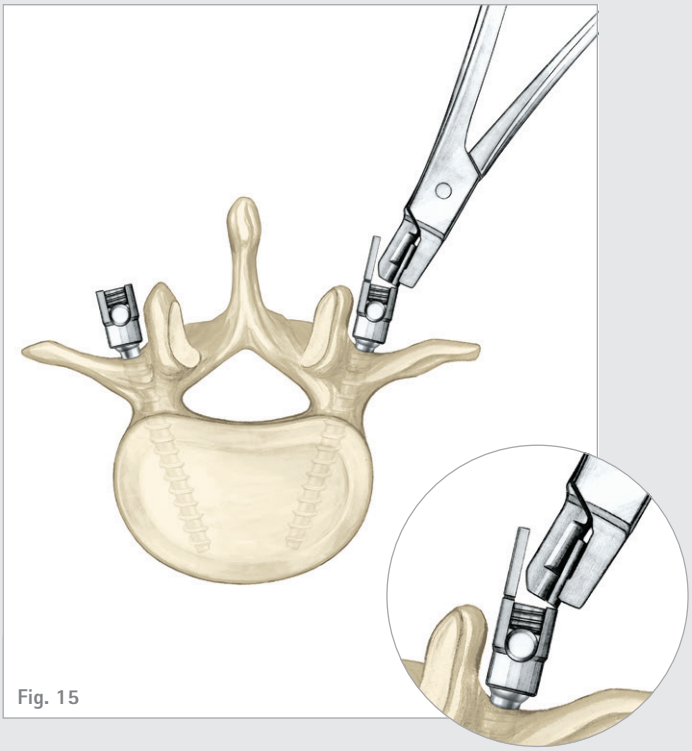


Fig. 15

D.11. Tab Removal

- After verifying that all screws are placed and tightened, remove the tabs with the Tab Breaker (FW179R).

AESCULAP® S4®

E | Surgical Technique – Connector Application

Trusted Experience

Connector Application

AESCULAP® S4®

E | Surgical Technique – Connector Application

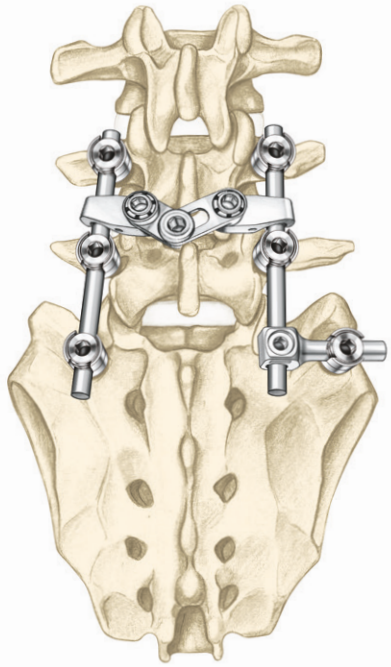


Fig. 1

E.1. Cross Connector Application

In the event that additional rotational stability of the construct is required, a cross connector may be used.

- Determine the appropriate size using the Cross Connector Sizing Template (FW202R).
- Verify there are no obstructions, then insert the cross connector.
- If the cross connector fits properly and is fully seated onto both rods, final tightening can be accomplished by applying 4 Nm (36 in/lbs) of torque to the locking screw using the Cross Connector Torque Wrench (FW207R) and the Cross Connector Counter Torque (FW204R).

If necessary, the optional "bar" style adjustable cross connector can be used.

- The bar style adjustable cross connectors can be contoured using the Cross Connector Bender (FW203R).
- Place the cross connector face-up in the bender and apply the necessary force required to achieve appropriate angle. The maximum angle allowed by the Cross Connector Bender is 20°.

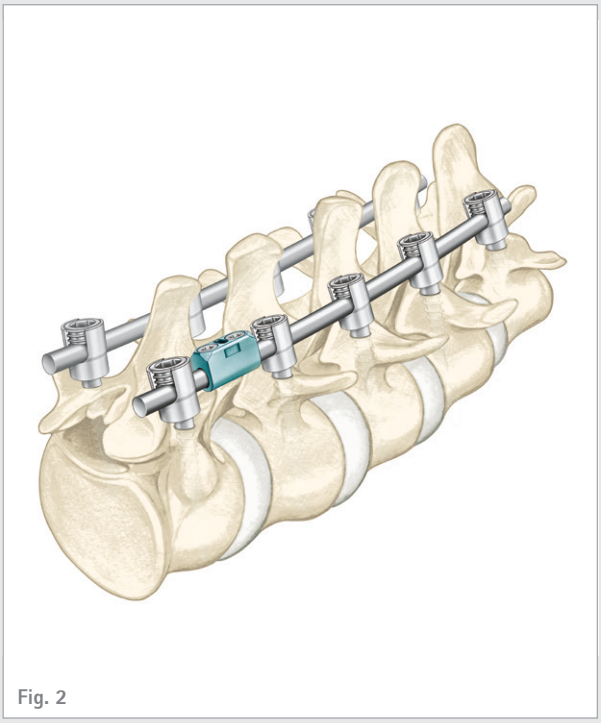


Fig. 2

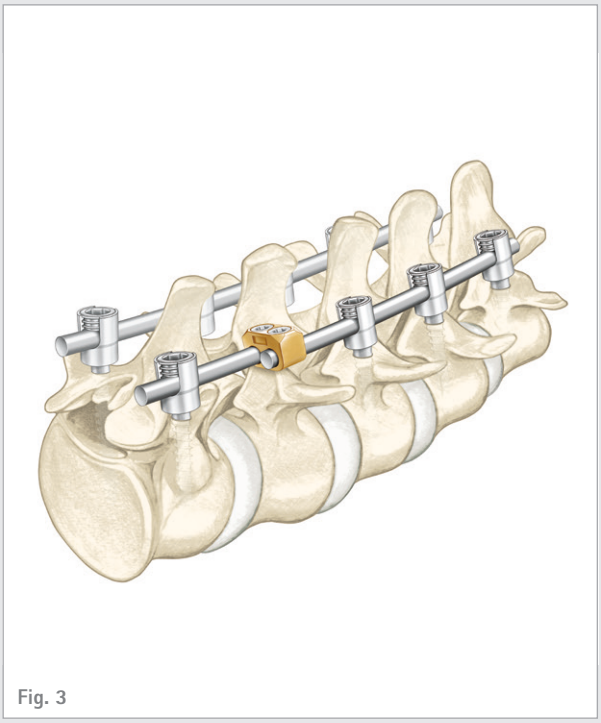


Fig. 3

E.2. Rod Connector Application

A Rod Connector may be used to extend an existing construct in the event of a revision surgery or for a new multilevel construct or to connect to an offset screw.

a) Axial Rod Connector Application

- To place the axial rod connector, first determine required length (short or long).
- Use the Rod Connector Inserter (FW493R) to grab the connector and fully seat the rods inside the connector and confirm adequate rod placement using the provided window on the connector.
- Final tighten by applying 4 Nm (36 in/lbs) of torque using the Torque Wrench (FW207R) and the Rod Connector Counter Torque Device (FW495R).

b) Domino Rod Connector Application

- To place the domino rod connector, first determine required length (7 mm or 11 mm) and desired connector type (open/closed or closed).
- For open/closed style, use the Rod Connector Inserter (FW493R) to grab the connector and slide a rod into the closed hole and then connect to the other rod using the open hole.
- For closed style, use the Rod Connector Inserter to grab the connector and slide both rods into the closed holes prior to placing the rods into the pedicle screw bodies.
- Final tighten by applying 4 Nm (36 in/lbs) of torque using the Torque Wrench (FW207R) and Rod Connector Counter Torque Device (FW495R).

E | Surgical Technique – Connector Application

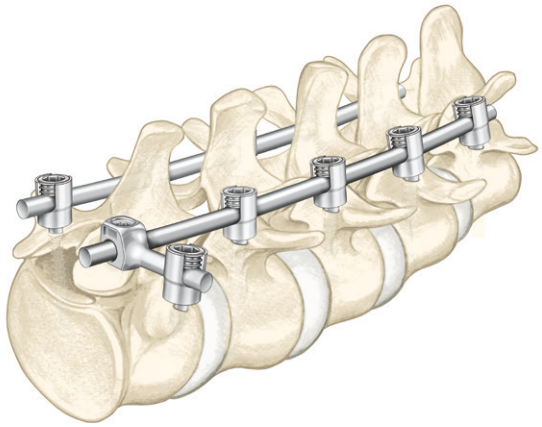


Fig. 4

c) Lateral Offset Rod Connector Application

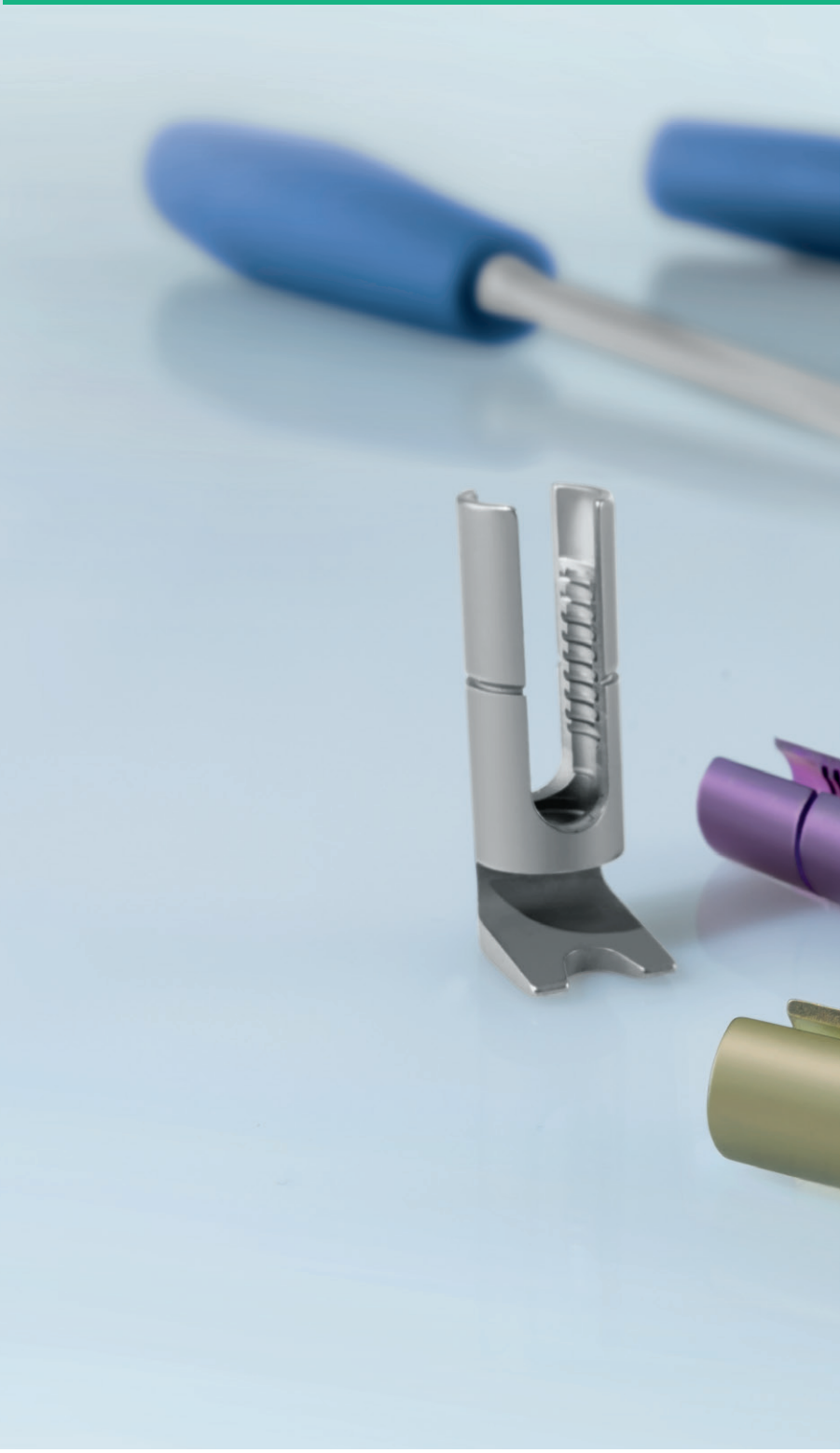
- Determine offset distance between the desired screw and the rod from the main construct and choose desired lateral offset connector type (open / closed or closed).
- Use the Rod Connector Inserter (FW493R) to grab the lateral offset connector and attach it to the rod from the main construct.
- Final tighten by applying 4 Nm (36 in / lbs) of torque using the Torque Wrench (FW207R) and Rod Connector Counter Torque Device (FW495R).

AESCULAP® S4®

F | Surgical Technique – Hook Application

Trusted Experience

Hook Application



AESCULAP® S4®

F | Surgical Technique – Hook Application

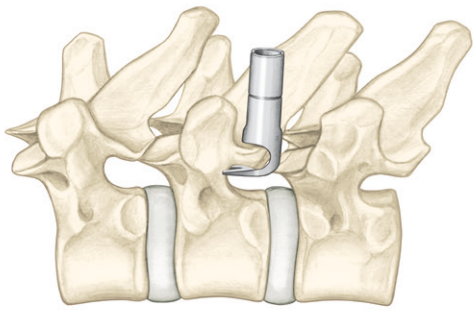


Fig. 1

F.1. Pedicle Hook Application

Pedicle hooks are available in right and left configuration along with two different blade opening sizes.

a) Preparation of Pedicle

- The tip of the inferior part of the articular process of the vertebra is resected using an Osteotome.
- The bed for the pedicle hook is prepared with the Pedicle Preparator (FW151R).
- The Pedicle Preparator crosses the capsule of the facet joint and its fork-shaped tip is set around the inferior part of the pedicle. Ensure that the blade of the Pedicle Preparator does fit to the pedicle, in order to guarantee proper hook placement.

b) Pedicle Hook Insertion

- The hook is attached to the facet joint using the Hook Holder (FW211R) supported by the Hook Pusher (FW212R).
- The hook can be impacted with the Hook Pusher.

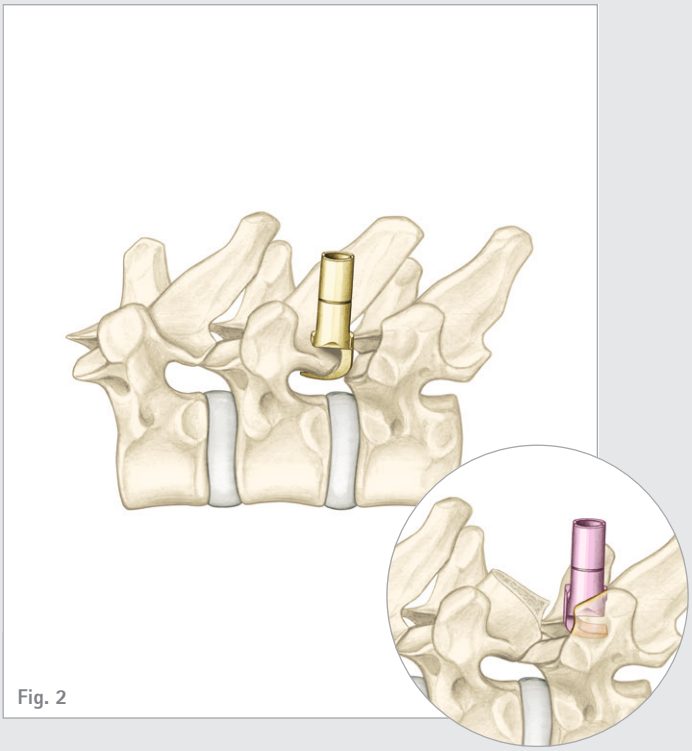


Fig. 2

F.2. Lamina Hook Application

Lamina hooks are available in right and left configurations and also an offset type.

a) Preparation of Lamina

- The spinal lumbar canal has to be opened by incision and resection of the ligamentum flavum. Check the spinal canal with a Dura Palpator before placing the hook.
- The lamina has to be horizontalized to create a bed for the blade of the lamina hook. If lamina hooks are placed on each side, the resection has to be lateralized to avoid contact between the right and the left hook.
- The Lamina Preparator (FW152R) is carefully inserted in the canal to prepare the bed for the lamina hook blade.

b) Lamina Hook Insertion

- The hook is maintained in a horizontal position using the Hook Holder (FW211R) and carefully rotated around the edge of the lamina into a vertical position supported by the Hook Pusher (FW212R).

F | Surgical Technique – Hook Application

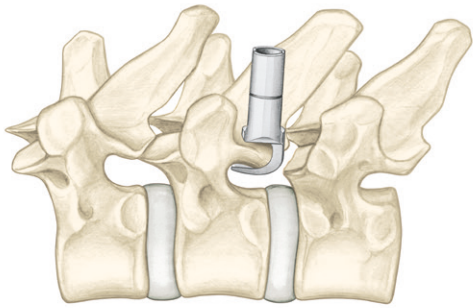


Fig. 3

F.3. Thoracic Hook Application

The smooth, slim design of the thoracic hook is adapted to the shape of the thoracic lamina.

a) Preparation of Lamina

- The spinal lumbar canal has to be opened by incision and resection of the ligamentum flavum. Check the spinal canal with a Dura Palpator before placing the hook.
- The lamina has to be horizontalized to create a bed for the blade of the lamina hook. If lamina hooks are placed on each side, the resection has to be lateralized to avoid contact between the right and the left hook.
- The Lamina Preparator (FW152R) is carefully inserted in the canal to prepare the bed for the lamina hook blade.

b) Thoracic Hook Insertion

- The hook is maintained in a horizontal position using the Hook Holder (FW211R) and carefully rotated around the edge of the lamina into a vertical position supported by the Hook Pusher (FW212R).

AESCULAP® S4®

Implants and Instruments Overview

Trusted Experience

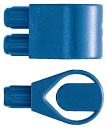
Implants and Instruments

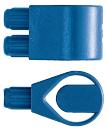

6
5
4
3
2

AESCULAP® S4®

G | Basic Implants and Instruments

FW259P – S4® Implant Tray for Open Approach

Pins for Polyaxial Screws (for Implant Tray)	Article No.	Description	Quantity
	TE854P	Pin for Polyaxial Screw, Ø 4.5 mm, Blue	1 Pack contains 10 pieces
	TE855P	Pin for Polyaxial Screw, Ø 5 mm, Yellow	
	TE856P	Pin for Polyaxial Screw, Ø 6 mm, Grey	
	TE857P	Pin for Polyaxial Screw, Ø 7 mm, Light Blue	
	TE858P	Pin for Polyaxial Screw, Ø 8 mm, Purple	

Pins for Monoaxial Screws (for Implant Tray)	Article No.	Description	Quantity
	TE864P	Pin for Monoaxial Screw, Ø 4.5 mm, Blue	1 Pack contains 10 pieces
	TE865P	Pin for Monoaxial Screw, Ø 5 mm, Yellow	
	TE866P	Pin for Monoaxial Screw, Ø 6 mm, Grey	
	TE867P	Pin for Monoaxial Screw, Ø 7 mm, Light Blue	
	TE868P	Pin for Monoaxial Screw, Ø 8 mm, Purple	

Set Screw	Article No.	Description
	SW790T	S4® Set Screw for Monoaxial / Polyaxial Screws
	SW375T	S4® Set Screw for Monoaxial / Polyaxial Screws cannulated

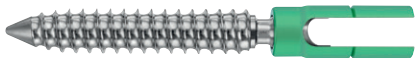
FW259P
Set

Monoaxial Pedicle Screws	Article No.	Size	Description
	**SW701T**	4.5 x 25 mm	S4® Monoaxial Screw, Ø 4.5 mm, non-cannulated
	SW702T	4.5 x 30 mm	
	SW703T	4.5 x 35 mm	
	SW704T	4.5 x 40 mm	
	SW706T	4.5 x 45 mm	
	SW707T	4.5 x 50 mm	
	**SW711T**	5.0 x 25 mm	S4® Monoaxial Screw, Ø 5.0 mm, non-cannulated
	SW712T	5.0 x 30 mm	
	SW713T	5.0 x 35 mm	
	SW714T	5.0 x 40 mm	
	SW716T	5.0 x 45 mm	
	SW717T	5.0 x 50 mm	
	**SW721T**	6.0 x 25 mm	S4® Monoaxial Screw, Ø 6.0 mm, non-cannulated
	SW722T	6.0 x 30 mm	
	SW723T	6.0 x 35 mm	
	SW724T	6.0 x 40 mm	
	SW726T	6.0 x 45 mm	
	SW727T	6.0 x 50 mm	
	SW728T	6.0 x 55 mm	
	SW729T	6.0 x 60 mm	
	**SW731T**	7.0 x 25 mm	S4® Monoaxial Screw, Ø 7.0 mm, non-cannulated
	SW732T	7.0 x 30 mm	
	SW733T	7.0 x 35 mm	
	SW734T	7.0 x 40 mm	
	SW736T	7.0 x 45 mm	
	SW737T	7.0 x 50 mm	
	SW738T	7.0 x 55 mm	
	SW739T	7.0 x 60 mm	
	**SW742T**	8.0 x 30 mm	S4® Monoaxial Screw, Ø 8.0 mm, non-cannulated
	SW743T	8.0 x 35 mm	
	SW744T	8.0 x 40 mm	
	SW746T	8.0 x 45 mm	
	SW747T	8.0 x 50 mm	
	SW748T	8.0 x 55 mm	
	SW749T	8.0 x 60 mm	

FW259P – S4® Implant Tray for Open Approach

Polyaxial Pedicle Screws	Article No.	Size	Description
	SW751T	4.5 x 25 mm	S4® Polyaxial Screw, Ø 4.5 mm, non-cannulated
	SW752T	4.5 x 30 mm	
	SW753T	4.5 x 35 mm	
	SW754T	4.5 x 40 mm	
	SW756T	4.5 x 45 mm	
	SW757T	4.5 x 50 mm	
	SW761T	5.0 x 25 mm	S4® Polyaxial Screw, Ø 5.0 mm, non-cannulated
	SW762T	5.0 x 30 mm	
	SW763T	5.0 x 35 mm	
	SW764T	5.0 x 40 mm	
	SW766T	5.0 x 45 mm	
	SW767T	5.0 x 50 mm	
	SW771T	6.0 x 25 mm	S4® Polyaxial Screw, Ø 6.0 mm, non-cannulated
	SW772T	6.0 x 30 mm	
	SW773T	6.0 x 35 mm	
	SW774T	6.0 x 40 mm	
	SW776T	6.0 x 45 mm	
	SW777T	6.0 x 50 mm	
	SW778T	6.0 x 55 mm	
	SW779T	6.0 x 60 mm	
	SW781T	7.0 x 25 mm	S4® Polyaxial Screw, Ø 7.0 mm, non-cannulated
	SW782T	7.0 x 30 mm	
	SW783T	7.0 x 35 mm	
	SW784T	7.0 x 40 mm	
	SW786T	7.0 x 45 mm	
	SW787T	7.0 x 50 mm	
	SW788T	7.0 x 55 mm	
	SW789T	7.0 x 60 mm	
	SW792T	8.0 x 30 mm	S4® Polyaxial Screw, Ø 8.0 mm, non-cannulated
	SW793T	8.0 x 35 mm	
	SW794T	8.0 x 40 mm	
	SW796T	8.0 x 45 mm	
	SW797T	8.0 x 50 mm	
	SW798T	8.0 x 55 mm	
	SW799T	8.0 x 60 mm	

Polyaxial Pedicle Screws

Article No.	Size	Description
		
SW802T	9.0 x 30 mm	S4® Polyaxial Screw, Ø 9.0 mm, non-cannulated
SW803T	9.0 x 35 mm	
SW804T	9.0 x 40 mm	
SW806T	9.0 x 45 mm	
SW807T	9.0 x 50 mm	
SW808T	9.0 x 55 mm	
SW809T	9.0 x 60 mm	
		
SW812T	10.0 x 30 mm	S4® Polyaxial Screw, Ø 10.0 mm, non-cannulated
SW813T	10.0 x 35 mm	
SW814T	10.0 x 40 mm	
SW816T	10.0 x 45 mm	
SW817T	10.0 x 50 mm	
SW818T	10.0 x 55 mm	
SW819T	10.0 x 60 mm	

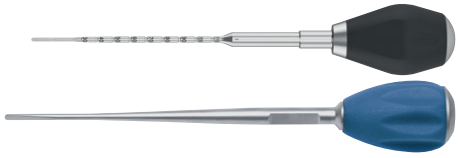
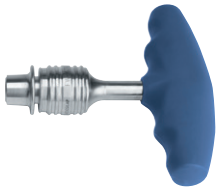
Rods

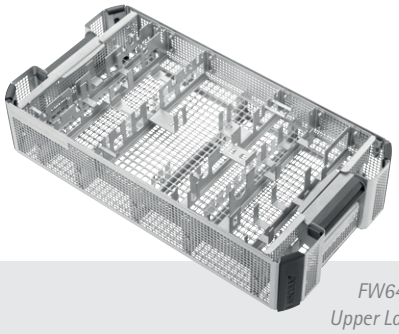
Article No.	Size	Description
		
SW653T	5.5 x 30 mm	Rod, pre-bent, Ø 5.5 mm
SW654T	5.5 x 35 mm	
SW655T	5.5 x 40 mm	
SW656T	5.5 x 45 mm	
SW657T	5.5 x 50 mm	
SW658T	5.5 x 55 mm	
SW659T	5.5 x 60 mm	
SW661T	5.5 x 70 mm	
SW662T	5.5 x 80 mm	
SW663T	5.5 x 90 mm	
SW684T	5.5 x 100 mm	
		
SW674T	5.5 x 35 mm	Rod, straight, Ø 5.5 mm
SW675T	5.5 x 40 mm	
SW676T	5.5 x 45 mm	
SW677T	5.5 x 50 mm	
SW678T	5.5 x 55 mm	
SW679T	5.5 x 60 mm	
SW681T	5.5 x 70 mm	
SW682T	5.5 x 80 mm	
SW664T	5.5 x 100 mm	
SW666T	5.5 x 120 mm	
SW667T	5.5 x 150 mm	
SW668T	5.5 x 180 mm	
SW669T	5.5 x 200 mm	
SW670T	5.5 x 300 mm	
SW671T	5.5 x 400 mm	
SW672T	5.5 x 500 mm	

AESCULAP® S4®

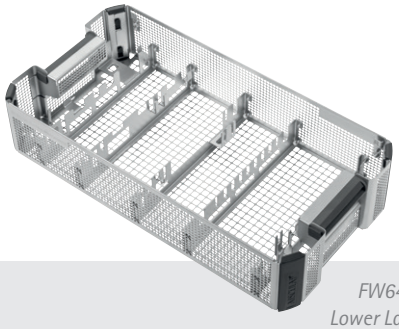
G | Basic Implants and Instruments

FW610 – S4® Basic Instruments

Upper Layer	Article No.	Description	Quantity
	**FW692R**	Percutaneous Cleaning Device	1
	**FW170R**	Torque Wrench	1
	**FW179R**	Tab Breaker	1
	**SZ242R**** **alternative** **FW188R**	Bone Probe, straight	1
	**FW165R**	Ratchet Handle, straight	2
	**FW258M**	K-Wire Aiming Device	2
	**FW271M**	Trocar	1
	**FW352R**	K-Wire Protection Tube	1
	**FW351R**	Screw Length Measuring Device	1
	**FW167R**	Ratchet Handle, T-Shaped	1*



FW649R
Upper Layer



FW649R
Lower Layer

Lower Layer	Article No.	Description	Quantity
	**FW194R**	Screw Tap, Ø 4.5 mm	1
	FW195R	Screw Tap, Ø 5.0 mm	1
	FW196R	Screw Tap, Ø 6.0 mm	1
	FW197R	Screw Tap, Ø 7.0 mm	1
	FW198R	Screw Tap, Ø 8.0 mm	1
	FW356R	Screw Tap, Ø 9.0 mm	1*
	FW357R	Screw Tap, Ø 10.0 mm	1*
	**FW240R**	Rod Insertion Instrument	2
	**FW242R**	Rod Length Measuring Instrument	1
	**FW024R**	French Rod Bender	1
	**FW174R**	Screw Driver with 3.5 mm hex tip	1
	**FW193R**	Set Screw Revision Screw Driver 4 mm hex tip	1
	**FW247S**	K-Wire, blunt	8
	**FW274M**	Handle for removal of FW258	1

Tray and Others	Article No.	Description	Quantity
	FW649R	Tray Basic Instruments	1
	JA455R	Lid for Aesculap OrthoTray DIN w/o handle	1
	TF139	Graphic Template f/FW649R	1*
	TF129	Packing Stencil f/FW649R	1

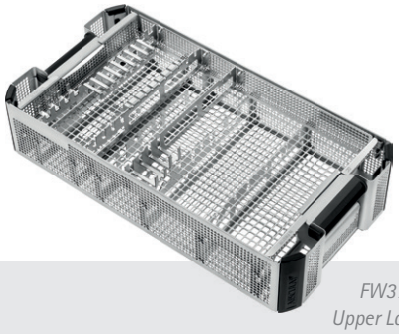
** This article is optional.*
*** Please note that the articles have an older version which is shipped as long as available.*

AESCULAP® S4®

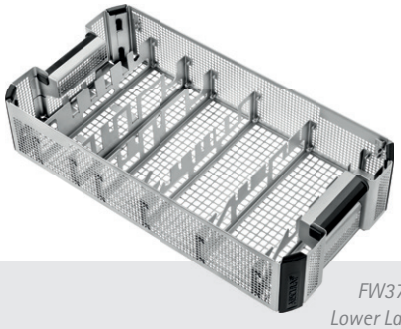
G | Basic Implants and Instruments

FW610 – S4® Open Approach Instruments I

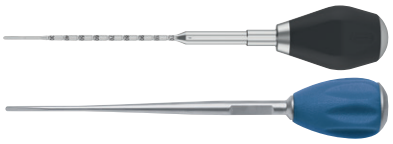
Upper Layer	Article No.	Description	Quantity
	**FW146R**	Pedicle Sounder, straight	1
	**FW147R**	Pedicle Sounder, curved	1
	**SZ249R alternative FW191R**	Pedicle Marker, single band	4
	**SZ248R alternative FW192R**	Pedicle Marker, dual band	4
	**FW208R**	Rod Persuader	1*
Lower Layer	**Article No.**	**Description**	**Quantity**
	**FW012R**	Rod Holding Forceps	1
	**FW154R**	Marnay Lever	2
	**FW270R**	Screw Driver for Polyaxial Screws	2
	**FW262R**	Screw Driver for Monoaxial Screws	2
	**FW177R**	Set Screw Starter	2
	**FW178R**	Counter Torque L-Handle	1



FW377R
Upper Layer



FW377R
Lower Layer

Lower Layer	Article No.	Description	Quantity
	**FW180R**	Screw Body Manipulator	1
	**SZ241R**** **alternative** **FW190R**	Bone Awl	1
	**SZ242R**** **alternative** **FW188R**	Bone Probe, straight	1*
	**SZ243R**** **alternative** **FW189R**	Bone Probe, curved	1
	**FW248R**	Bone Probe, Lenke, straight	1*
	**FW249R**	Bone Probe, Lenke, curved	1*

Tray and Others	Article No.	Description	Quantity
	FW377R	Tray Instruments f/Open Approach I	1
	JA455R	Lid for Aesculap OrthoTray DIN w/o handle	1
	TE993	Graphic Template f/FW377R	1*
	TF127	Packing Stencil f/FW377R	1

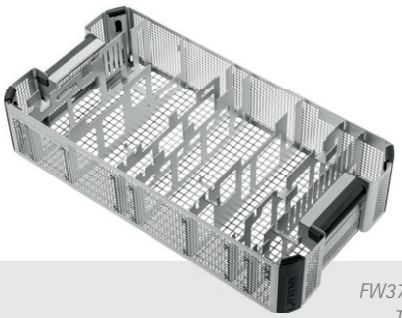
** This article is optional.*
*** Please note that the articles have an older version which is shipped as long as available.*

AESCULAP® S4®

G | Basic Implants and Instruments

FW610 – S4® Open Approach Instruments II

Instruments	Article No.	Description	Quantity
	**FW513R**	Rod Pusher	1
	**SZ072SU**	Rod Bending Template 60 mm	2
	SZ073SU	Rod Bending Template 150 mm	
	SZ074SU	Rod Bending Template 290 mm	
	**FW183R**	De-Rotation Sleeves	6
	**FW210R**	Compression Forceps	1
	**FW184R**	Compression Forceps	1*
	**FW181R**	Distraction Forceps	1*
	**FW023R**	Distraction Forceps, small	2



FW378R
Tray

Tray and Others

Article No.	Description	Quantity
FW378R	Tray Instruments f/Open Approach II	1
JA455R	Lid for Aesculap OrthoTray DIN w/o handle	1
TE994	Graphic Template f/FW378R	1*
TF128	Packing Stencil f/FW378R	1

** This article is optional.*

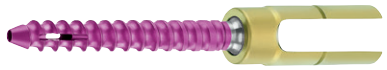
AESCULAP® S4®

G | Cement Application – Implants and Instruments

Additional to FW259P – Implants

Monoaxial Pedicle Screws
(sterile packed)

Article No.	Size	Description
SW510TS	5.5 x 35 mm	S4® Monoaxial Pedicle Screw, Ø 5.5 mm, cannulated
SW515TS	5.5 x 40 mm	
SW518TS	5.5 x 45 mm	
SW519TS	5.5 x 50 mm	
SW531TS	6.5 x 35 mm	S4® Monoaxial Pedicle Screw, Ø 6.5 mm, cannulated
SW532TS	6.5 x 40 mm	
SW533TS	6.5 x 45 mm	
SW534TS	6.5 x 50 mm	
SW536TS	6.5 x 55 mm	
SW537TS	6.5 x 60 mm	
SW538TS	6.5 x 70 mm	
SW539TS	6.5 x 80 mm	
SW541TS	7.5 x 35 mm	S4® Monoaxial Pedicle Screw, Ø 7.5 mm, cannulated
SW542TS	7.5 x 40 mm	
SW543TS	7.5 x 45 mm	
SW544TS	7.5 x 50 mm	
SW546TS	7.5 x 55 mm	
SW547TS	7.5 x 60 mm	
SW548TS	7.5 x 70 mm	
SW549TS	7.5 x 80 mm	

Polyaxial Pedicle Screws (sterile packed)	Article No.	Size	Description
	SW621TS	5.5 x 35 mm	S4® Polyaxial Pedicle Screw, Ø 5.5 mm, cannulated
	SW622TS	5.5 x 40 mm	
	SW623TS	5.5 x 45 mm	
	SW624TS	5.5 x 50 mm	
	SW631TS	6.5 x 35 mm	S4® Polyaxial Pedicle Screw, Ø 6.5 mm, cannulated
	SW632TS	6.5 x 40 mm	
	SW633TS	6.5 x 45 mm	
	SW634TS	6.5 x 50 mm	
	SW636TS	6.5 x 55 mm	
	SW637TS	6.5 x 60 mm	
	SW638TS	6.5 x 70 mm	
	SW639TS	6.5 x 80 mm	
	SW641TS	7.5 x 35 mm	S4® Polyaxial Pedicle Screw, Ø 7.5 mm, cannulated
	SW642TS	7.5 x 40 mm	
	SW643TS	7.5 x 45 mm	
	SW644TS	7.5 x 50 mm	
	SW646TS	7.5 x 55 mm	
	SW647TS	7.5 x 60 mm	
	SW648TS	7.5 x 70 mm	
	SW649TS	7.5 x 80 mm	

Additional to FW649R, FW377R and FW378R – Instruments

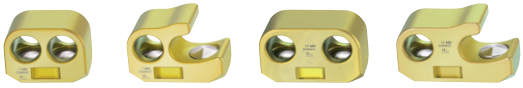
Instrument (sterile packed)	Article No.	Description	Quantity
	SR146SU	S4® Injection Cannula, short, 100 mm	1

AESCULAP® S4®

G | Connector Application – Implants and Instruments

Additional to FW259P – Implants

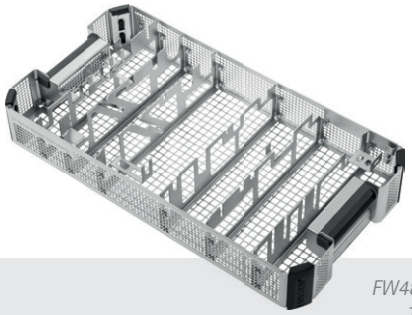
Cross Connectors	Article No.	Size	Description
 	SW690T	21 mm	S4® Cross Connector, straight
	SW691T	25 mm	
	SW692T	29 mm	
	SW693T	32 mm	
	SW694T	35 mm	
	SW695T	38 mm	
	SW696T	41 mm	
	SW490T	28 mm	
	SW491T	30 mm	
	SW492T	32 mm	
	SW493T	34 mm	
	SW488T	35-36 mm	S4® Cross Connector, adjustable
	SW489T	36-38 mm	
	SW494T	38-42 mm	
	SW495T	42-50 mm	
	SW496T	50-60 mm	
	SW497T	60-77 mm	
	SW498T	77-107 mm	
	SW697T	43-49 mm	
	SW698T	49-60 mm	
	SW699T	60-75 mm	

Rod-to-Rod Connectors[1]	Article No.	Size	Description
	SW821T		S4® Parallel Rod Connector
	SW842T/TS	7 mm	S4® Domino Connector, closed
	SW844T/TS	11 mm	
	SW841T/TS	7 mm	S4® Domino Connector, closed/open
	SW843T/TS	11 mm	
	SW838T/TS	19 mm	S4® Axial Connector, short
	SW839T/TS	34.2 mm	S4® Axial Connector, long
	SW847T/TS	20 mm	S4® Lateral Offset Connector, closed
	SW849T/TS	35 mm	
	SW872T/TS	50 mm	
	SW846T/TS	20 mm	S4® Lateral Offset Connector, open
	SW848T/TS	35 mm	
	SW871T/TS	50 mm	

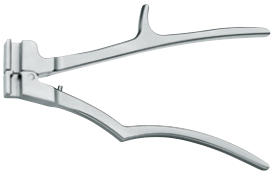
[1] *The rod-to-rod connectors are not included in the basic set and must therefore be orderd separately!*

TS = Sterile packed implants

FW610 – S4® Open Approach Extension



FW489R
Tray

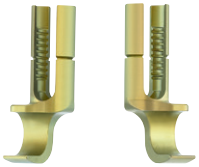
S4® Extension Instruments	Article No.	Description	Quantity
	**FW202R**	Cross Connector Sizing Template	1
	**FW203R**	Cross Connector Bender	1
	**FW204R**	Counter-Torque for Cross Connectors	1
	**FW207R**	Cross Connector Torque Wrench (4 Nm)	1
	**FW491R**	Rod-To-Rod Connector Revis. Screw Driver	1
	**FW493R**	Rod-To-Rod Connector Inserter	1
	**FW495R**	Rod-To-Rod Connector Counter Torque	1
	FW489R	Tray Instruments f/Extensions	1
	JA455R	Lid for Aesculap OrthoTray DIN w/o handle	1
	TF144	Graphic Template f/FW489R	1*
	TF134	Packing Stencil f/FW489R	1

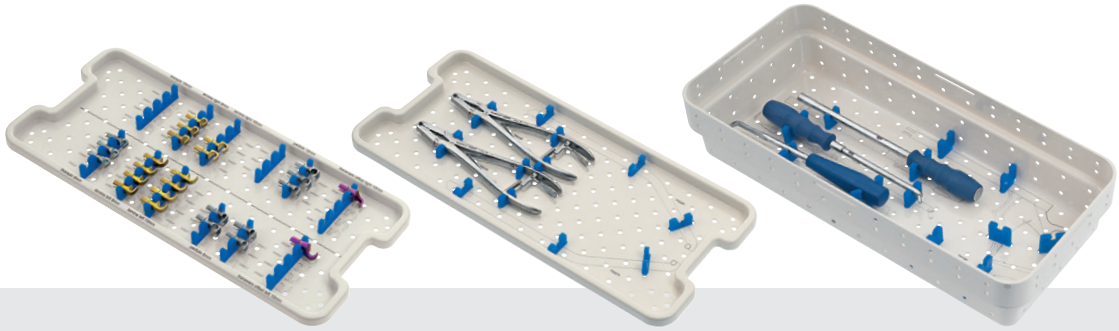
** This article is optional.*

AESCULAP® S4®

G | Hook Application – Implants and Instruments

Additional to FW259P – Implants

Hooks	Article No.	Size	Description
	**SW831T**	6 mm	S4® Pedicle Hook
	SW832T	10 mm	S4® Pedicle Hook
	**SW827T**	6 mm	S4® Lamina Hook, right
	SW829T	10 mm	S4® Lamina Hook, right
	SW826T	6 mm	S4® Lamina Hook, left
	SW828T	10 mm	S4® Lamina Hook, left
	**SW833T**	6 mm	S4® Thoracic Hook
	SW834T	8 mm	S4® Thoracic Hook
	**SW837T**	10 mm	S4® Offset Hook, right
	SW836T	10 mm	S4® Offset Hook, left
	FW160P		Tray for Hook System



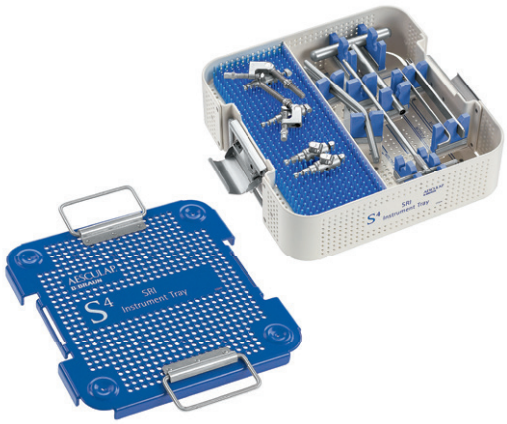
FW160P
Tray

Instruments for Hook Application	Article No.	Description
	**FW211R**	Hook Holder
	**FW212R**	Hook Pusher
	**FW227R**	In-situ-Bender, right
	**FW226R**	In-situ-Bender, left
	**FW151R**	Pedicle Preparator
	**FW152R**	Lamina Preparator

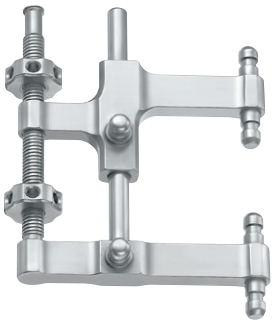
AESCULAP® S4®

G | Spondylolisthesis Reduction – Instruments

Additional Instrumentation

S4® SRI Instruments	Article No.	Description	Quantity
	**FW225R**	Reduction Instrument, left and right incl. 2 reduction levers	1
	**FW231R**	Outer T-Handle for S4® SRI locking sleeve	2
	**FW232R**	Inner T-Handle for S4® SRI screw attachment	2
	**FG321R**	Tightening Key	1*
	**FG322R**	Fast Tightening Key	1*
	**FW246R**	Tray for SRI instruments	1

FW472 - S4® FRI Intruments for open Approach

S4® Open FRI Instruments			
Upper Layer	**Article No.**	**Description**	**Quantity**
	**FW237R**	Fixation Nut Wrench	2
	**FW238R**	Distractor	2
	**FW239R**	Distraction Arm	4
	**FW241R**	Distraction Spindle	2
Lower Layer	**Article No.**	**Description**	**Quantity**
	**FW143P**	Spacer	2
	**FW228R**	Screw Driver	2
	**FW353R**	Outer Sleeve	4
	**FW236R**	Counter Torque	1
	**FW734R**	Rep. Lever Threadpipe Percutaneous	4

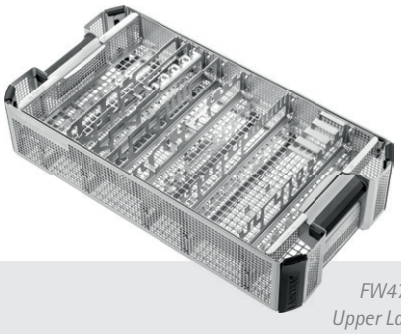
** This article is optional.*

AESCULAP® S4®

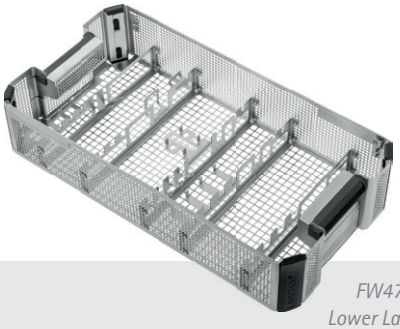
G | Fracture Reduction – Instruments

Additional to FW610

Rods**	Article No.	Size	Description
	SW554T	5.5 x 35 mm	Rod with tip and hexagonal connection, pre-bent, Ø 5.5 mm
	SW555T	5.5 x 40 mm	
	SW556T	5.5 x 45 mm	
	SW557T	5.5 x 50 mm	
	SW558T	5.5 x 55 mm	
	SW559T	5.5 x 60 mm	
	SW561T	5.5 x 70 mm	
	SW562T	5.5 x 80 mm	
	SW563T	5.5 x 90 mm	
	SW564T	5.5 x 100 mm	
	SW566T	5.5 x 110 mm	
	SW567T	5.5 x 120 mm	
	SW573T	5.5 x 35 mm	Rod with tip and hexagonal connection, straight, Ø 5.5 mm
	SW574T	5.5 x 40 mm	
	SW576T	5.5 x 45 mm	
	SW577T	5.5 x 50 mm	
	SW578T	5.5 x 55 mm	
	SW579T	5.5 x 60 mm	
	SW581T	5.5 x 70 mm	
	SW582T	5.5 x 80 mm	
	SW583T	5.5 x 90 mm	
	SW584T	5.5 x 100 mm	
	SW585T	5.5 x 110 mm	
	SW586T	5.5 x 120 mm	
	SW587T	5.5 x 150 mm	
	SW588T	5.5 x 180 mm	
	SW589T	5.5 x 200 mm	Rod with hexagonal connection, straight, Ø 5.5 mm
	SW590T	5.5 x 300 mm	
	SW591T	5.5 x 400 mm	
	SW592T	5.5 x 500 mm	



FW473R
Upper Layer



FW473R
Lower Layer

Tray and Others	Article No.	Description	Quantity
	FW473R	Tray FRI Instruments Open Approach	1
	JA455R	Lid for Aesculap OrthoTray DIN w/o handle	1
	TF143	Graphic Template f/FW473R	1*
	TF133	Packing Stencil f/FW473R	1

** This article is optional.*
*** Are not included in standard implant tray.*

AESCULAP® S4®

Literature

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3. Stulik J, Nesnidal P, Kryl J, Vyskocil T, Barna M. Kyphotic deformities of the cervical spine. 28th Annual Meeting of the AANS/CNS Section on Disorders of the cervical Spine and peripheral Nerves. March 2012 Orlando, Florida.
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5. Finger T, Bayerl S, Onken J, Czabanka M, Woitzik J, Vajkoczy P. Sacropelvic fixation versus fusion to the sacrum for spondylodesis in multilevel degenerative spine disease. Eur Spine J. 2014;23:1013-20.
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Notes

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