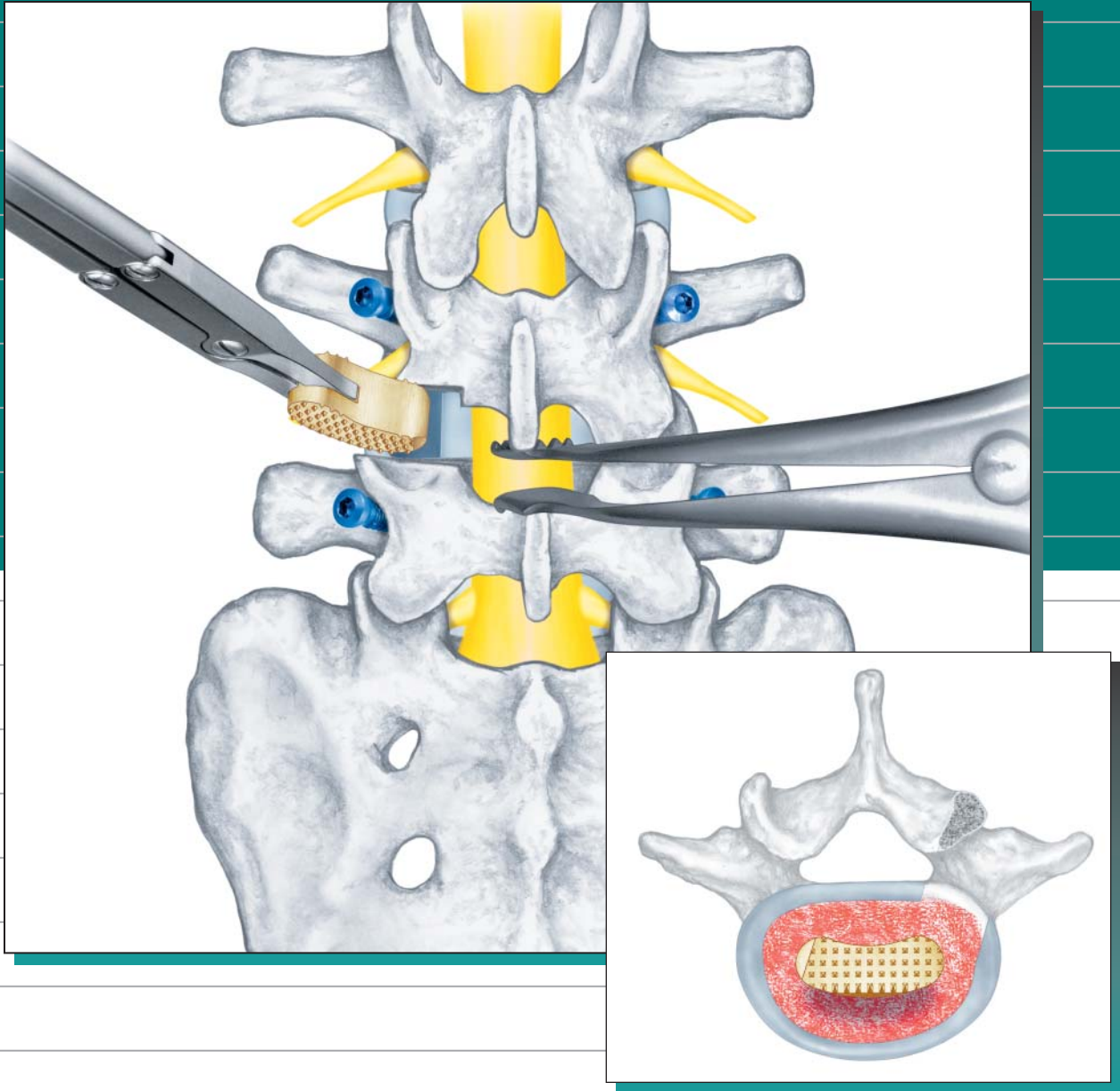


T-PLIF Spacer Instruments

TECHNIQUE GUIDE



T-PLIF Overview

The T-PLIF instrument set supports the placement of T-PLIF Spacers used in transforaminal posterior lumbar interbody fusion (T-PLIF) procedures.

The T-PLIF approach is a unilateral alternative to the PLIF approach. Distraction is essential to restore the disc height and decompress the neural elements. Distraction can be achieved using the Lamina Spreader or Lateral Distractor. T-PLIF Trial Spacers and the T-PLIF Implant Holder are provided to ensure that the appropriate implant is selected and inserted fully into the disc space to restore disc height.

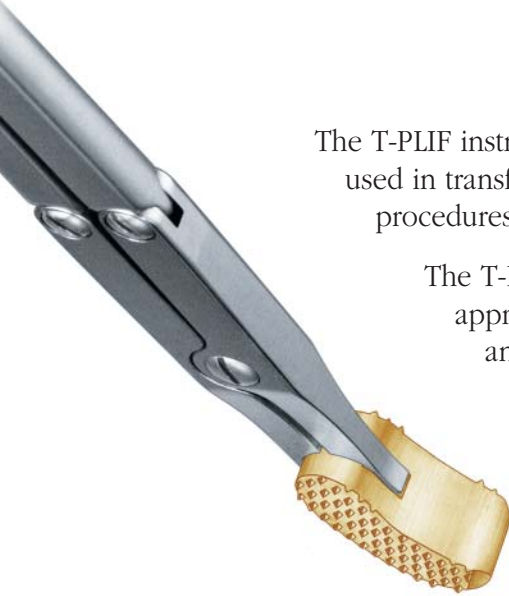


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Principle-Based Transforaminal Posterior Lumbar Interbody Fusion (T-PLIF)

The AO ASIF Principles of Internal Fixation

In 1958, the AO ASIF (Association for the Study of Internal Fixation) formulated four basic principles,¹ which have become the guidelines for internal fixation. They are:

- Anatomical reduction
- Stable internal fixation
- Preservation of blood supply
- Early, active pain-free mobilization

The fundamental aims of fracture treatment in the limbs and fusion of the spine are the same. A specific goal is returning as much function as possible to the injured neural elements.²

AO ASIF Principles as Applied to the Spine³

Anatomical Alignment

Restoration of normal spinal alignment to improve the biomechanics of the spine.

Stable Internal Fixation

Stabilization of the spinal segment to promote bony fusion.

Preservation of Blood Supply

Creation of an optimal environment for fusion.

Early, Pain-Free Mobilization

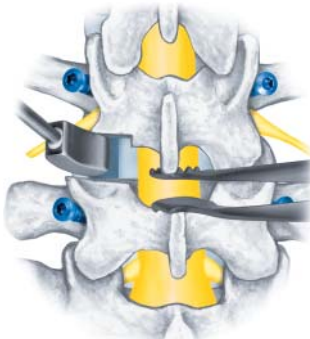



Minimization of damage to the spinal vasculature, dura, and neural elements, which may contribute to pain reduction and improved function for the patient.

1. M.E. Muller, M. Allgower, R. Schneider, H. Willenegger. *AO Manual of Internal Fixation*, 3rd Edition. Berlin; Springer-Verlag. 1991.

2. Ibid.

3. M. Aebi, J.S. Thalgott, J.K. Webb. *AO ASIF Principles in Spine Surgery*. Berlin; Springer-Verlag. 1998.

The AO Principles Applied to T-PLIF

<i>AO Principle</i>	Spine Principle	T-PLIF Technique Feature	Clinical Importance
Anatomical alignment			
Restore disc height	Technique promotes decompression of neural elements Trial Spacers assess the intervertebral disc space and facilitate insertion of the tallest possible implant to restore disc height		Maintains decompression of neural elements Restores sagittal alignment and normal spinal biomechanics
Restore lordosis	Implant designed to match vertebral anatomy and restore lordosis		Restores normal spinal alignment
Stable Internal Fixation			
Provide stability	Unilateral (vs. bilateral) approach designed to decrease segmental instability Posterior instrumentation is recommended for additional stabilization		Stable segment promotes fusion
Preserve endplates	Rasp removes cartilaginous endplates while retaining structural support		Minimizes implant subsidence

**AO Principle
Spine Principle**

T-PLIF Technique Feature

Clinical Importance

**Preservation of
Blood Supply**

Prepare endplates

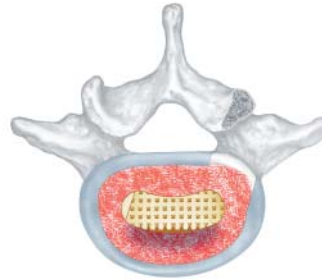
Curettes facilitate a complete discectomy



Promotes bony fusion

Provide optimum fusion bed

Large surface area for placing bone graft around the implant

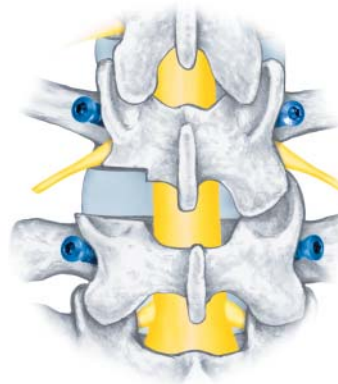


Creates an optimal environment for fusion

**Early, Pain-Free
Mobilization**

Use atraumatic technique

Unilateral incision minimizes tissue damage
Technique eliminates dural retraction and minimizes nerve root retraction



Minimizes trauma to patient and may lead to pain reduction and improved function

T-PLIF Spacer Instruments



Lamina Spreader [389.265]

Enables distraction of the intervertebral disc space to ensure maximum implant height and neural foraminal decompression

Lateral Distractor [397.084]

Alternate method of distraction using Click'X, USS or VAS system pedicle screws as anchors for the appropriate distractor inserts



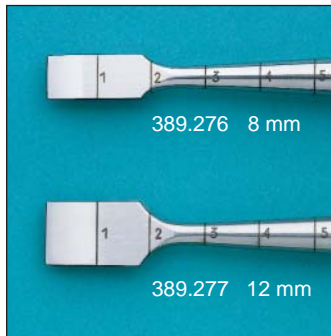
Distractor Inserts for Click'X [397.099]



Distractor Inserts for USS [397.097]



Distractor Inserts for VAS [397.098]



Osteotomes

8 mm width [389.276]

12 mm width [389.277]

Facilitate facetectomy to create a transforaminal window



389.278



T-PLIF Curettes, 7.5 mm width

Straight [389.278]

Reverse angle, left [389.282]

Reverse angle, straight [389.279]

Reverse angle, right [389.281]

- Enable a complete discectomy through the transforaminal window when utilizing the T-PLIF approach
- Length, angulation and orientation provide access to the entire disc space, including the far lateral disc material

T-PLIF Spacer Instruments (continued)



T-PLIF Rectangular Curettes, 8 mm width

Left [389.284]

Right [389.283]

- For more aggressive removal of the disc material and cartilaginous tissue
- Length, angulation and orientation facilitate removal of the tissue through the transforaminal window

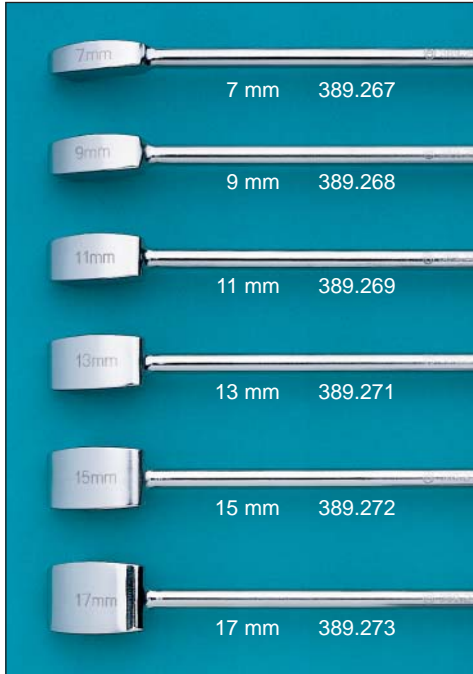


Bone Rasps, 8 mm width

Left [389.286]

Right [389.285]

- Curves allow contact with endplate surfaces
- Permit removal of cartilaginous tissue from the endplate to expose bleeding bone
- Endplate preparation can be achieved without damage to the subchondral bone



T-PLIF Trial Spacers [389.267–389.273]

- Ensure accurate sizing of T-PLIF Spacer to restore proper disc height
- Six heights (7 mm–17 mm, in 2 mm increments) correspond to implant height and geometry



Quick Release T-Handle [394.951]

Use with T-PLIF Trial Spacers.



T-PLIF Implant Holder [389.266]

- Securely grips the T-PLIF Spacer
- Curved neck maximizes control for implant insertion through transforaminal window
- Enables impaction during insertion

T-PLIF Spacer Instruments (continued)



Impactors

Straight [389.274]

Angled [389.275]

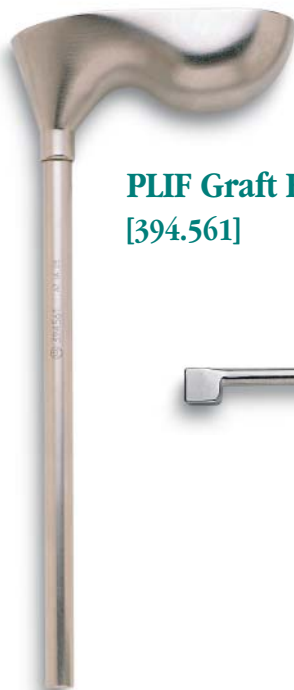
- Used to fully seat implant into intervertebral disc space
- Textured end minimizes slipping
- Curved neck facilitates impaction through the transforaminal window

Bone Grafting Instruments

Facilitate insertion of autogenous cancellous bone graft or a bone graft substitute into the disc space



PLIF Graft Pusher [394.571]



**PLIF Graft Funnel
[394.561]**



PLIF Graft Packer [394.579]

Surgical Technique

Preoperative Planning

Preoperative planning is recommended for the precise identification and selection of the T-PLIF Spacer. Determine the implant height by comparing a lateral view on the T-PLIF Preoperative Planner with the adjacent intervertebral discs on a lateral radiograph.

The implant must be firmly seated with a secure fit between the end-plates when the segment is fully distracted. It is essential to use the tallest possible implant to maximize segmental stability, as determined by the preoperative planning.

Due to variations in radiographic magnification, the templates only provide an estimate of the ideal implant size.

Surgical Approach

Position patient

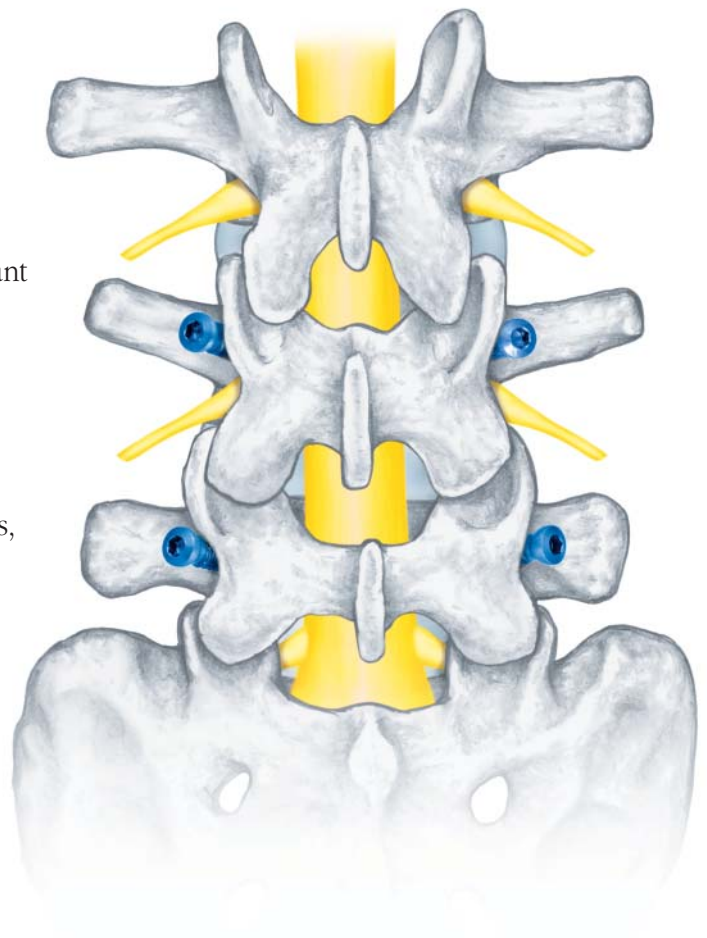
The patient is positioned prone on a lumbar frame that promotes suitable exposure and restores sagittal alignment.

Intraoperative radiographic equipment can aid in confirming the precise position of the allograft implant and minimize surgical exposure.

1 Make incision

Incise and identify anatomical landmarks. Locate the facets, pars interarticularis, lamina, spinous processes, and transverse processes.

Insert VAS, Click'X or USS screws.



Click'X Screws inserted

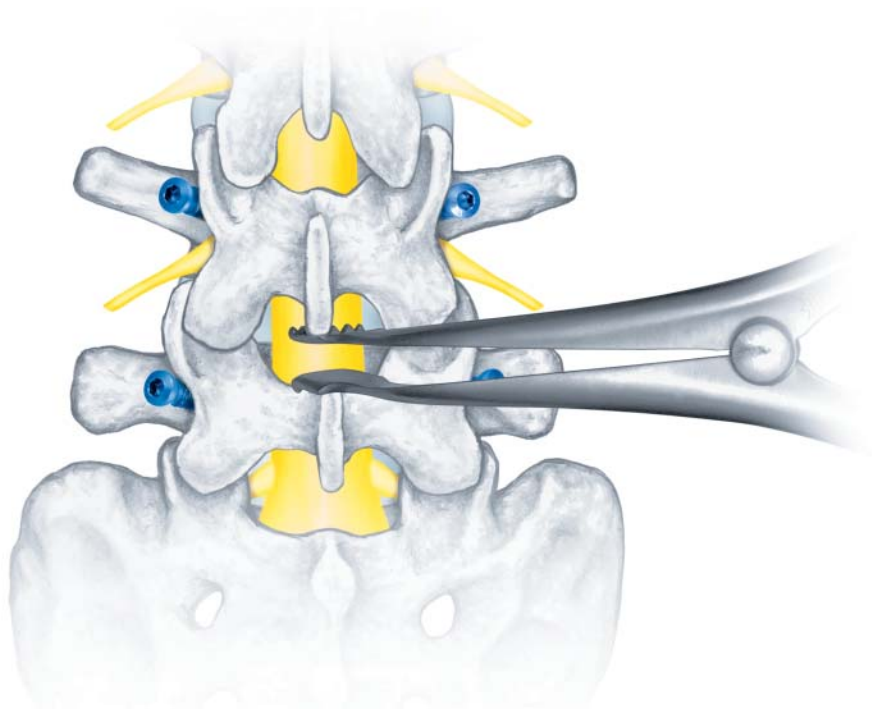
Surgical Technique (continued)

2 Distract

Use one of the following two options to achieve distraction:

Option 1: Lamina Spreader

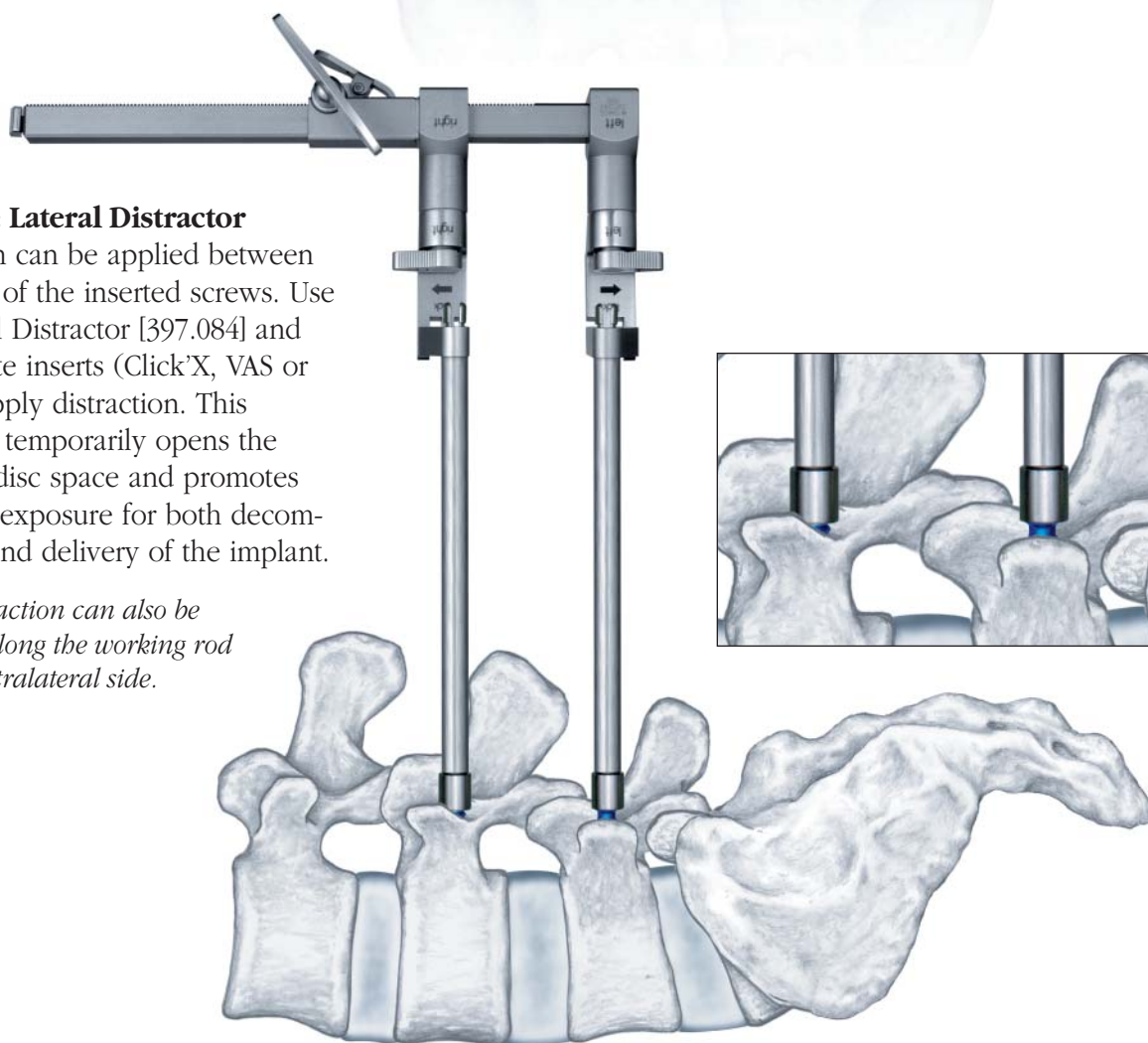
Place the Lamina Spreader [389.265] at the base of the spinous processes of the appropriate levels and apply distraction. This maneuver temporarily opens the posterior disc space and promotes increased exposure for both decompression and delivery of the implant.



Option 2: Lateral Distractor

Distraction can be applied between the heads of the inserted screws. Use the Lateral Distractor [397.084] and appropriate inserts (Click'X, VAS or USS) to apply distraction. This maneuver temporarily opens the posterior disc space and promotes increased exposure for both decompression and delivery of the implant.

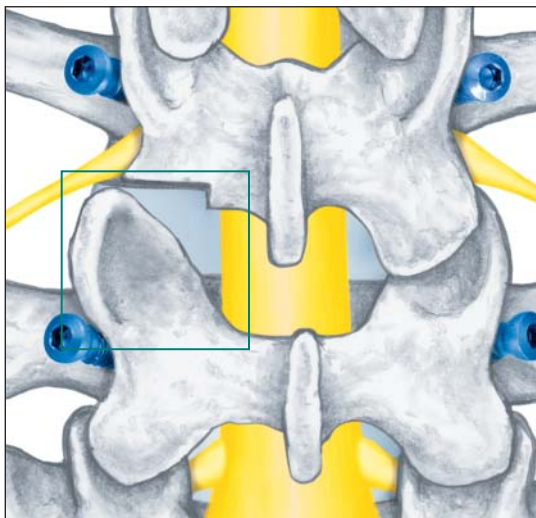
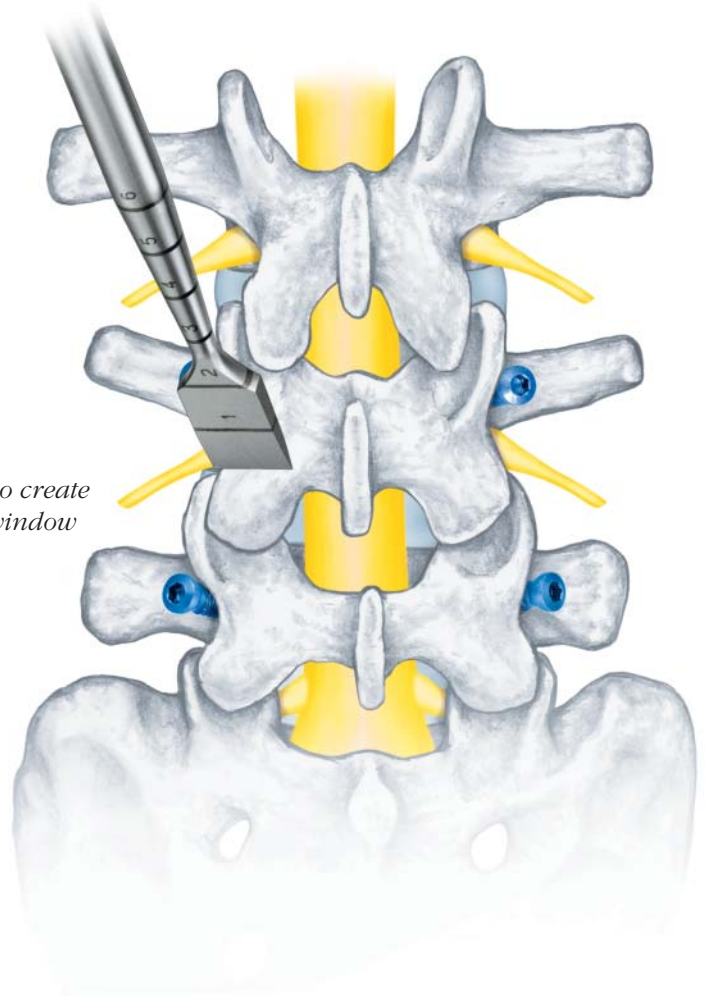
Note: Distraction can also be achieved along the working rod on the contralateral side.



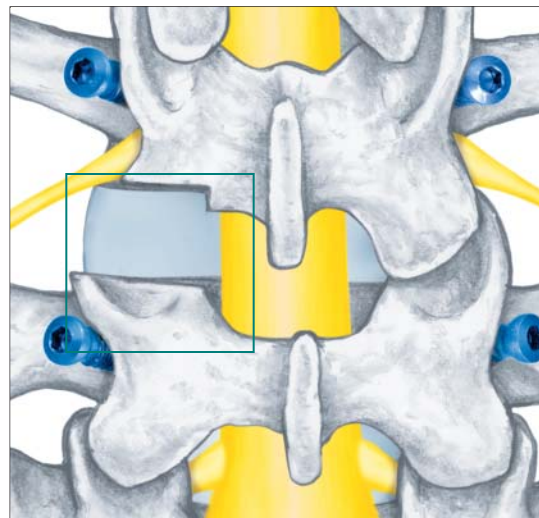
3 Create the transforaminal window

Using a T-PLIF Osteotome [389.276 or 389.277], remove the inferior facet of the cranial vertebra and the superior facet of the caudal vertebra of the appropriate levels, as shown.

Using osteotome to create transforaminal window



Inferior articular facet removed



Transforaminal window created by unilateral facetectomy

Surgical Technique (continued)

4 Perform discectomy

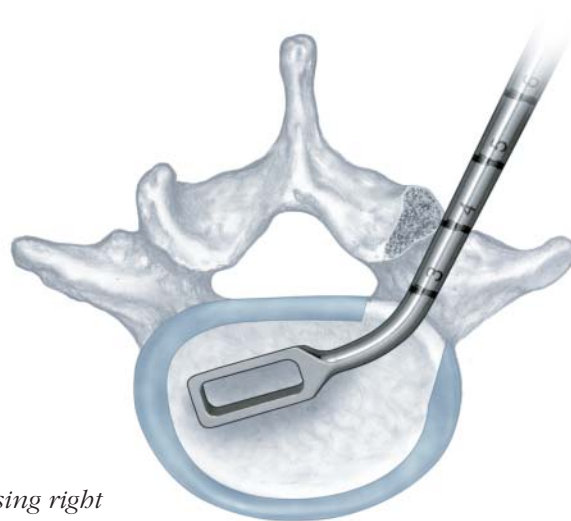
Remove disc material from the intervertebral disc space using the T-PLIF Curettes [389.278–389.284]. Use the right- and left-angled curettes to facilitate removal of material in the far lateral disc space. The anterior and lateral walls of the annulus must be preserved to provide additional support for the T-PLIF Spacer. Additional distraction may be applied at this time.



Using straight curette



Using right reverse angle curette to remove far lateral disc material

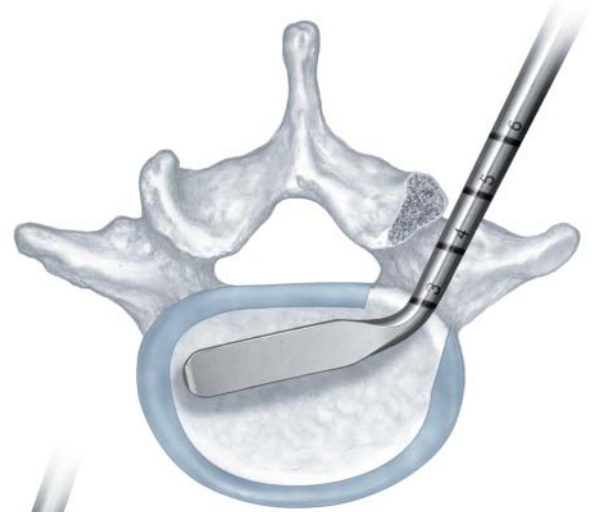


Using right rectangular curette

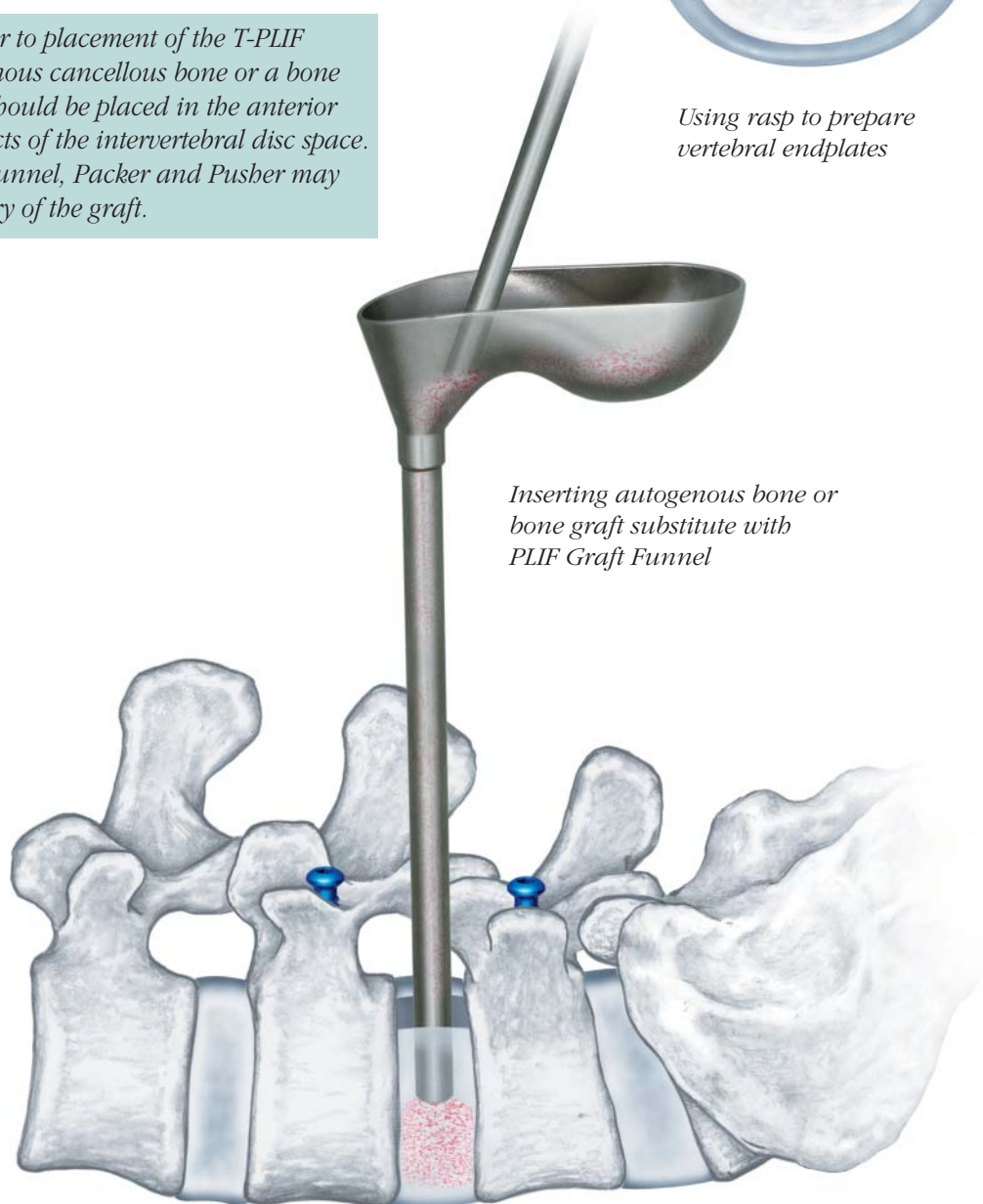
5 Prepare endplates

After the discectomy is complete, use the Bone Rasps [389.285 and 389.286] to remove the superficial layers of the entire cartilaginous endplates and expose bleeding bone. Excessive removal of subchondral bone may weaken the vertebral endplate. If the entire endplate is removed, subsidence and a loss of segmental stability may result.

Important: Prior to placement of the T-PLIF implant, autogenous cancellous bone or a bone graft substitute should be placed in the anterior and lateral aspects of the intervertebral disc space. The PLIF Graft Funnel, Packer and Pusher may aid in the delivery of the graft.



Using rasp to prepare vertebral endplates



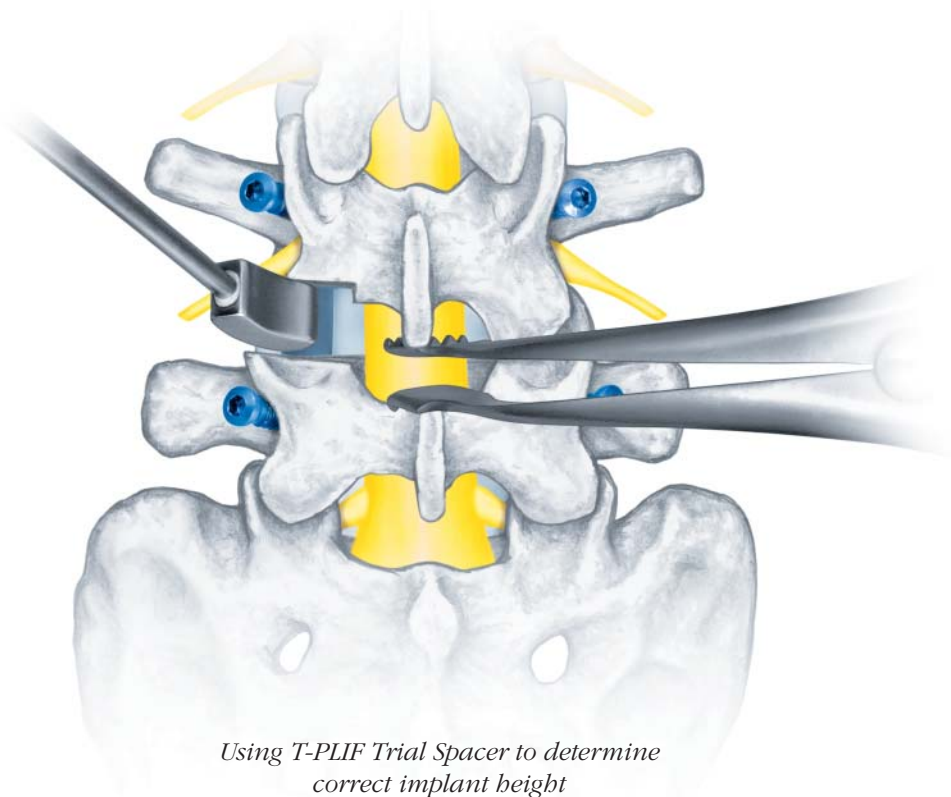
Inserting autogenous bone or bone graft substitute with PLIF Graft Funnel

Surgical Technique (continued)

6 Determine implant size

Connect an appropriately-sized T-PLIF Trial Spacer [389.267–389.273] to the Quick Release T-Handle [394.951]. Insert the assembly into the intervertebral disc space using gentle impaction. Fluoroscopy can assist in confirming the fit and geometry of the trial spacer. If the trial spacer appears too small or too tight, try the next larger or smaller size until the most secure fit is achieved.

Select an implant that corresponds to the Trial Spacer height and remove the Trial Spacer.



7 Insert the implant

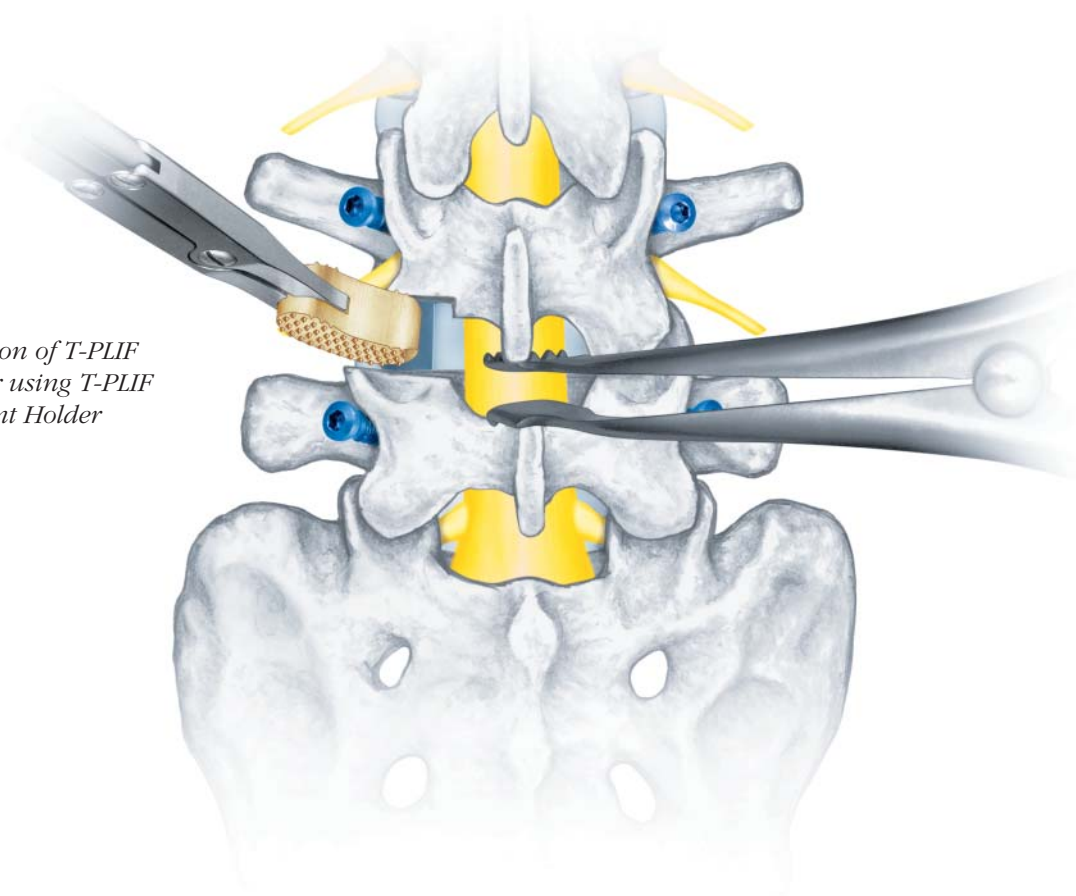
Insert the T-PLIF Implant Holder [389.266] into the slots of the selected implant and tighten the speed nut on the handle. Ensure that the implant is held flush against the neck of the implant holder and securely in the jaws of the instrument.

Introduce the T-PLIF Spacer into the intervertebral disc space, ensuring that the orientation of the implant is correct.



Spacer is held securely against the implant holder

Insertion of T-PLIF Spacer using T-PLIF Implant Holder



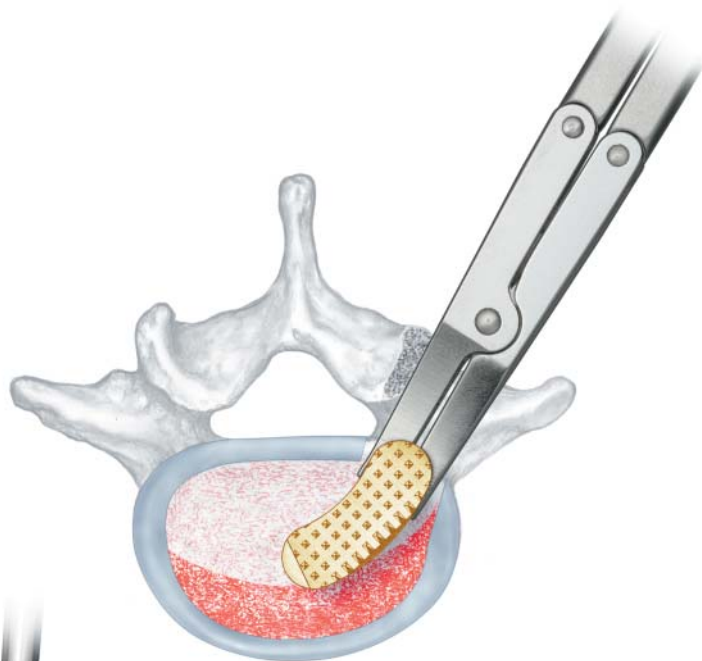
Surgical Technique (continued)

7 Insert the implant (continued)

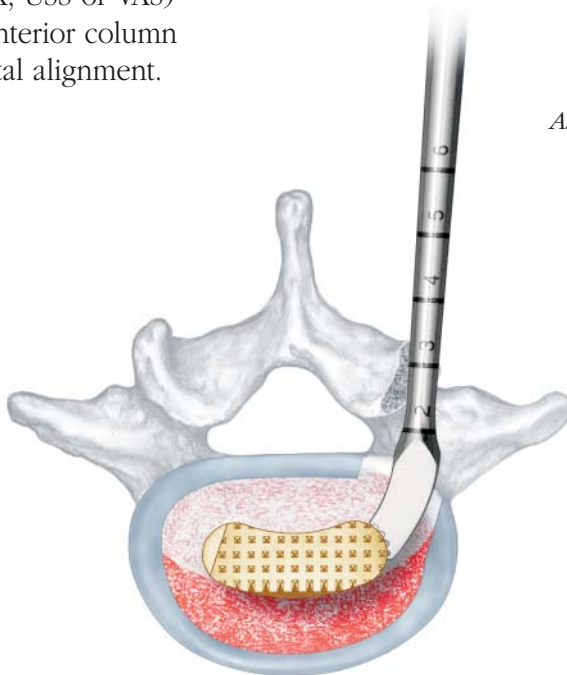
Slight impaction on the implant holder may be necessary. Remove the implant holder and use the T-PLIF impactors [389.274, 389.275] to fully seat the implant.

Additional graft material should be inserted posterior to the spacer.

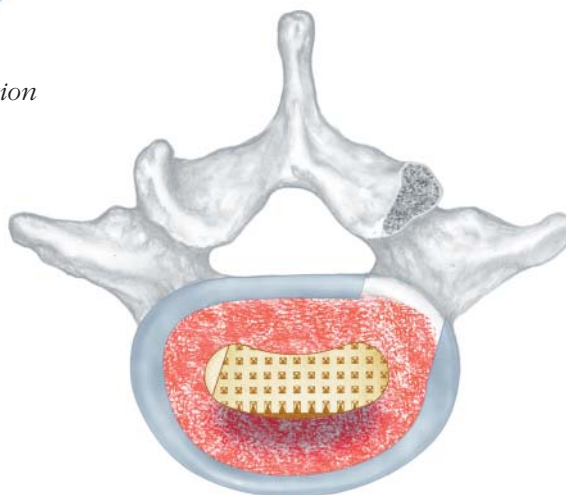
Release of the distraction and subsequent segmental compression with posterior instrumentation (Click'X, USS or VAS) allows loading of the anterior column and restoration of sagittal alignment.



Axial view of implant insertion



Axial view of implant insertion



Final position of T-PLIF Spacer

T-PLIF Spacer Instrument Set [105.125]



T-PLIF Spacer
Instrument Set
Graphic Case
690.039

Instruments

- 389.265 Lamina Spreader
- 397.084 Lateral Distractor
- 397.097 Distractor Insert for Universal Spinal System (USS), 2 ea.
- 397.098 Distractor Insert for Variable Axis System (VAS), 2 ea.
- 397.099 Distractor Insert for Click'X[®], 2 ea.
- 389.266 T-PLIF Implant Holder
- 389.267 T-PLIF Trial Spacer, 7 mm
- 389.268 T-PLIF Trial Spacer, 9 mm
- 389.269 T-PLIF Trial Spacer, 11 mm
- 389.271 T-PLIF Trial Spacer, 13 mm
- 389.272 T-PLIF Trial Spacer, 15 mm
- 389.273 T-PLIF Trial Spacer, 17 mm
- 394.951 Quick Release T-Handle, 2 ea.
- 389.274 T-PLIF Impactor, straight
- 389.275 T-PLIF Impactor, angled
- 394.561 PLIF Graft Funnel
- 394.571 PLIF Graft Pusher
- 394.579 PLIF Graft Packer
- 389.276 Osteotome, 8 mm width
- 389.277 Osteotome, 12 mm width
- 389.278 Bone Curette, straight, 7.5 mm width
- 389.279 Bone Curette, reverse angle, straight, 7.5 mm width
- 389.281 Bone Curette, reverse angle, right, 7.5 mm width
- 389.282 Bone Curette, reverse angle, left, 7.5 mm width
- 389.283 Bone Curette, rectangular, right, 8 mm width
- 389.284 Bone Curette, rectangular, left, 8 mm width
- 389.285 Bone Rasp, right, 8 mm width
- 389.286 Bone Rasp, left, 8 mm width
- 8053 T-PLIF Preoperative Planner



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