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The Armada spinal system is designed for surgeons treating multiple pathologies, ranging from low-back, degenerative conditions to complex spinal deformities. Armada provides sophisticated instruments and implants that integrate seamlessly to work in concert with the most advanced surgical techniques. The Armada Vertebral Body Derotation (VBD) system is designed to be extremely rigid, yet easily assembled and disassembled to adapt to surgeons’ various techniques in the correction of rotational deformities. Armada VBD provides efficient and effective solutions for optimal surgical outcomes in the most complex rotational deformities.
EQUIPMENT REQUIREMENTS

- Armada 5.5mm Degenerative Instruments, Tray One
- Armada 5.5mm Degenerative Instruments, Tray Two
- Armada 5.5mm Deformity Instruments, Tray One
- Armada 5.5mm Deformity Instruments, Tray Two
- Armada 5.5mm Titanium Degenerative Implants Tray
- Armada Vertebral Body Derotation Tray
- Armada Rod Cutter Tray
- C-Arm Fluoroscope
- Radiolucent Surgical Table
- NVMS®

OPTIONAL:

- Armada 5.5mm Titanium Cross Connector Tray
- Armada 5.5mm Titanium Reduction Screw Implants Tray
- Armada 5.5mm Titanium Uniplanar Implants Tray
- Armada 5.5mm Titanium Reduction Uniplanar Implants Tray
- Armada 5.5mm Titanium Fixed Screws & Hooks
- Armada 5.5mm Titanium Iliac Implants Tray
- Armada 5.5mm Titanium Deformity Implants Tray
- Armada 5.5mm Titanium Extended Polyaxial Implants Tray
- Armada 5.5mm Titanium Long Rod Implants Tray

For a complete list of intended uses, indications, device description, contraindications, warnings, and precautions, please refer to the Armada Instructions for Use (#9400798), as well as the Armada surgical technique guide (#9500480).

STIMULATED EMG

- NVMS Dynamic EMG monitoring is delivered seamlessly and meaningfully to provide information related to trajectory and nerve health
- Dynamic Stimulated EMG provides real-time feedback directly to the surgeon that may help minimize the potential for pedicle breaches

FREE RUN MEP/SSEP

- Free Run EMG displays alarm if mechanical insults to nerves may be causing irritation
- MEPs and SSEPs provide 360° cord monitoring during spinal cord manipulation, which may help avoid a postoperative deficit

RECOMMENDED IMPLANTS

Suggested Armada implants include Fixed Screws, Uniplanar Screws, and/or Provisional Locking Screws (PLS).

FIXED SCREW

Low-profile rigid fixation for extreme corrective maneuvers

UNIPLANAR SCREW

40° of angulation restricted to the sagittal plane enables axial rotational correction while preserving sagittal plane alignment

PROVISIONAL LOCKING SCREW

40° of polyaxial angulation locks into a fixed orientation, providing the flexibility of a polyaxial screw with the corrective capability of a fixed screw
STEP 1:
SCREW INSERTION

Introduce the screw into the pilot hole and advance until the desired depth is reached (Fig. 1). The Screwdriver sleeve is designed to rotate freely, allowing the instrument to be firmly grasped throughout insertion without early release from the screw. To release the Screwdriver, turn the knurled section counterclockwise until the outer sleeve is fully unthreaded from the tulip, and remove from the screw. For polyaxial screws, ensure the head of the screw is free from impedance and retains its full polyaxial motion. If additional adjustment to screw depth is required, the Screw Adjuster may be used.

Tips and Tricks

Fixed, Uniplanar, or Provisional Locking Screws are suggested for vertebral body derotation maneuvers.

Note

Use NVM5® to monitor pedicle integrity during screw placement. Attach the Dynamic Stimulation Clip to the shaft of the instrument, and stimulate in Dynamic Screw Test mode.
STEP 2: ROD CONTOURING
Once all screws are in position, use a rod template to measure the length. Contour the rod to the desired curve using the French Bender (Fig. 2). To achieve large radius bends, the Rod Benders may be utilized (Fig. 3).

**Note**
The 300mm and 500mm rods have longitudinal lines to aid in aligning the curve along the same plane down the length of the rod.

STEP 3: ROD INSERTION
Once the rod has been cut to length and contoured, place the working rod (rotated 90°) into the concavity of the curve. Secure the rod in position by threading lock screws into the tulips with the Lock Screw Starter. The Rod Holder may be used to assist in placing the rod (Fig. 4).

**Note**
During rod insertion, NVMS® may be set to Free Run mode.
STEP 4:
ROD ROTATION

With the lock screws loose, rod rotation may be performed using the Rod Gripper. Ensure the tips of the Rod Gripper are open by depressing the button in the center of the ratchet (Fig. 5). Place the Rod Gripper over the rod and compress the handle until rigidly fixed to the rod. Perform rod rotation using two Rod Grippers to achieve the desired coronal and sagittal profiles (Fig. 6). After the rod has been rotated into its final position, tighten the lock screws using the Lock Screw Starter. To release the Rod Gripper from the rod, depress the button in the center of the ratchet.

The 300mm and 500mm rods have a hex end; a Rod Rotation Wrench may be used for rod rotation. Place the Rod Rotation Wrench over the hex end of the rod and rotate to achieve the desired amount of rod rotation (Fig. 6a).

**Note**

During rod rotation, NVMS® may be set to Free Run mode.
STEP 5: CONSTRUCT ASSEMBLY

Medial/Lateral

Attach Reduction Towers to the selected rotated vertebral bodies and connect them medial-laterally using the Reduction Tower Link. Prior to engaging the Reduction Tower Link to the Reduction Towers, ensure the set screws are loose, allowing polyaxial motion of the Reduction Tower Clip. Place the Reduction Tower Clips over the Reduction Towers, apply downward force, and push the gold button to secure it in place (Fig. 7).

Once the Reduction Tower Link is connected to the Reduction Towers, lock the two set screws with the Reduction Tower Link Locking Driver to create a rigid frame (Fig. 8).
STEP 5: CONSTRUCT ASSEMBLY (CONT.)

Cephalad/Caudal

When cephalad/caudal connection is needed for either unilateral or en bloc correction techniques, utilize the Universal Tower Clamp. Ensure the clamp is open by pressing the gold release button and ensure the gold locking lever is in the unlocked position. Place the Universal Tower Clamp over the Reduction Tower Link or Reduction Tower Extensions (Fig. 9) and squeeze the clamp. Rotate the locking lever into the locked position for a secure connection (Fig. 10).

Tips and Tricks

If there isn’t room on the middle Reduction Tower(s) for a Reduction Tower Link, place Tower Links on the cephalad and caudal Reduction Towers with the medial/lateral bars facing out. Use Reduction Tower Extensions on the middle tower(s) to provide adequate surface area for cephalad/caudal connection (Fig. 11).
STEP 6: 
DEROTATION

Segmental

Use preoperative x-rays to select the most caudal-neutral vertebral body as the starting point for segmental derotation.

On both the neutral vertebral body and the first superior rotated vertebral body, secure Reduction Towers to the pedicle screws and link medial-laterally with Reduction Tower Links, creating two separate rigid frames (Fig. 12).

**Note**

*During segmental vertebral body derotation, NVM® may be set to Free Run mode.*

(Fig. 12)
STEP 6: DEROTATION (CONT.)

Segmental (cont.)

Provisionally tighten the lock screws on the neutral vertebral body, and loosen the lock screws on the rotated vertebral bodies. Do not completely remove the lock screws.

Next, using the neutral vertebral body as a reference, derotate the rotated vertebral body around the rod into a neutral position (Fig. 13). Lock the correction by provisionally tightening the lock screw with the VBD Lock Screw Driver (Fig. 14).

The derotated vertebral body will now become the neutral vertebral body. This process is repeated until all vertebral bodies have been derotated into a neutral position.

Tips and Tricks
Multiple passes up the construct may be required for complete rotational correction.
STEP 6:
DEROTATION (CONT.)

*En Bloc*

Use preoperative x-rays to identify the apex of the rotational deformity for the start of the *en bloc* derotation correction.

On the selected rotated vertebral bodies, secure Reduction Towers to the pedicle screws and link medial-laterally with the Reduction Tower Links, creating separate rigid frames. Next use the Universal Tower Clamp to connect the rotated vertebral body frames together cephalad-caudally, creating one rigid *en bloc* frame (Fig. 15).

*Tips and Tricks*

*If bilateral clamping isn’t able to be achieved, unilateral clamping may provide adequate rigidity.*

*Note*

During *en bloc* vertebral body derotation, NVMS® may be set to Free Run mode.
STEP 6: 
DEROTATION (CONT.)

*En Bloc* (cont.)

Lock at least two lock screws above or below (but not in-between) the Reduction Towers on the neutral segments to hold the rod in the proper rotational position. A Rod Rotation Wrench may be used in place of lock screws.

Rotate the *en bloc* frame around the rod until the vertebral bodies are in a neutral position (Fig. 16). Lock the correction by provisionally tightening the lock screws with the VBD Lock Screw Driver (Fig. 17).

**Tips and Tricks**

1. Use a neutral vertebral body that is inferior or superior to the *en bloc* frame as a reference during the derotation.

2. Having an assistant push on the rib hump during derotation can aid in the correction maneuver.

- Lawrence Haber, M.D.
STEP 7:
CONSTRUCT DISASSEMBLY
Cephalad/Caudal
To remove the Universal Tower Clamp, press the gold release button on the side to open the clamp (Fig. 18), and pull the clamp off the Reduction Tower Link (Fig. 19).
STEP 7:  
CONSTRUCT DISASSEMBLY (CONT.)

Medial/Lateral
To remove the Reduction Tower Link and Reduction Towers, first use the Reduction Tower Link Locking Driver to loosen the set screws on the Reduction Tower Link (Fig. 20). Then press down on the Reduction Tower’s gold thumb piece to release the frame from the screws (Fig. 21).

Tips and Tricks
For easy Reduction Tower removal, rock the Reduction Tower toward the gold thumb piece.
**FINAL CONSTRUCT**

Osteocel® Plus is a formulation of cryopreserved viable cancellous matrix and ground demineralized bone matrix. The native cell population includes cells of mesenchymal lineage differentiating toward bone-forming cells.

The Bendini® Spinal Rod Bending system expedites manual rod manipulation via computer-assisted Bend Instructions. The system uses a Digitizer, an infrared Camera, NVMS® Rod Bending software, and a mechanical Rod Bender.
SCOLIOSIS

A female patient with diagnosis of thoraco-lumbar scoliosis presented a curve measured 61° from T9 to L3. This is a case that demonstrates the ability of Armada® to correct deformities of the spine and to get strong rotational correction in the axial plane. Armada Uniplanar screws were utilized at most levels and at any level that was planned to be derotated. Cobalt chromium rods were utilized because they offer a similar advantage to achieve and maintain correction as stainless steel rods.

An over-contoured right concave working rod was rotated and placed to match the deformity and to reduce loosely placed lock screws in order to hold the rod within the screws. The rod was then derotated, utilizing the Armada Rod Grippers and Rod Rotation Wrench into the appropriate sagittal alignment. The alignment was held with the Rod Rotation Wrench to avoid having to tighten any of the lock screws.

Armada Reduction Towers were placed bilaterally at T6 to T7 and T11 to T12. They were linked medial/lateral with the Armada Reduction Tower Link and locked to create four separate rigid constructs. The rigid constructs at T6 to T7 and T11 to T12 were locked together with the Universal Tower Clamp, creating two separate cluster frames. The two clusters were derotated around the rod into their normal axial alignment and then rotated back. This was done a few times to allow further evaluation of rotational correction and to give the spine time to creep in the axial plane before locking into the correct axial alignment by provisionally locking the lock screws.

The slight under-contoured, left-stabilizing rod was then placed. Fluoro shots were used to make sure there was appropriate leveling of the instrumented segments at the proximal and distal ends of the construct. In situ rod bending, compression, and distraction were used for final adjustments, being careful to loosen only one side at a time to prevent any loss of rotational correction. One cross-link was placed to neutralize rotational forces of the final construct.

– Lawrence Haber, M.D.
Orthopaedic Surgeon
ARMADA® VBD SYSTEM

ARMADA® VBD INSTRUMENTS

INSTRUMENTS TRAY

40mm REDUCTION TOWER

REDUCTION TOWER LINK

UNIVERSAL TOWER CLAMP

REDUCTION TOWER EXTENSION

TOWER LINK LOCK SCREW DRIVER

LOCK SCREW DRIVER
# ARMADA® VBD INSTRUMENTS

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<td>Universal Tower Clamp</td>
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<td>Reduction Tower Extension</td>
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<td>Lock Screw Driver</td>
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