## Aesculap<sup>®</sup> S<sup>4®</sup> Spinal System

Augmentation Screws



Aesculap Spine



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### **Field of Application**

The S<sup>4®</sup> Spinal System implants are used for dorsal monosegmental and multisegmental stabilization of the lumbar and thoracic spine. The injection cannulae SR146SU/SR148SU are used for the application of bone cement in combination with augmentation screws.

The augmentation screw allows the surgeon to respond to a reduced bone quality of the patient. Sometimes, the existing bone quality of patients does not provide sufficient fixation ability to ensure the required system stability of internal fixation.

To achieve the desired fixation of the screw, a bone cement, having a defined viscosity, can be injected through the augmentation screw into the vertebral body. The slots provide homogenous cement distribution.

The purpose of the augmentation screws is in line with the existing system requirements and objectives of  $S^{4^{\circ}}$  Spinal System.

### Features

- For use with vertrebroplasty cement
- Cement distribution through side slots
- Screw joint is cement tight but permeable to air: the air in the needle is not pressed into the vertebral body, but escapes at the screw joint
- Injection cannula has a Luer-Lock connector for adaption to a cement applicator
- Both augmentation screws and injection cannulae are single sterile packed
- Two cannula versions a short one for the open approach (SR146SU) and a long one for the percutaneous approach (SR148SU)

Surgical Steps – Open Approach

# Open Approach



### A.1 Screw Placement

The placement of the screws is described in the surgical technique ' $S^{4^{\circ}}$  Spinal System – Posterior Thoracolumbar Stabilization System' (026702).

Select the appropriate screw length. The contact with the anterior cortical wall should be avoided in order not to risk cement leakage.

It is recommended to place the augmentation screw over the K-wire to avoid unwanted penetration of bone into the augmentation area. The K-wire remains in place until the full placement of the screw.

### Note:

- When the augmentation screws are being placed without K-wire, there is a risk of penetration of bone particles, which could interfere with the proper injection of the cement. Therefore it is necessary to check the path by introducing carefully a K-wire under image intensifier control.
- Align the monoaxial screws before introducing the cement. Afterwards, realignment is not possible.

### Danger:

It has to be avoided that the K-wire is pushed too far forward because there is danger of perforation of the aorta.



### Surgical Steps – Open Approach



### A.2 Cannula Attachment

The augmentation cannula is placed over the K-wire, connected with the augmentation screw and hand tightened. The K-wire is removed afterwards.

#### Note:

- When introducing the augmentation cannula it is important to align the polyaxial screw vertically in order to avoid cross threading.
- For each augmentation screw one injection cannula (single use) is required.
- In order to avoid unwanted cement leakage make sure that there is a tight connection between cannula and applier.



### A.3 Cement Application

Attach the cement applier to the cannula. For cement application make sure that the consistency of the cement is pasty (see manufacturers specifications).

#### Note:

- It is important that there is no cement at the connection between applier and cannula.
- When applying cement ensure that the cannula doesn't loose connection.
- Recommended cement quantity: 2 ml Cannula volume: 0.5 ml







Cement injection should be effected under real time image intensifier control:

- Inject cement until it extrudes from the slots. Check that no cement leakage occurs.
- Continue the injection until the adequate quantity of cement is introduced and shows in a cloud pattern.

### Note:

• Check that there is no cement leakage at any time.

The cannula remains in the pedicle screw until the cement has hardened.

Otherwise there is a risk of contamination of the screw head.

### Note:

• The manufacturers specifications for the cement hardening times have to be observed.

The next steps (rod positioning, insertion of the locking screw, ...) are performed according the surgical technique 'S<sup>4®</sup> Spinal System – Posterior Thoracolumbar Stabilization System' (026702).



Surgical Steps – Percutaneous Approach

## Percutaneous Approach



### **B.1 Screw Placement**

The placement of the screws is described in the surgical technique 'S<sup>4®</sup> Spinal System – Percutaneous Approach' (044602). Select the appropriate screw length. The contact with the anterior cortical wall should be avoided in order not to risk cement leakage.

### Note:

- When the augmentation screws are being placed without K-wire, there is a risk of penetration of bone particles, which could interfere with the proper injection of the cement. Therefore it is necessary to check the path by introducing carefully a K-wire under image intensifier control.
- Align the monoaxial screws before introducing the cement. Afterwards, realignment is not possible.

### Danger:

It has to be avoided that the K-wire is pushed too far forward because there is danger of perforation of the aorta.



### Surgical Steps – Percutaneous Approach





### **B.2 Cannula Attachment**

The augmentation cannula is placed over the K-wire, connected with the augmentation screw and hand tightened. The K-wire is removed afterwards. In case of having already removed the K-wire the placement of the cannula can be done by means of the insertion aid (included in the kit).

### Note:

- When introducing the augmentation cannula it is important to align the polyaxial screw vertically in order to avoid cross threading. The marking on the introduction aid must not be visible.
- For each augmentation screw one injection cannula (single use) is required.
- In order to avoid unwanted cement leakage make sure that there is a tight connection between cannula and applier.



### **B.3 Cement Application**

Attach the cement applier to the cannula. For cement application make sure that the consistency of the cement is pasty (see manufacturers specifications).

### Note:

- It is important that there is no cement at the connection between applier and cannula.
- When applying cement ensure that the cannula doesn't loose connection.
- Recommended cement quantity: 2 ml Cannula volume: 0.8 ml



Cement injection should be effected under real time image intensifier control:

- Inject cement until it extrudes from the slots. Check that no cement leakage occurs.
- Continue the injection until the adequate quantity of cement is introduced and shows in a cloud pattern.

### Note:

• Check that there is no cement leakage at any time.

## <u>B.3</u>

### Surgical Steps – Percutaneous Approach



The cannula remains in the pedicle screw until the cement has hardened.

Otherwise there is a risk of contamination of the screw head.

### Note:

The manufacturers specifications for the cement hardening times have to be observed.

The next steps (rod positioning, insertion of the locking screw, ...) are performed according the surgical technique 'S<sup>4®</sup> Spinal System – Percutaneous Approach' (044602).





Article List

### C.1 Monoaxial Screws – Overview

Injection Cannulae	(sterile	packed)
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SR146SU	S4® Injection Cannula, short	100 mm
SR148SU	S <sup>4®</sup> Injection Cannula, long	200 mm

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Monoaxial Screws for Cement Augmentation (sterile packed)						
SW510TS	S4® Monoaxial Screw, Ø 5.5 mm	Ø 5.5 x	35 mm			
SW515TS	S <sup>4®</sup> Monoaxial Screw	Ø 5.5 x	40 mm			
SW518TS	S4® Monoaxial Screw	Ø 5.5 x	45 mm			
SW519TS	S4® Monoaxial Screw	Ø 5.5 x	50 mm			
SW531TS	S4® Monoaxial Screw, Ø 6.5 mm	Ø 6.5 x	35 mm			
SW532TS	S <sup>4®</sup> Monoaxial Screw	Ø 6.5 x	40 mm			
SW533TS	S <sup>4®</sup> Monoaxial Screw	Ø 6.5 x	45 mm			
SW534TS	S4® Monoaxial Screw	Ø 6.5 x	50 mm			
SW536TS	S <sup>4®</sup> Monoaxial Screw	Ø 6.5 x	55 mm			
SW537TS	S <sup>4®</sup> Monoaxial Screw	Ø 6.5 x	60 mm			
SW538TS	S4 <sup>®</sup> Monoaxial Screw	Ø 6.5 x	70 mm			
SW539TS	S4® Monoaxial Screw	Ø 6.5 x	80 mm			
SW541TS	S <sup>4®</sup> Monoaxial Screw, Ø 7.5 mm	Ø 7.5 x	35 mm			
SW542TS	S4® Monoaxial Screw	Ø 7.5 x	40 mm			
SW543TS	S <sup>4®</sup> Monoaxial Screw	Ø 7.5 x	45 mm			
SW544TS	S4 <sup>®</sup> Monoaxial Screw	Ø 7.5 x	50 mm			
SW546TS	S4® Monoaxial Screw	Ø 7.5 x	55 mm			
SW547TS	S <sup>4®</sup> Monoaxial Screw	Ø 7.5 x	60 mm			
SW548TS	S4® Monoaxial Screw	Ø 7.5 x	70 mm			
SW549TS	S <sup>4®</sup> Monoaxial Screw	Ø 7.5 x	80 mm			

### C.2 Polyaxial Screws – Overview

### Polyaxial Screws for Cement Augmentation (sterile packed)

SW621TS	S4® Polyaxial Screw, Ø 5.5 mm	Ø 5.5 x	35 mm
SW622TS	S4® Polyaxial Screw	Ø 5.5 x	40 mm
SW623TS	S <sup>4®</sup> Polyaxial Screw	Ø 5.5 x	45 mm
SW624TS	S4® Polyaxial Screw	Ø 5.5 x	50 mm
SW631TS	S4® Polyaxial Screw, Ø 6.5 mm	Ø 6.5 x	35 mm
SW632TS	S <sup>4®</sup> Polyaxial Screw	Ø 6.5 x	40 mm
SW633TS	S4® Polyaxial Screw	Ø 6.5 x	45 mm
SW634TS	S <sup>4®</sup> Polyaxial Screw	Ø 6.5 x	50 mm
SW636TS	S <sup>4®</sup> Polyaxial Screw	Ø 6.5 x	55 mm
SW637TS	S4® Polyaxial Screw	Ø 6.5 x	60 mm
SW638TS	S <sup>4®</sup> Polyaxial Screw	Ø 6.5 x	70 mm
SW639TS	S4® Polyaxial Screw	Ø 6.5 x	80 mm
SW641TS	S4® Polyaxial Screw, Ø 7.5 mm	Ø 7.5 x	35 mm
SW642TS	S <sup>4®</sup> Polyaxial Screw	Ø 7.5 x	40 mm
SW643TS	S4® Polyaxial Screw	Ø 7.5 x	45 mm
SW644TS	S <sup>4®</sup> Polyaxial Screw	Ø 7.5 x	50 mm
SW646TS	S <sup>4®</sup> Polyaxial Screw	Ø 7.5 x	55 mm
SW647TS	S4® Polyaxial Screw	Ø 7.5 x	60 mm
SW648TS	S <sup>4®</sup> Polyaxial Screw	Ø 7.5 x	70 mm
SW649TS	S <sup>4®</sup> Polyaxial Screw	Ø 7.5 x	80 mm





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