

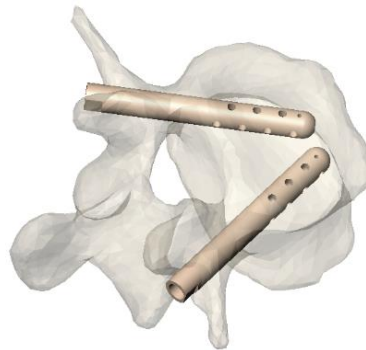
# OPERATIVE TECHNIQUE

*United States Federal law restricts this device to sale by or on the order of a physician or licensed practitioner.*



## Vertebral Implant

V-STRUT® Vertebral Implant is intended for use in the treatment of vertebral fractures.



See also the Instructions for Use:

V-STRUT® Vertebral Implant - Instructions

V-STRUT® Guide Wire and Instrumentation Kit - Instructions

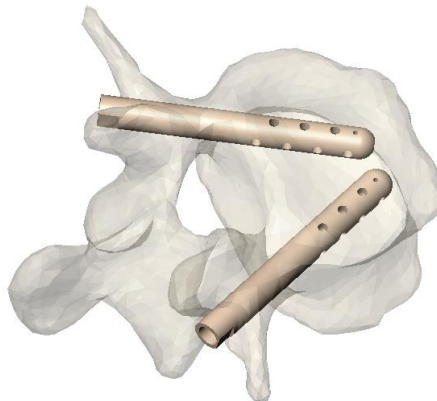
V-STRUT® Bone Filler - Instructions

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## INDICATIONS

V-STRUT® Vertebral Implant is indicated for use in the treatment of vertebral fractures in the thoracic and lumbar spine from T9 to L5. It is intended to be used in combination with vertebroplasty or kyphoplasty bone cement, Teknimed F20® (manufacturer TEKNIMED).



V-STRUT® Vertebral Implant is placed in the vertebrae through a minimally invasive procedure. Two devices are implanted in each vertebra to be treated. Each implant is introduced posteriorly through the pedicle up to the anterior vertebral body wall. A part of the implant is embedded into the pedicle, thus providing posterior support. The other part of the device, located in the vertebral body, presents lateral perforations, which allow acrylic bone cement diffusion, filling of the vertebral body, implant fixation, and support of the upper endplate. The combination of the implant and the cement allows the treatment of vertebral fractures.

The implant is made of radio transparent PEEK (PolyEther Ether Ketone) polymer and includes visualizing markers made of Tantalum which make the implant visible in-situ.

The device is intended to be implanted using a Guide Wire and the Instrumentation Kit.

V-STRUT® Vertebral Implant is part of V-STRUT® Transpedicular Vertebral System.

V-STRUT® Transpedicular Vertebral System is composed of:

- V-STRUT® Vertebral Implant
- V-STRUT® Guide Wire
- V-STRUT® Instrumentation Kit

V-STRUT® Bone Filler is used to inject bone cement through V-STRUT® Vertebral Implant. See V-STRUT® Bone Filler Instructions For Use.

References for each item of the V-STRUT® Transpedicular Vertebral System and V-STRUT® Bone Filler are described in section “References”.

Additional equipment, such as trocar and bone cement, is needed to perform the procedure. See section “Additional necessary equipment”.

In addition to the operative technique, please consult the V-STRUT® Vertebral Implant - Instructions, V-STRUT® Guide Wire and Instrumentation Kit - Instructions and V-STRUT® Bone Filler - Instructions.

# OPERATIVE TECHNIQUE

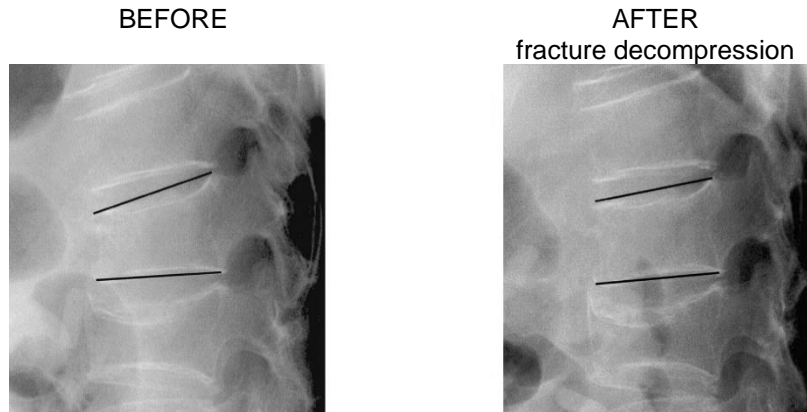
## 1. Patient preparation and precautions

V-STRUT® Vertebral Implant implantation requires anesthesia.

The patient lies in a prone position on the operating table.

Imaging equipment must be available for 3D-control of each operative step.

If needed, fracture decompression is performed by patient positioning on the table (postural correction using pillows).



The transpedicular approach requires that the minimal internal pedicle dimension is larger than the implant diameter (see implants sizes in section “References”) to avoid pedicle fracture during implant insertion.


- V Pre-operative imaging of the surgical level is therefore mandatory to ensure that the anatomical dimensions are compatible with the V-STRUT® Vertebral Implant range of sizes.**
- V This operative technique can only be performed by an experienced spine practitioner trained in the operative technique.**
- V The patient must be immobilized for V-STRUT® Vertebral Implant implantation.**
- V 3D-imaging (or at least anteroposterior and lateral) is required during the whole procedure to check the proper progress of the operating steps and the good positioning of the device.**
- V All operative steps are performed with the guidewire securely in place. If the guidewire is pulled out during the procedure, it must be re-inserted immediately, and imaging control is mandatory to check its good repositioning in all planes.**
- V V-STRUT® Vertebral Implant is made of radiotransparent PEEK polymer raw material and it is made visible on imaging by means of tantalum markers positioned at each implant end.**

**Before starting the procedure:**

- V Ensure that the appropriate instrument kit and an adequate quantity of implants sizes and accessories are available in the operating room (see section “References”).**
- V Ensure that the additional material necessary for the procedure is available, such as Teknimed F20® bone cement, compliant with the V-STRUT® Vertebral Implant Instructions, and its preparation and injection kit (see section “Additional necessary equipment”).**

## 2. Procedure

### Positioning of guide wires

Ref	Quantity	Name	Picture and description
32300	2	Guide wire	 Ø 1.60 mm – length 400 mm The guide wire is used to define the implant positioning in the vertebrae and used to insert cannulated instruments in their correct positioning.

One guide wire must be used for each pedicle.

**V During the whole procedure, ensure that guide wires are not twisted or damaged. If so, it is mandatory to replace the guide wires with new ones.**

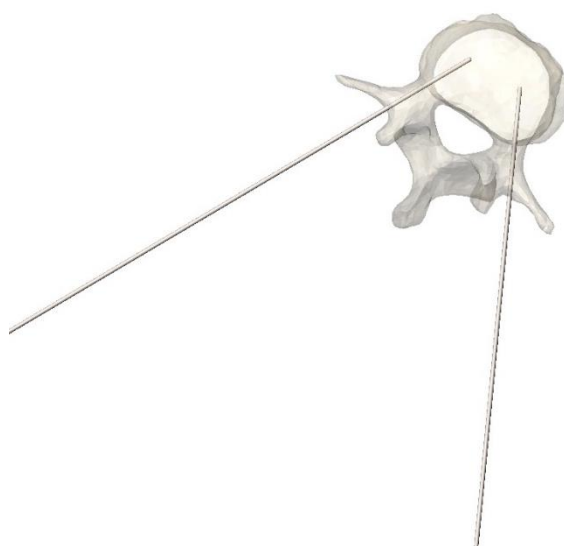
**1.** Insert a trocar (can be provided by Hyprevention, see section “Additional necessary equipment”) centered through the pedicle up to 1/3 of the vertebral body, centered between superior and inferior endplates.

**2.** After removal of the central part of the trocar, insert the guide wire into the trocar. It is recommended to position the guide wire up to the center of the vertebral body (between the posterior wall and anterior wall).



**3.** Remove trocar.

**4.** Repeat steps 1 to 3 in the second pedicle (same trocar can be used, a second guidewire is needed).

**V Ensure that the second implant will not interfere with the first one when the second guide wire is inserted.**



## Positioning of tube

Ref	Quantity	Name	Picture and description
32020	1	Dilator	 <p>The dilator is a cannulated instrument used to expand a passage through soft tissues from the skin to the pedicle entry.</p>
32010	2	Tube	 <p>The tube is a cannulated instrument used to protect the soft tissue within the passing of the drills and implant-holders.</p>

One dilator is used for both sides. One tube must be used for each pedicle access.

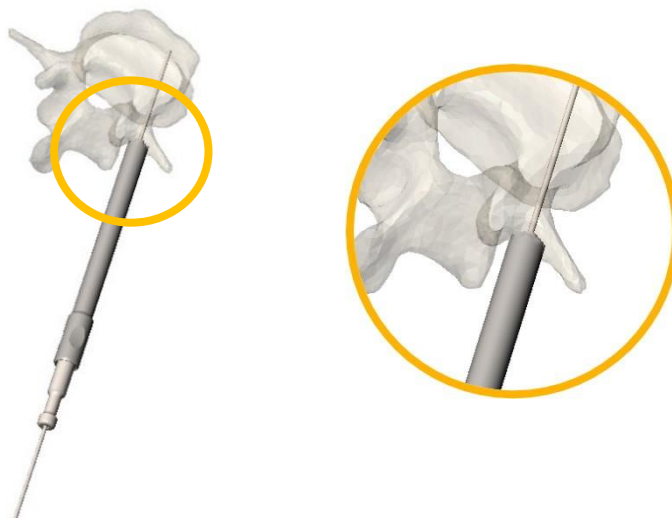
**5.** Insert dilator over the guide wire up to the bone (pedicle entry).



**6.** Insert the tube over the dilator up to the bone (pedicle entry).

**V** Ensure that the distal extremity is not in contact with the facet joint, but in contact with pedicle entry.




**V** Ensure that the distal extremity is in contact with the bone during the whole procedure.



7. Remove dilator. Protection tube is in place.

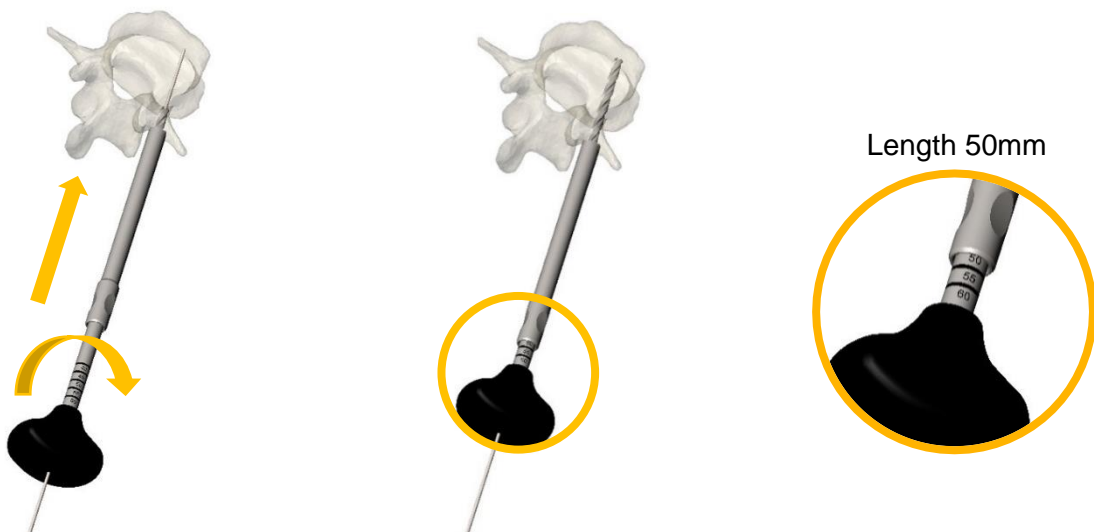


Drilling implant cavity

Ref	Quantity	Name	Picture and description
34500	1	Drill 4.5	 The drill 4.5 is used for the pre-drilling of the implant bed from 40 mm to 60 mm long into the vertebrae from the pedicle entry to the vertebral body.
35500	1	Drill 5.5	 The drill 5.5 is used for the drilling of 5.5 mm diameter implant bed from 40 mm to 60 mm long, or as a pre-drilling in case of the use of a 6.5 mm diameter implant.
36500	1	Drill 6.5	 The drill 6.5 is used for the drilling of 6.5 mm diameter implant bed from 40 mm to 60 mm.

**V** Ensure that at least an Ø 5.5 mm device can be inserted in the pedicles without any damage or risk of fracture.

8. Pre-drilling: insert drill Ø 4.5 mm (black handle) over the guide wire through the tube until it reaches the bone, then drill the cavity for the implant through the pedicle by turning the handle clockwise.



**V** Imaging 3D-control of the drilling progression is required.

**V** Check that the guide wire does not move during the drilling and does not pierce the anterior cortical wall of the vertebral body.

**9.** Stop drilling when the drill is about 5 to 10 mm from the anterior wall cortex, within the limit of 5 mm MAXIMUM.

**10.** Read the implant size (in length) in between the two marker lines of the drill: 40-45-50-55-60 mm.

**11.** Remove the drill by turning the handle counterclockwise. Be careful to maintain the guide wire in position during drill removal.



**V** If the guidewire is pulled out when removing the drill, it must be re-inserted immediately, and imaging control is mandatory to check its good repositioning in all planes.

**12.** Insert drill Ø 5.5 mm (grey handle) over the guide wire through the tube until it reaches the bone, then drill the cavity for the implant through the pedicle by turning the handle clockwise.

**V** Imaging 3D-control of the drilling progression is required.

**V** Check that the guide wire does not move during the drilling and does not pierce the anterior cortical wall of the vertebral body.

**13.** Stop drilling when the drill is about 5 to 10 mm from the anterior wall cortex, positioning the drill between two marker lines and within the limit of 5 mm MAXIMUM.





**14.** Read the implant size in between the two marker lines of the drill: 40-45-50-55-60 mm.

**15.** Remove the drill by turning the handle counterclockwise (see step 11.). Be careful to maintain the guide wire in position during drill removal. Make sure the implant cavity is cylindrical to allow implant insertion.

**V** If the guidewire is pulled out when removing the drill, it must be re-inserted immediately, and imaging control is mandatory to check its good repositioning in all planes.

**V** The implant cavity may not be too close to the anterior wall thus avoiding cement leakage during cement injection.

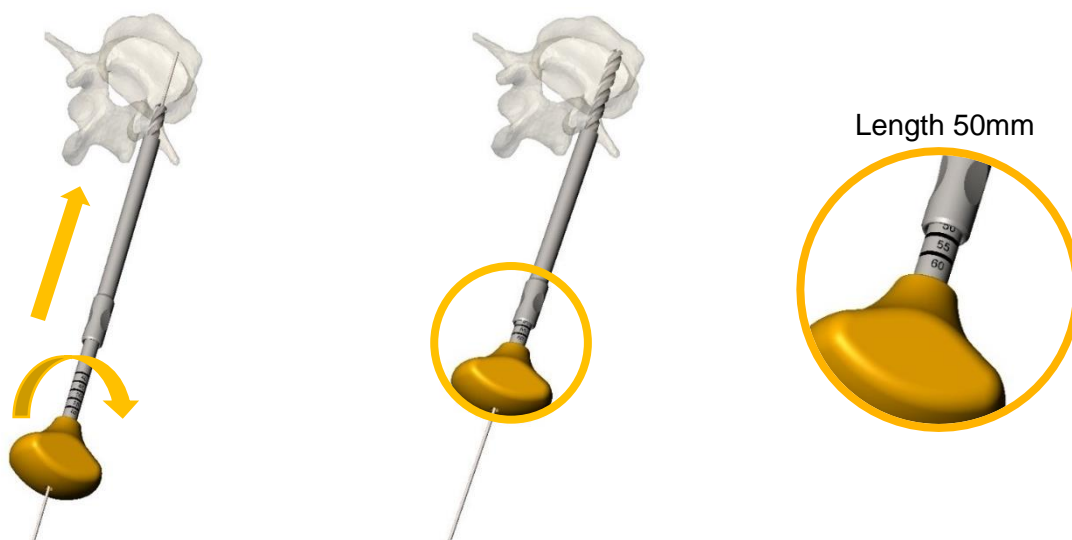
**16.** Select the corresponding implant size (length and diameter).

**Example** Implant 35550: Ø5.5 L50 mm

5.5  
L50

**17.** In the case of large pedicles, an implant diameter of 6.5 mm can be used. In this case, insert drill Ø 6.5 mm (yellow handle) over the guide wire through the tube until it reaches the bone, then drill the cavity for the implant through the pedicle by turning the handle clockwise. Stop drilling when the drill is about 5 to 10 mm from the anterior wall cortex, positioning the drill between two marker lines, and within the limit of 5 mm MAXIMUM.

**18.** Read the implant size in between the two marker lines of the drill: 40-45-50-55-60 mm.



**19.** Remove the drill by turning the handle counterclockwise (see step 11.). Be careful to maintain the guide wire in position during drill removal. Make sure the implant cavity is cylindrical to allow implant insertion.

**V** If the guidewire is pulled out when removing the drill, it must be re-inserted immediately, and imaging control is mandatory to check its good repositioning in all planes.

**20.** Select the corresponding implant size (length and diameter).

**Example** Implant 36550: Ø6.5 L50 mm




6.5  
L50

**V** It is recommended to use the same implant diameter on both sides.

**NOTE:** Any combination of implants length can be used to fit each patient's anatomy.


**21.** Remove the drill by turning the handle counterclockwise (see 11.). Be careful to maintain the guide wire in position during drill removal. Make sure the implant cavity is cylindrical to allow implant insertion.

## Assembling implant on implant-holder (gripper + positioner)

Ref	Quantity	Name	Picture and description
35540 36540 35545 36545 35550 36550 35555 36555 35560 36560	2	Implant	 <p>The implants are provided in 2 diameters and 5 lengths (see section "References").</p>
32050	2	Gripper	 <p>The gripper is a cannulated instrument. It is the inner part of the implant holder. It is used to hold and introduce the implant into the bone, in a correct position prior to release the implant.</p>
32060	2	Positioner	 <p>The positioner is the outer part of the implant holder. It is used to hold and introduce the implant into the bone in a correct position prior to release the implant.</p>

One implant must be placed in each pedicle.

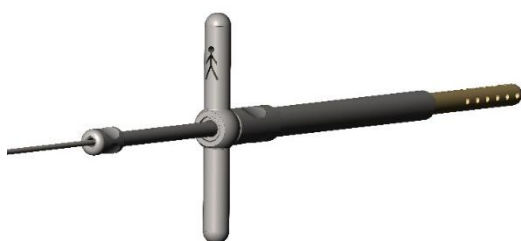
**22.** Insert the gripper into the positioner.

**23.** Insert the implant previously selected into the positioner according to the symbol  (a) until the two are in contact (b).



**24.** Hold the implant and the positioner in one hand while pushing and screwing the gripper clockwise into the implant until you feel resistance.

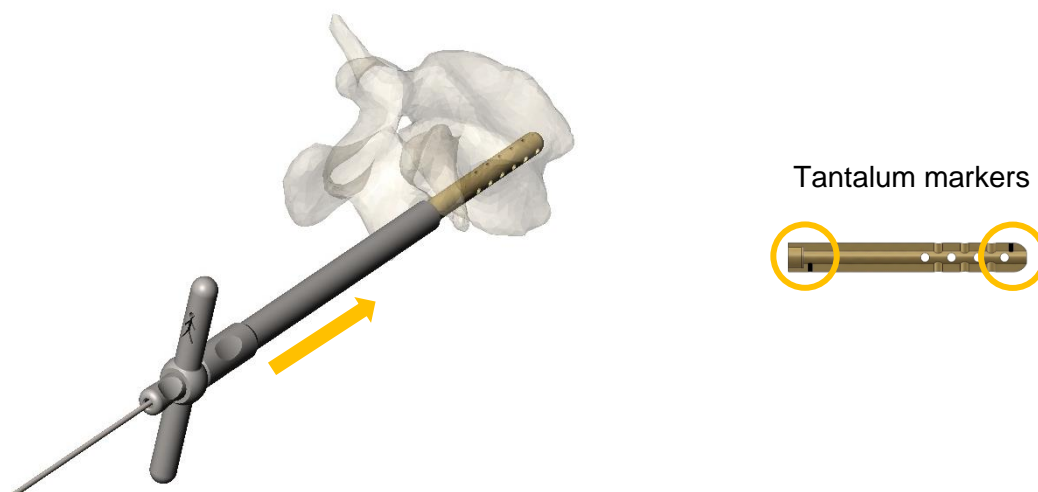
**V** Do not screw the gripper excessively in order not to damage the implant made of polymer.




**V** Ensure that the implant is lined up with the implant-holder. If not, start assembling again.

## Positioning implant

**25.** Insert gently the implant by means of the implant-holder over the guide wire. The implant is radio transparent, yet it has visualizing markers made of tantalum at its distal and proximal end.



Respect the symbol orientation  on the handle of the implant-holder. The T-handle must be parallel to the axis of the spine.

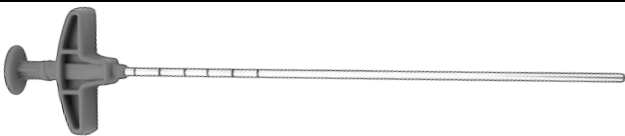
**V** It is possible to use a hammer to gently insert the implant in its cavity. Gently tap on T-handle.

**V** Do not perform the cement injection before insertion of the second implant.

## Positioning of second implant

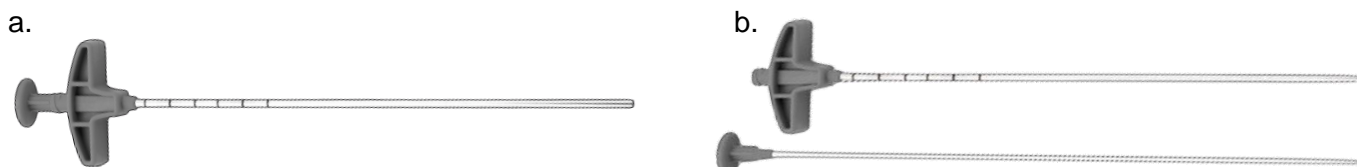
**26.** Repeat steps 5 to 25 through the contralateral pedicle of the vertebra.

## Cement injection

Ref	Quantity	Name	Picture
32600	1 or 2	Bone Filler	 <p>The bone filler is a needle intended to inject bone cement in the vertebral body of the vertebral body through the instrumentation.</p>

One bone filler can be used for both pedicles or one in each pedicle.

The below pictures show the bone filler in its entirety with the pusher stylet coming inside (a). The pusher stylet apart from the bone filler (b).



A minimum of 10cc of cement with the corresponding injection material is required separately, in compliance with the V-STRUT® Vertebral Implant Instructions.

**27.** Prepare the cement according to the manufacturer's Instructions For Use.

**V** Respect the manufacturer's instructions to prepare and use the cement.

**V** Review the bone cement Instructions For Use before mobilizing the patient.

**28.** Remove the pusher stylet and connect the injection system to the standard Luer-lock connection of bone filler.

**29.** Prefill the bone filler with cement before inserting it into the implant to prevent air from coming in.

**30.** Remove one guide wire and gently insert the bone filler into the implant-holder up to the center of the vertebral body.



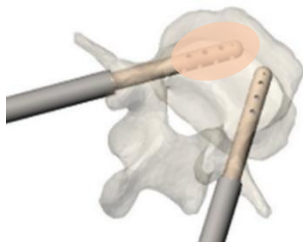
**31.** Progressively inject the cement in the vertebral body, through the implant. The cement flows out of the implant through its lateral holes.

**32.** Repeat steps 27 to 31 for the second implant.

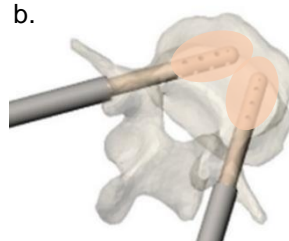
**V** Cement injection must be performed carefully to avoid any extravasation / cement leakages.

During injection, ensure by imaging control that the cement is going through the lateral perforations of the implant and that it is distributed homogeneously on one side (a), and on the other side (b).

a.

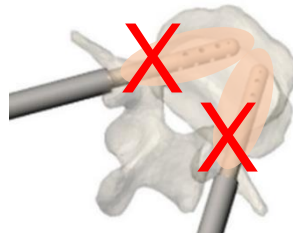
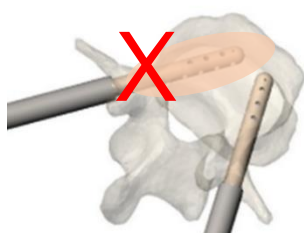


b.



**V** Cement must not be injected in the pedicles.

**V** The implant-holders must not get into contact with the cement, it may impede implant-holder removal and/or involve the implant removal.



**33.** Remove bone filler.

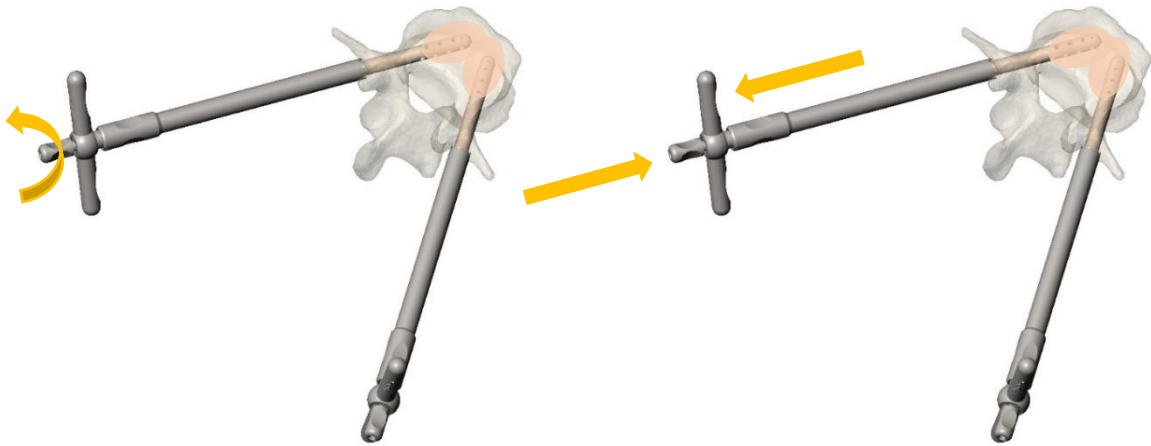
### 3. Instruments removal and suture of incisions

Disassembling the implant–holders.

**34.** Start on side cement was injected first.

**35.** Unscrew gripper (round handle) while holding positioner (T shape handle) in position, until gripper is fully unscrewed (loose).

**36.** Push on gripper and pull-out positioner simultaneously to release implant.

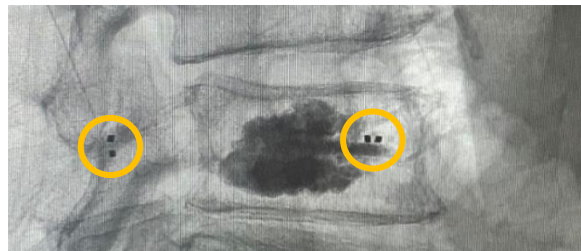
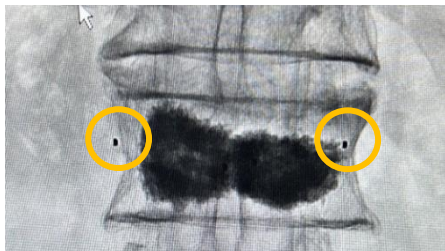


**37.** Remove implant holder (gripper + positioner), ensure that implant remains in position (markers control).

**38.** Remove tube.

**39.** Repeat steps 34 to 38 to remove the instruments on other side.

**V** Ensure by 3D imaging control that the implants are well positioned and there are no remaining cement residues in the tissues (it is recommended to be removed cement residues).



**40.** Suture the incisions.

**V** Ensure the patient stays in a prone position on the operating table (no mobilization) until the cement is polymerized as specified by the cement manufacturer. (See Instructions For Use).

## 4. Instrument cleaning at the end of procedure

At the end of the procedure all instruments must be completely disassembled, as presented in the list of instruments (See section “References”).

Check that the instruments were not damaged during the procedure. It is imperative to replace a damaged instrument as it could injure the patient or compromise the procedure during the next intervention.

**V Ensure that there is no cement residue on/in the instruments.**

**V Ensure that the cutting parts of the drills remain sharp.**

**V Ensure that the laser markings on the drills are always legible in order to select the appropriate implant size.**

**V Ensure that the screw and gripper threads are not damaged.**

Each instrument or part of it will be cleaned individually.

The damaged instruments must be replaced before performing a new procedure.


For instruments / Guide wire cleaning and sterilization see V-STRUT® Guide Wire and Instrumentation Kit – Instructions.

## 5. Revision procedure


See V-STRUT® Instructions For Use.

## 6. V-STRUT® References


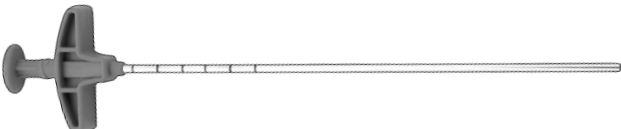
### V-STRUT® Implant 5.5

Ref	Diameter (mm)	Length (mm)	Material	Image
35540	5.5	40	PEEK	 Provided sterile in individual packaging.
35545		45		
35550		50		
35555		55		
35560		60		

### V-STRUT® Implant 6.5









Ref	Diameter (mm)	Length (mm)	Material	Image
36540	6.5	40	PEEK	 Provided sterile in individual packaging.
36545		45		
36550		50		
36555		55		
36560		60		

## V-STRUT® Single use accessories

Ref	Quantity	Name	Image
32300	2	Guide Wire	 Provided non-sterile (See Instructions For Use)
32600	1 or 2	Bone Filler	 Provided sterile in individual packaging (See Instructions For Use)

## V-STRUT® Reusable instruments set (ref 32500)

(See Instructions For Use for cleaning and sterilization)

Ref	Quantity	Name	Picture
32010	2	Tube	
32020	1	Dilator	
34500	1	Drill 4.5	
35500	1	Drill 5.5	
36500	1	Drill 6.5	
32050	2	Gripper	
32060	2	Positioner	
32400	1	Container	

All instruments and accessories are made of stainless steel, except for the handles of the drills which are in polypropylene.

## 7. Additional necessary equipment

The following material must be available before V-STRUT® procedure.

It can be provided by Hyprevention:

- Trocar 11G or 13G - Length 100 to 150 mm, qty 1 or 2.
- Teknimed F20® Bone Cement (see the V-STRUT® Vertebral Implant Instructions For Use to choose the appropriate bone cement), qty 1 or 2.
- Corresponding material to prepare and inject the cement, qty 1 or 2.





V-STRUT® Instructions For Uses in force are available on the website [instructions.hy prevention.com](https://instructions.hy prevention.com).  
Or contact Hy prevention, see details below.

## Manufacturer



### **Hy prevention SAS**

Plateforme Technologique d'Innovation Biomédicale (PTIB)

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## Revision

The revision in force is available on the website [instructions.hy prevention.com](https://instructions.hy prevention.com). Should the user use a copy of this electronic revision he/she is responsible for verifying that he/she uses the version in force.

Copies are available on request at [contact@hy prevention.com](mailto:contact@hy prevention.com)

Date of the latest revision: August 30, 2023