Degenerative Spondylolisthesis Reduction
- Single Level
- Distraction and Reduction
- Tactile and Visual Feedback
- Unlimited Manipulation

Angular Reduction
- Restore Lordosis/Kyphosis
- Restore Vertebral Height

Interbody Access
- PLIF
- TLIF

INNOVATION THAT ENDURES
The Backbone of Innovation.

TSRH-3D™ Connector: The Heart Of It All.

The new Vertebral Body Reduction instruments address a wide range of indications by allowing you to perform a variety of spinal manipulations before the TSRH-3D connector secures all directions with its single tightening step.

**SIX DIRECTIONS, ENDLESS POSSIBILITIES...**

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**KEY POINTS FOR MANIPULATIONS**
- Enhanced capabilities allow for corrections in all directions.
- All are gradual and progressive.
- Tactile and visual feedback for safety.

*See package insert for labeling limitations.
The Tools: An Overview

**Reduction Pliers**
- Works on Single Level
- Simultaneous Reduction/Distraction
- Tactile and Visual Feedback During Reduction
- Permanent Fixation Regardless of Reduction Attained

**Reduction Nuts with Threaded Post Screws**
- Linear Reduction
- 57mm Reduction Range
- Angular Reduction
- Restores Lordosis/Kyphosis
**Distraction:** Allows Interbody Access for PLIF and TLIF Procedures

**DISTRACTION STEPS**

- Place TSRH-3D™ screws in the usual manner.
- With the **Reduction Pliers**, back out the lock screws on each jaw.
- Place the jaws of the pliers on the pedicle screws and tighten the lock screws.
- To distract, simply squeeze the pliers as shown in Figure 3b.
- To hold the distraction, adjust the threaded bar assembly.
- To lock the posterior construct, the pedicle screws can be connected by the TSRH-3D connectors in the usual manner.

**KEY POINTS**

- **Screw extenders can be used to help.**
- **This may be done unilaterally or bilaterally.**
- **This distraction facilitates interbody work.**
REDUCTION STEPS

■ Place TSRH-3D™ screws in the usual manner using extended smooth post or threaded post screws at L5.

■ Position TSRH-3D connectors and rods as shown in Figure 4b: at L5 slightly above the corrected position.

■ At S1 all the way down, slightly tightened.

■ With its lock screws medial, place the Reduction Pliers on the TSRH-3D screw posts, tighten the pliers at L5.

■ You are ready to do manipulation.

■ For distraction, squeeze the pliers' handles together as in Figure 4c*. For Spondylolisthesis reduction, manipulate the pliers as shown in Figure 4d.

■ OPTIONAL: If angular reduction is desired, you may do so at this time.

■ To hold a position provisionally, simply tighten the TSRH-3D connectors.

■ To maintain any position permanently, simply tighten the TSRH-3D lock screws with final tightening torque.

■ Cut TSRH-3D screw posts as needed.

KEY POINTS

- Mallable screw extenders should be used to load the construct onto the TSRH-3D screws.

- This can be done unilaterally or bilaterally.

- *If desired, interbody fusion can be performed at this time.

- A hybrid motion can also be performed as in Figure 2c.

- To continue with further reductions, simply loosen the TSRH-3D connectors, then re-apply desired forces.

- Before final tightening of the connectors, the standard TSRH-3D screws may be lowered, rather than cut.

- Before using the modular cutter, ensure the knurled end is fully tightened.

- Slide the modular cutter over the screw post until fully seated against the connector.
REDUCTION STEPS

■ Position the TSRH-3D™ connectors and rods:
  At S1 and L4, fully seat the connectors without tightening the lock screw. At L5, the connector should be slightly above the corrected position as shown in Figure 5a.
  ■ Apply the reduction nuts to the TSRH-3D threaded post screws at L5.
  ■ Using the reduction nut driver and the threaded post screw counter torque, drive the nut to reduce L5 posteriorly (Figure 5b).
  ■ Once the desired reduction is attained (Figure 5c), other manipulations, such as compression or angular reduction, can be performed at this time.
  ■ To secure the position of the TSRH-3D screw, apply the final tightening torque to the TSRH-3D connector lock screw.
  ■ Cut TSRH-3D screw posts as needed.

KEY POINTS

■ Always use a contoured rod. Allowing the rod to rotate will also minimize medial-lateral forces during reduction.
  ■ Make sure the hex end of the reduction nuts are proximal, with the contoured distal end completely seated on the connector.
  ■ This can be done slowly and incrementally to allow for relaxation. Remember, the TSRH-3D connector will allow permanent fixation at any point desired along the smooth portion of the screw shank.
  ■ To maintain reduction, do not remove the reduction nuts until the final tightening has been performed.
  ■ Before final tightening, the standard TSRH-3D screws can be lowered, rather than cut.
  ■ Before using the modular cutter, ensure the knurled end is fully tightened.
  ■ Slide the modular cutter over the screw post until fully seated against the connector.
Angular Reduction: Restoring Lordosis/Kyphosis with Threaded Post Screws

**THREADED POST SCREW STEPS**

- Place TSRH-3™ **threaded post screws** in the usual manner.
- Position the TSRH-3D connectors and rods, as shown in Fig. 6a, then thread the **reduction nuts** down to the connectors.
- To hold a position along the rod (Figure 6b), use a distractor or rod holder.
- For angular reduction, (Figure 6b), rotate the threaded screw posts toward each other until the correction is achieved.
- To hold angular reduction, slightly tighten the TSRH-3D connectors until the splines engage.
- To hold all positions provisionally, simply tighten the TSRH-3D connectors further without breaking off the lock screws.
- To secure the position permanently, apply final tightening torque to the TSRH-3D connectors breaking off the lock screw.
- Cut TSRH-3D screw posts as needed.

**KEY POINTS**

- Make sure the hex end of the reduction nuts are proximal, and the contoured distal end is completely seated on the connector.
- Avoid tightening the connector lock screws to allow maximum angular movements.
- If additional leverage is desired, the reduction nut drivers may be used.
- This still allows for compression/distraction (Figure 6c).
- To continue with further reductions, simply loosen the TSRH-3D connector lock screws, then re-apply desired forces.
- Before using the modular cutter, ensure the knurled end is fully tightened.
- Slide the modular cutter over the screw post until fully seated against the connector.

Note: When the spine has adequate anterior column support, the compressive loads carried by a posterior construct are minimized. By adequate anterior column support, we are referring to an “intact” intervertebral disc and ligaments, or an anterior fusion with or without supplemental anterior hardware. In each of these cases, the anterior column supports the majority of the compressive load, thus decreasing the forces on a posterior construct.

*patented 6, 248, 107 B1.*
**TSRH-3D**

Unique connectors and pedicle screws that deliver unequalled medial-lateral and sagittal angulation with true in situ dorsal adjustability.

**Vertebral Body Reduction**

A complementary module to the TSRH-3D implants and instruments that addresses degenerative spondylolisthesis reduction and tumor/trauma indications. The module has two styles of extended post screws and associated instrumentation.

**Pediatric**

A universal rod and hook system with less volume than other TSRH implants to aid in addressing the spinal concerns in children.

**Low Profile CROSSLINK® Plates**

A plate intended to help prevent rod migration and to help increase the overall construct rigidity by increasing the axial and torsional stiffness. The plates are offered in many sizes and may be contoured to increase the intraoperative solutions.

**TACOMA Sacral Plates**

A variable angle plate that conforms to the sacral inclination without contouring the rod. The plate is used as a means of fixation for constructs requiring rigid sacral fixation.

When used as a pedicle screw fixation system of the non-cervical posterior spine in skeletally mature patients, the TSRH Spinal System is indicated for one or more of the following: (1) degenerative spondylolisthesis with objective evidence of neurologic impairment, (2) fracture, (3) dislocation, (4) scoliosis, (5) kyphosis, (6) spinal tumor, and/or (7) failed previous fusion (pseudarthrosis).