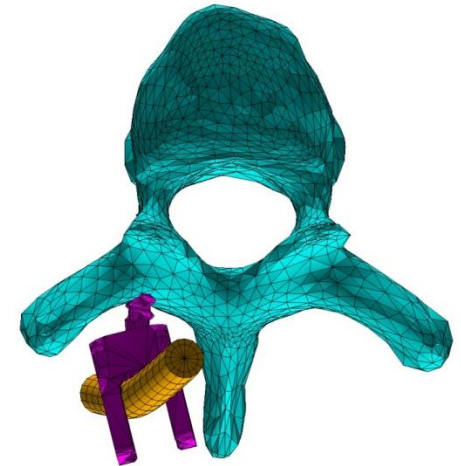
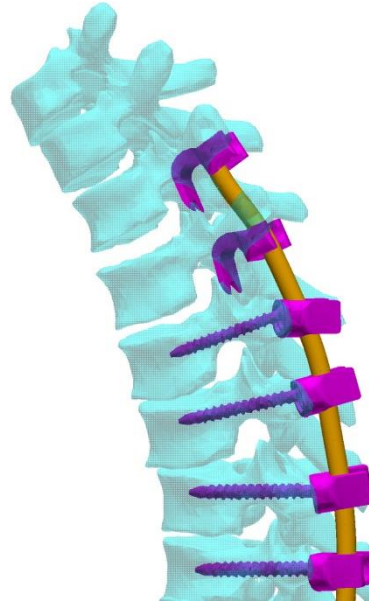
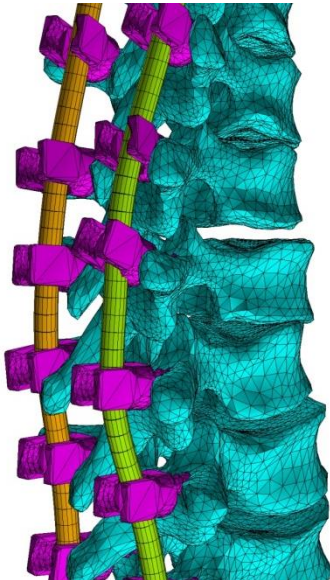




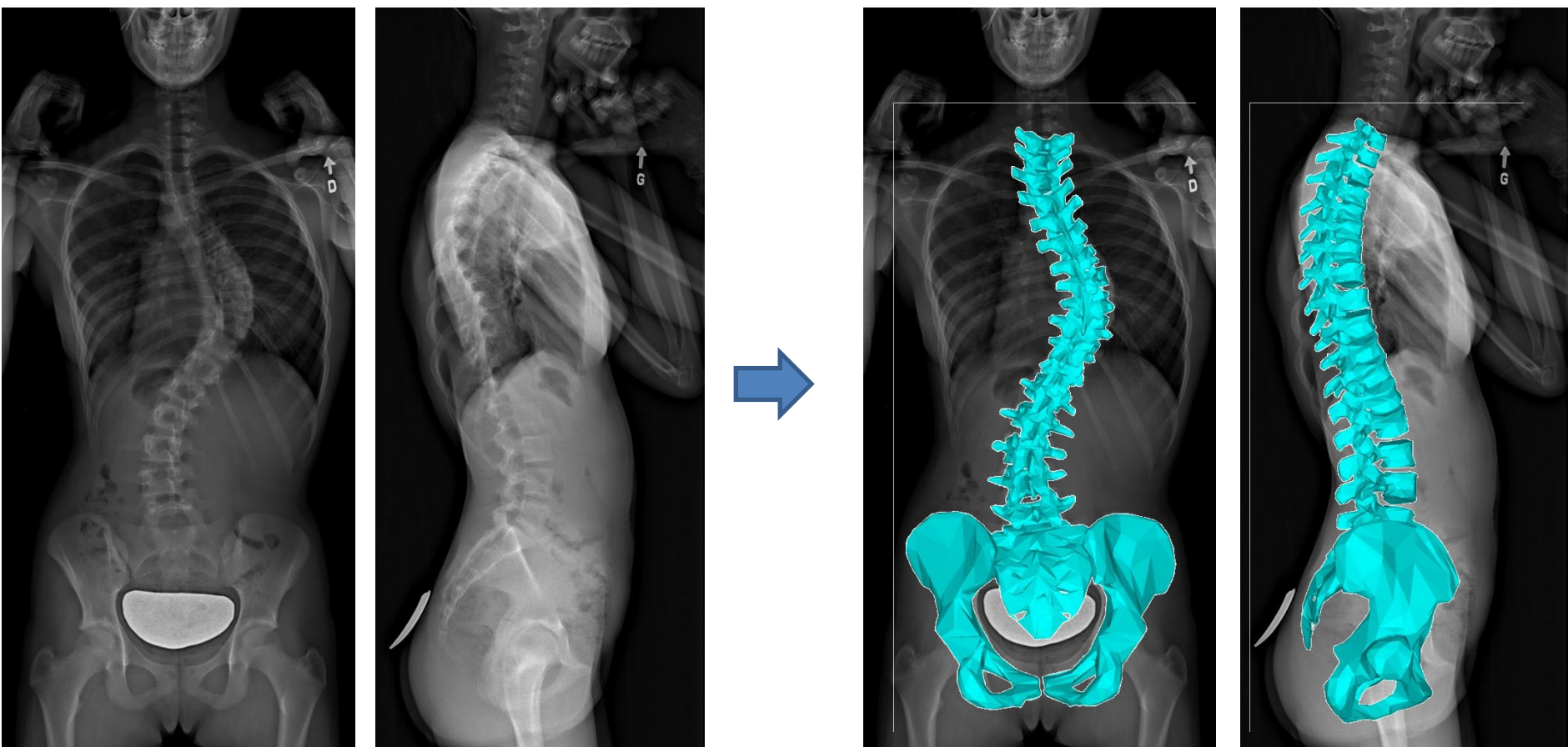
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Leading the development of improved spinal care™

Scoliosis Surgery *Simulation*



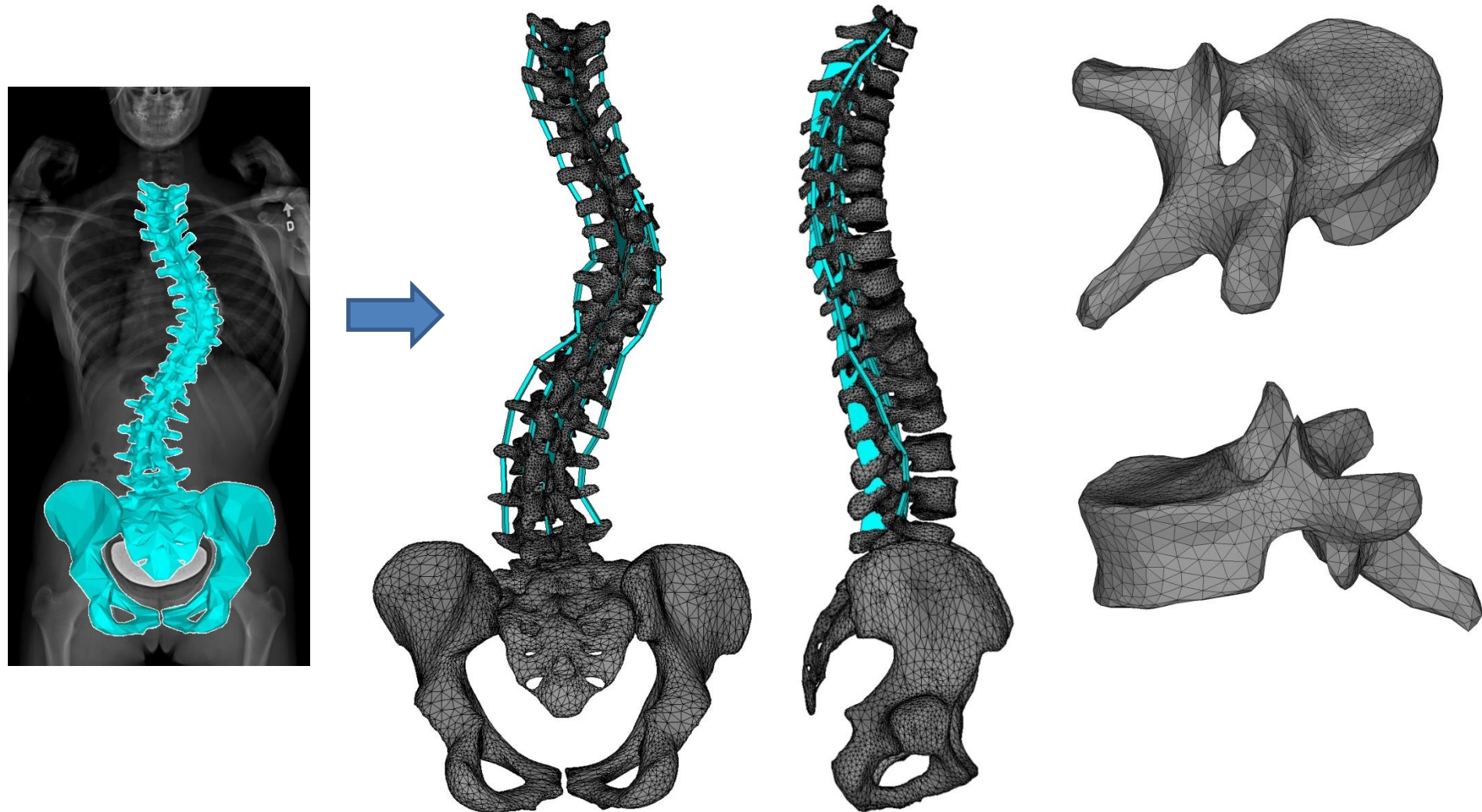
Personalized 3D Geometry



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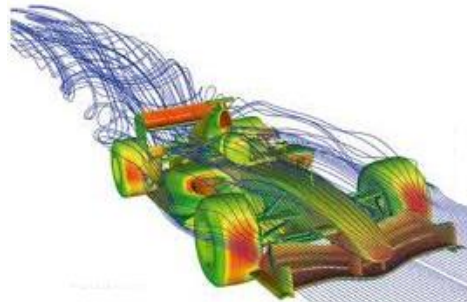
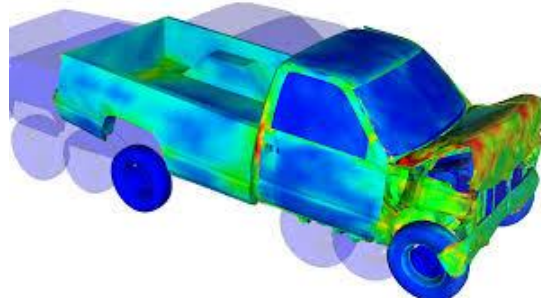
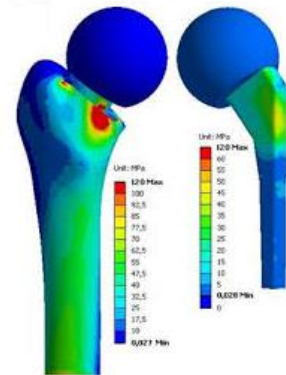
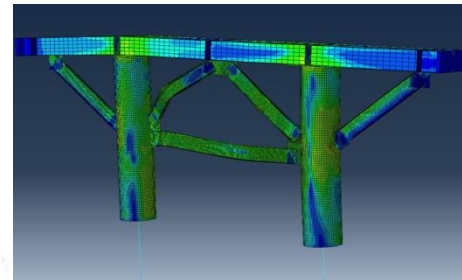
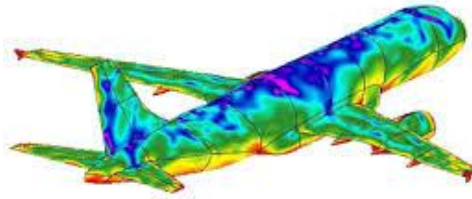
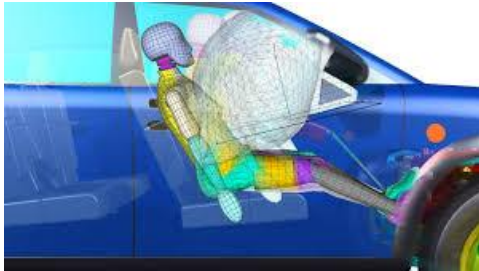
[Spinologics.com](https://www.spinologics.com)

Spine Finite Element Model



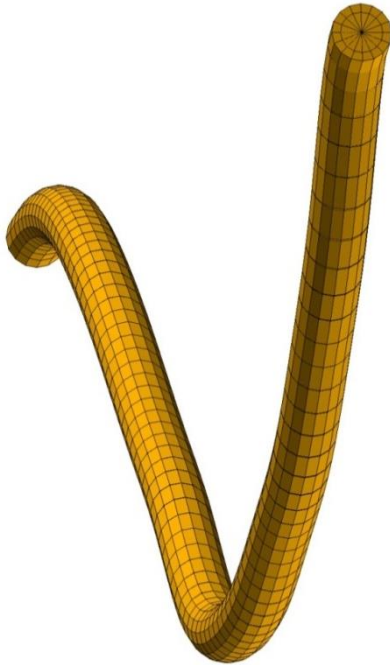
Finite Element (FE) Models

- Finite element model: mathematical method widely used in traditional engineering fields (aeronautics, car industry, civil engineering).
- Principle: Discretize a given geometry in order to compute the deformations of a body when external forces are applied on it.
- FE models are increasingly popular in the medical field.



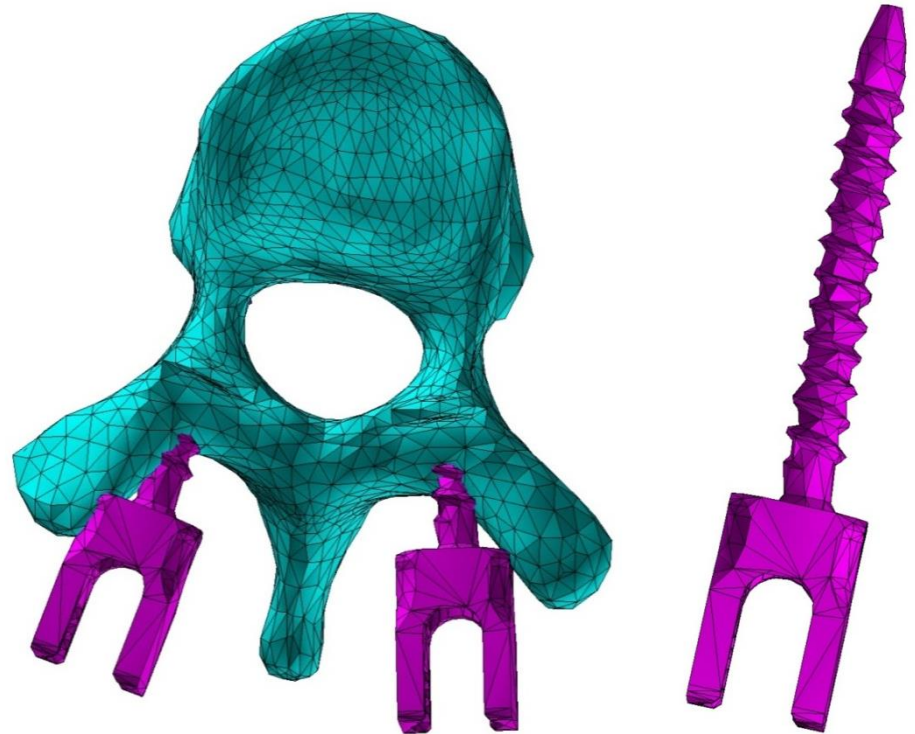
Rod FE Model

- Materials: Cobalt Chrome, Titanium, Stainless Steel
- Plasticity included.



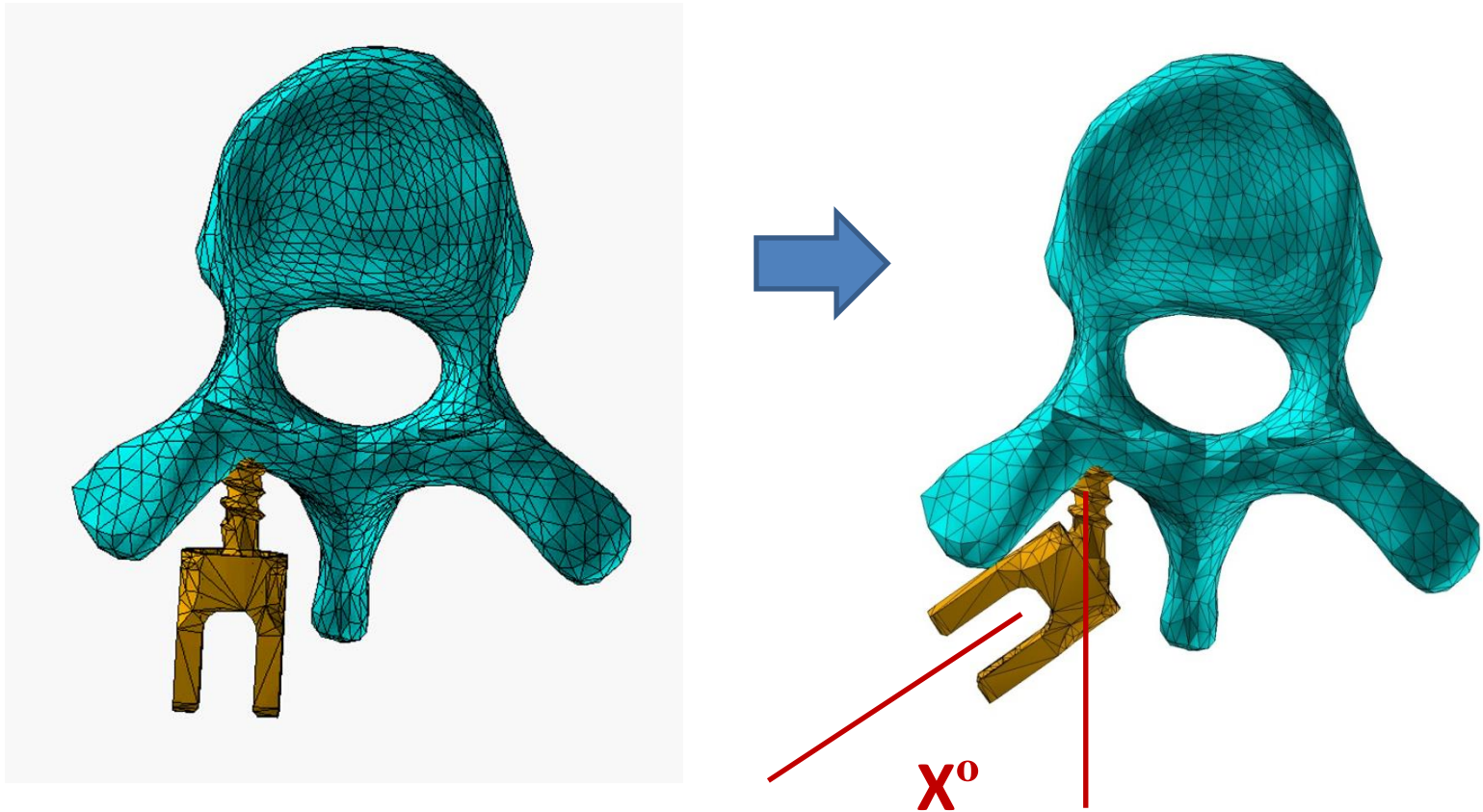
Screws FE Model

- Any type of screw can be modeled (here a 'generic' screw was used).

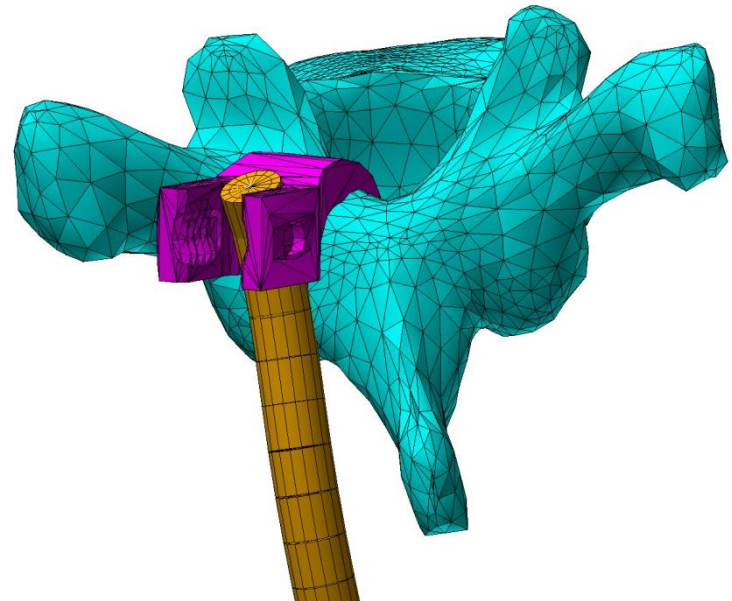
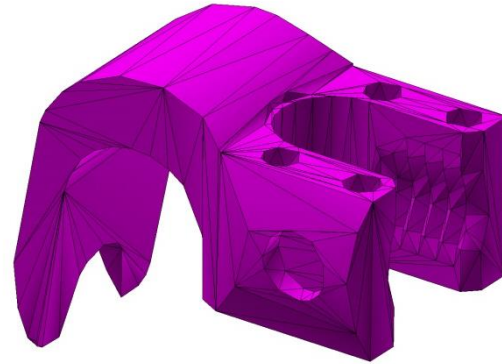
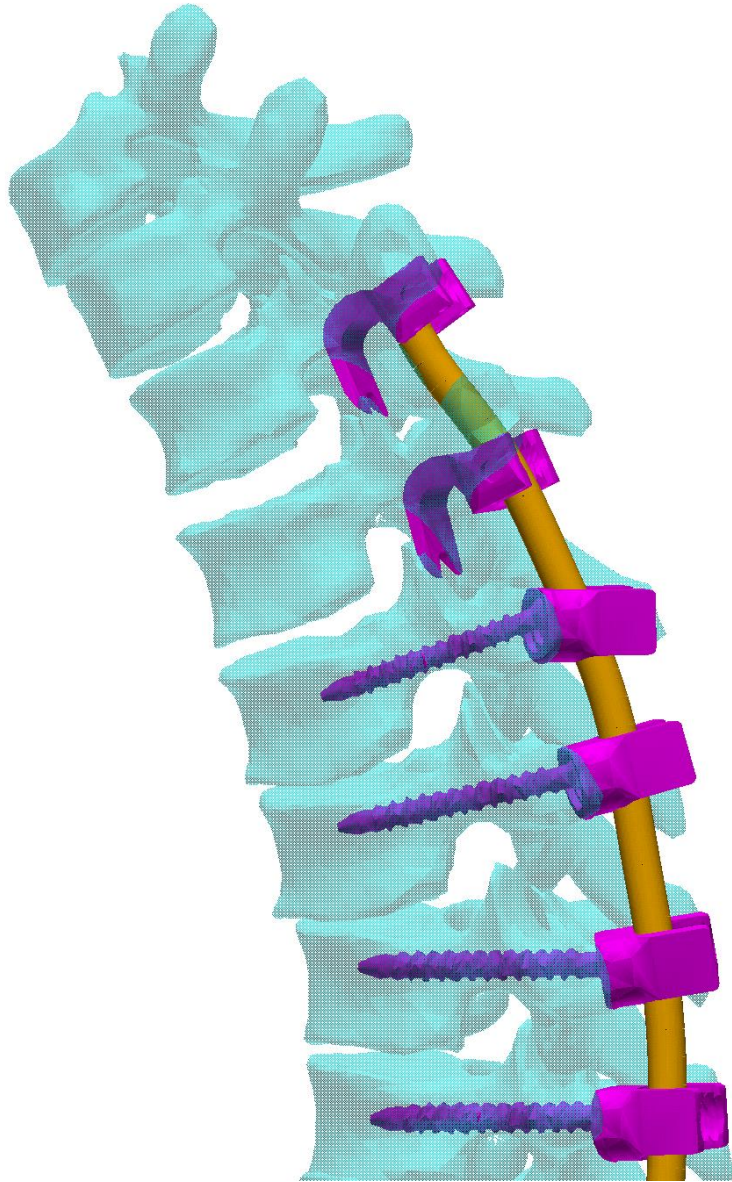


Screw Behavior

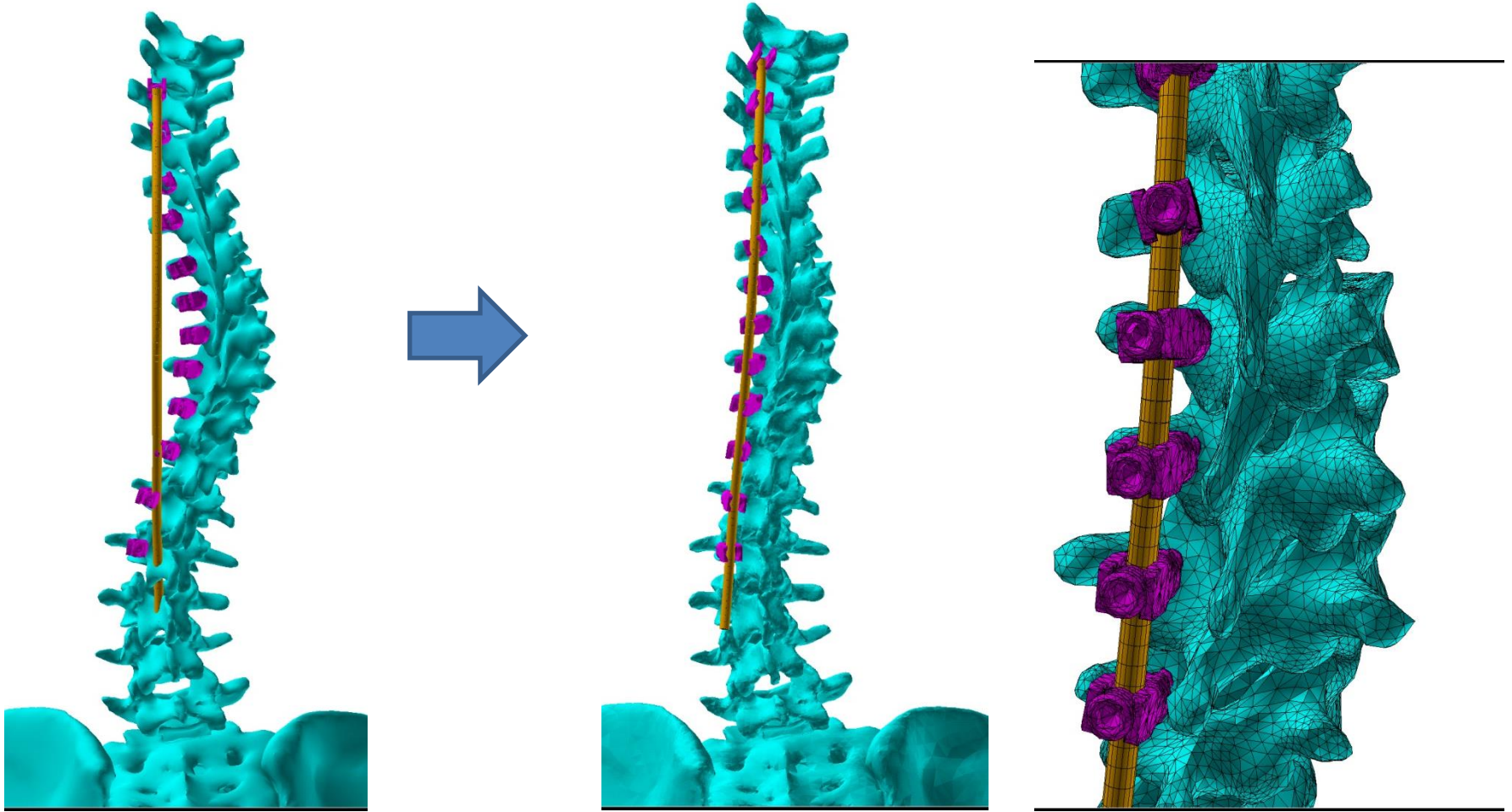
Mono-Axial, Multi-Axial, Uniplanar Screws can be modeled.



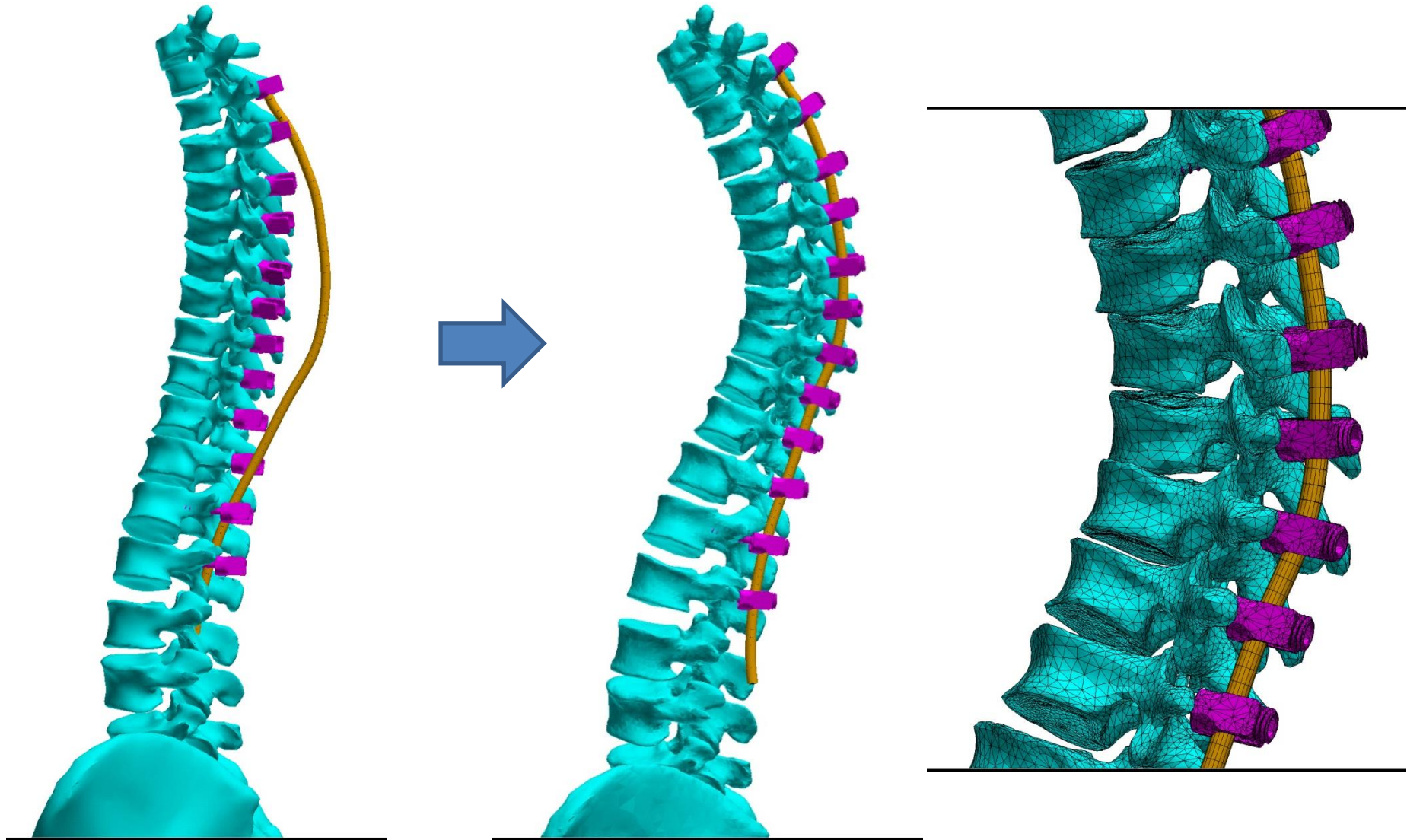
Hook FE Model



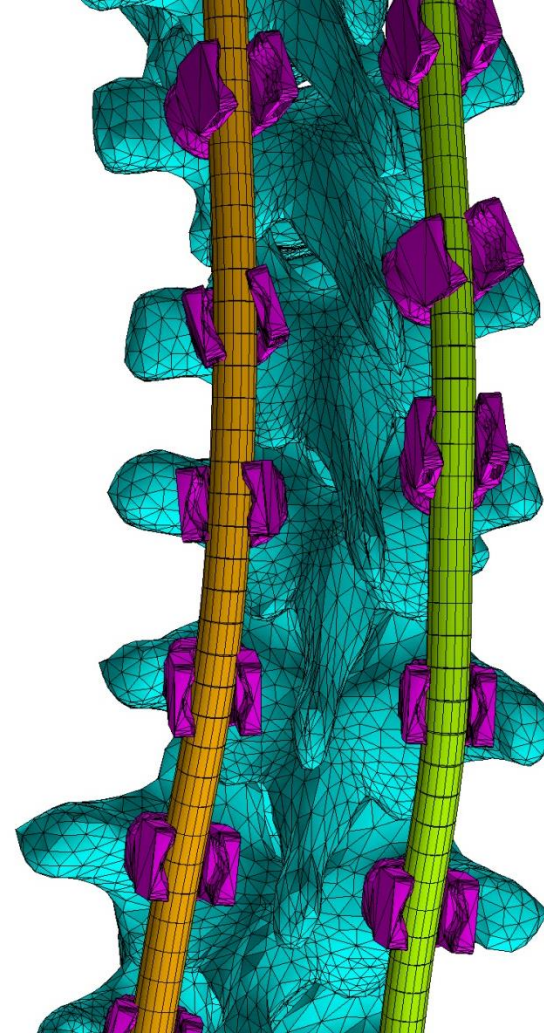
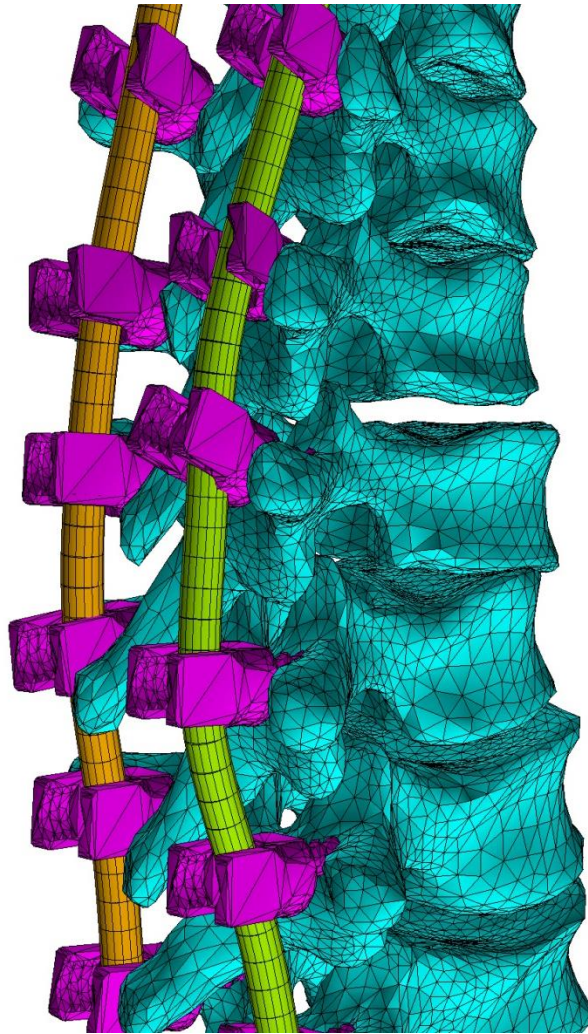
Simulation: 1st Rod Attachment



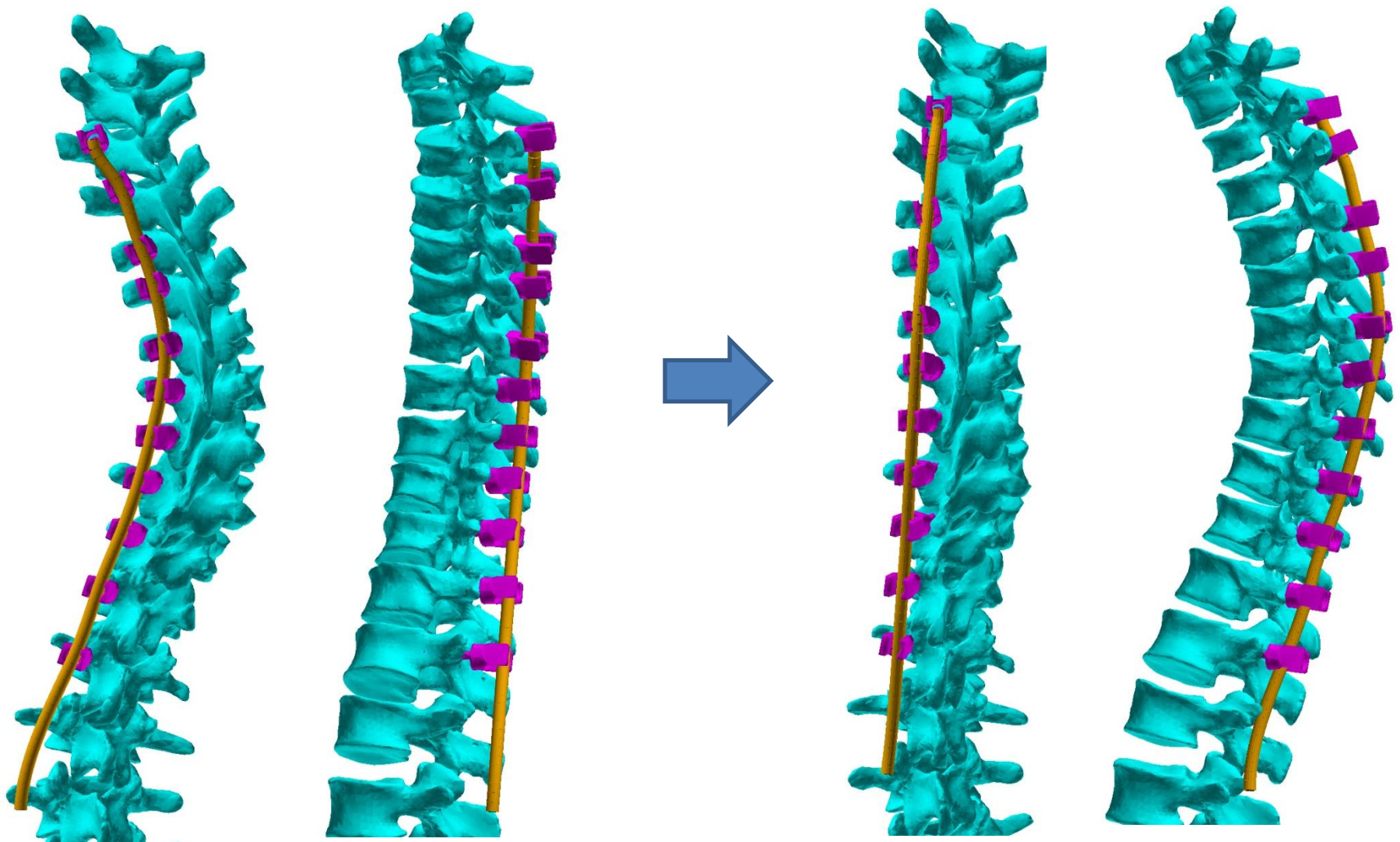
Simulation: 1st Rod Attachment

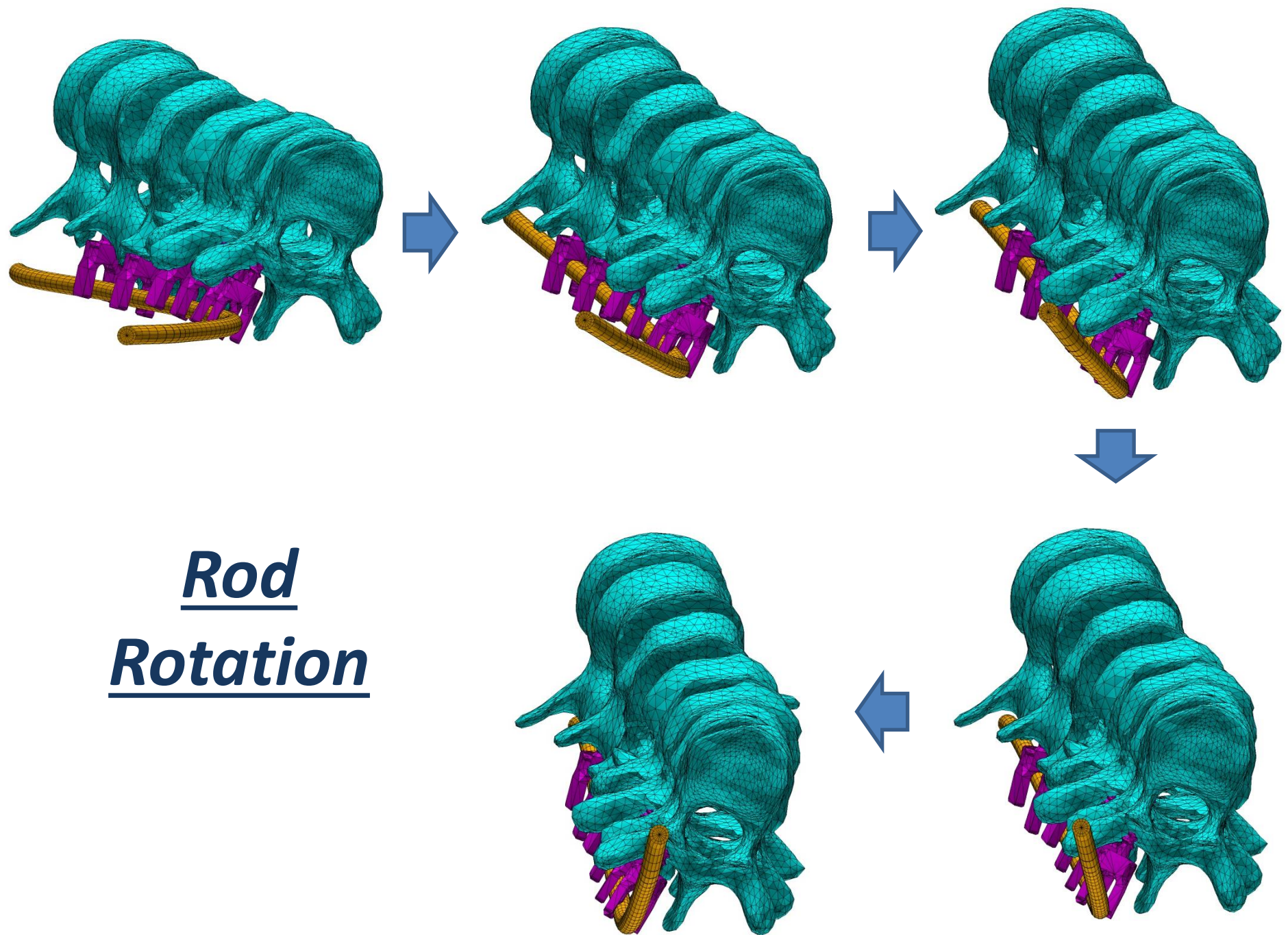


Simulation: 2nd Rod Attachment



Simulation: Rod Rotation

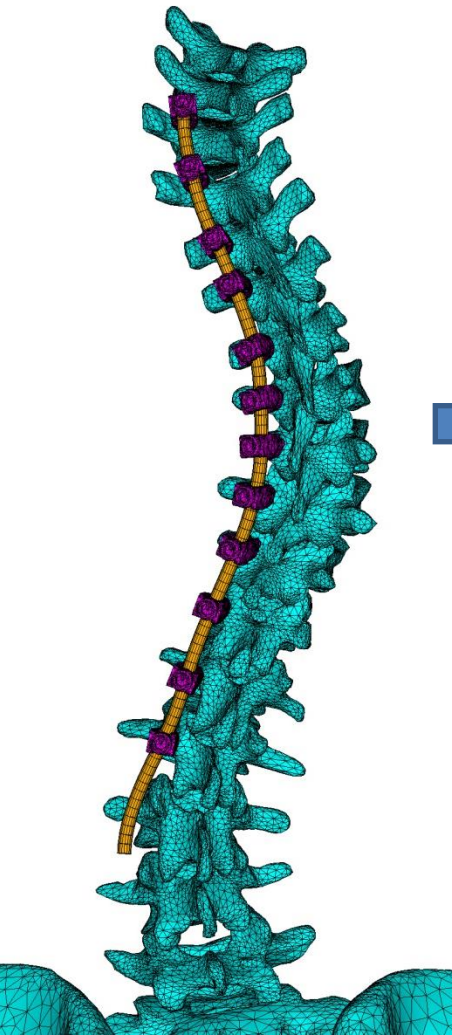




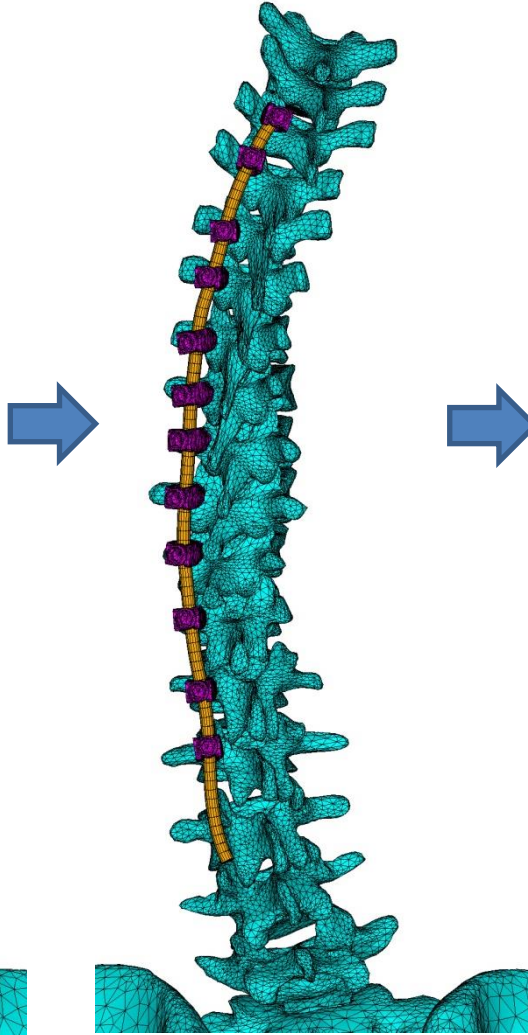
Rod
Rotation

Simulation: In-Situ Bending

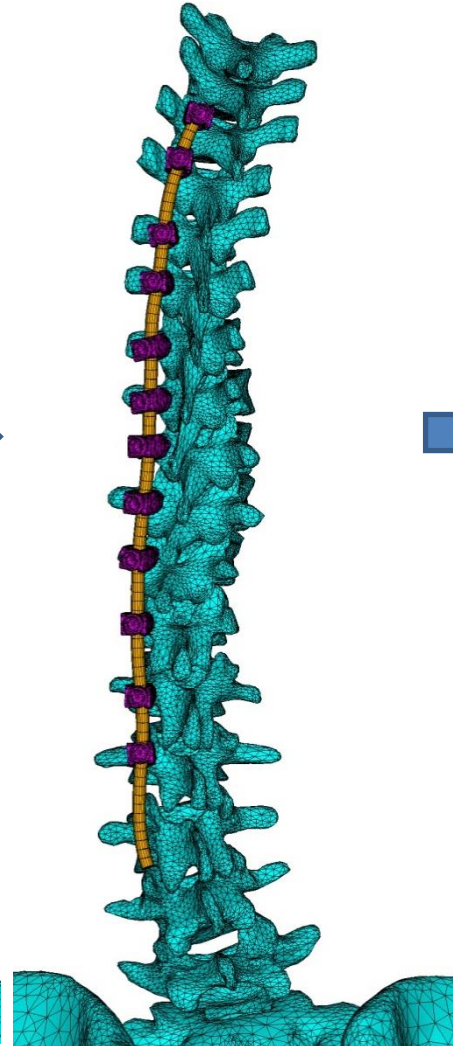
1: Rod attached



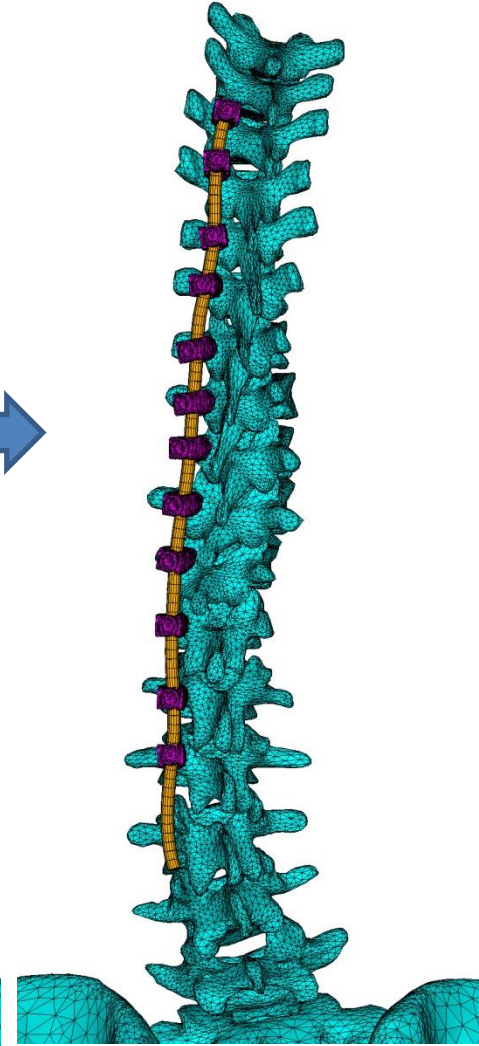
2: Bending moment applied on the rod



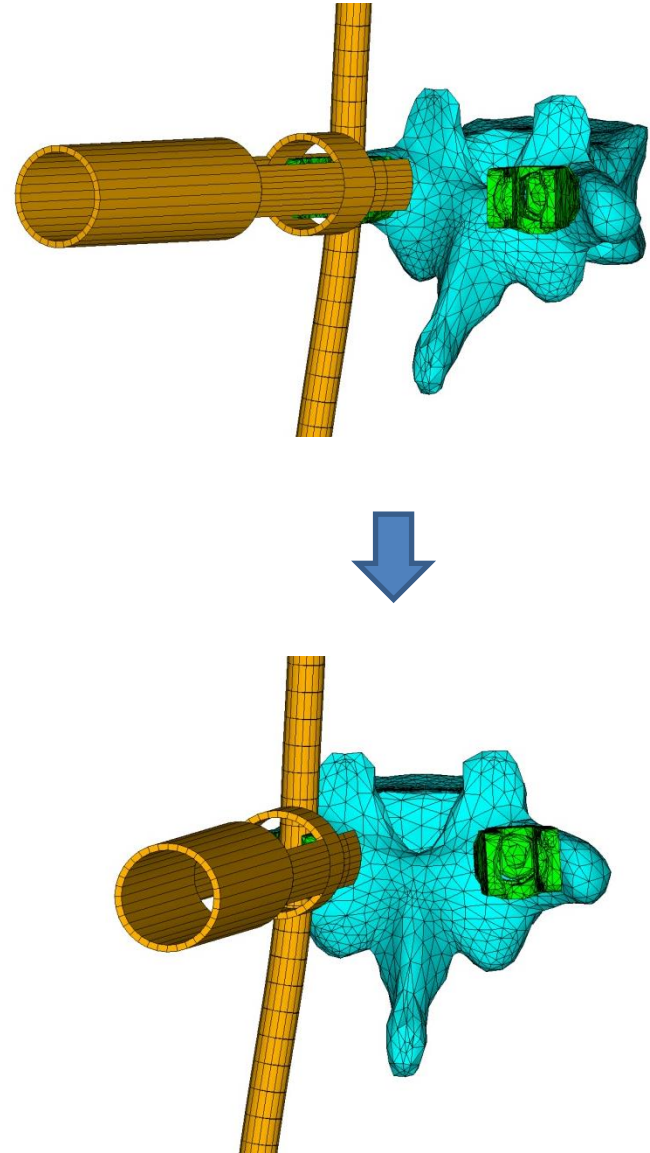
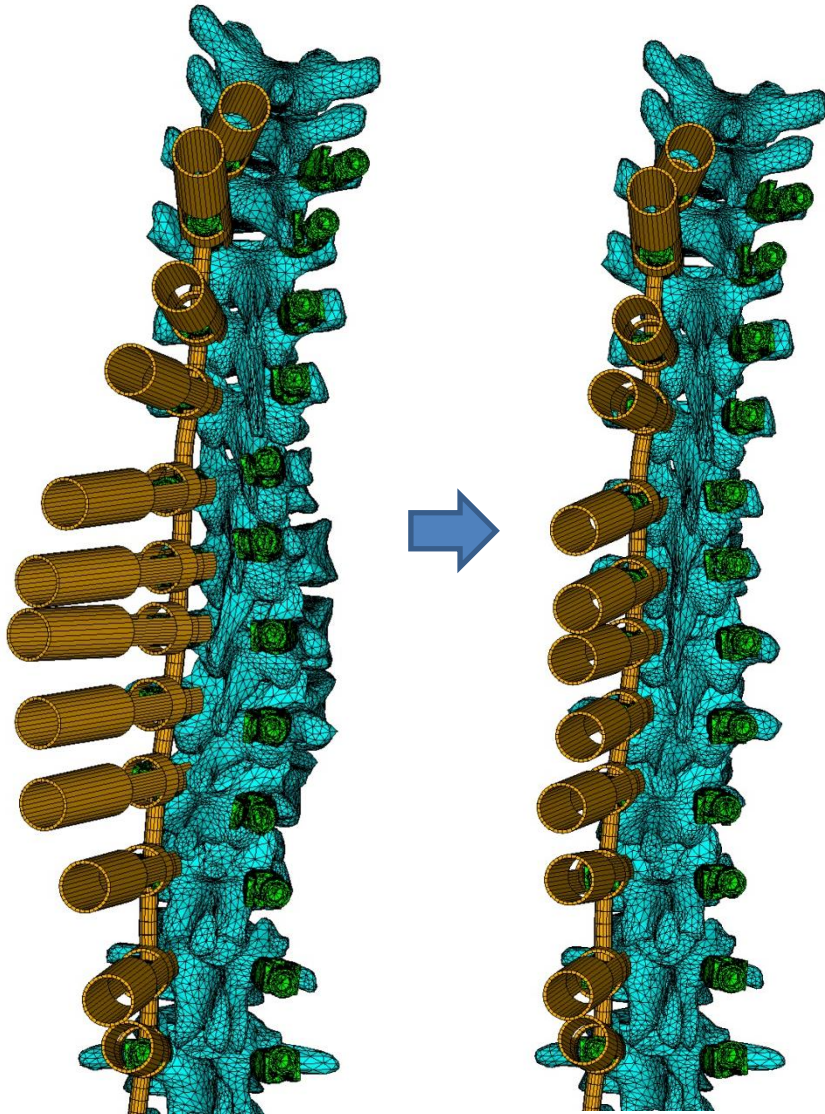
3: Bending moment released.
New equilibrium state
(plasticity)



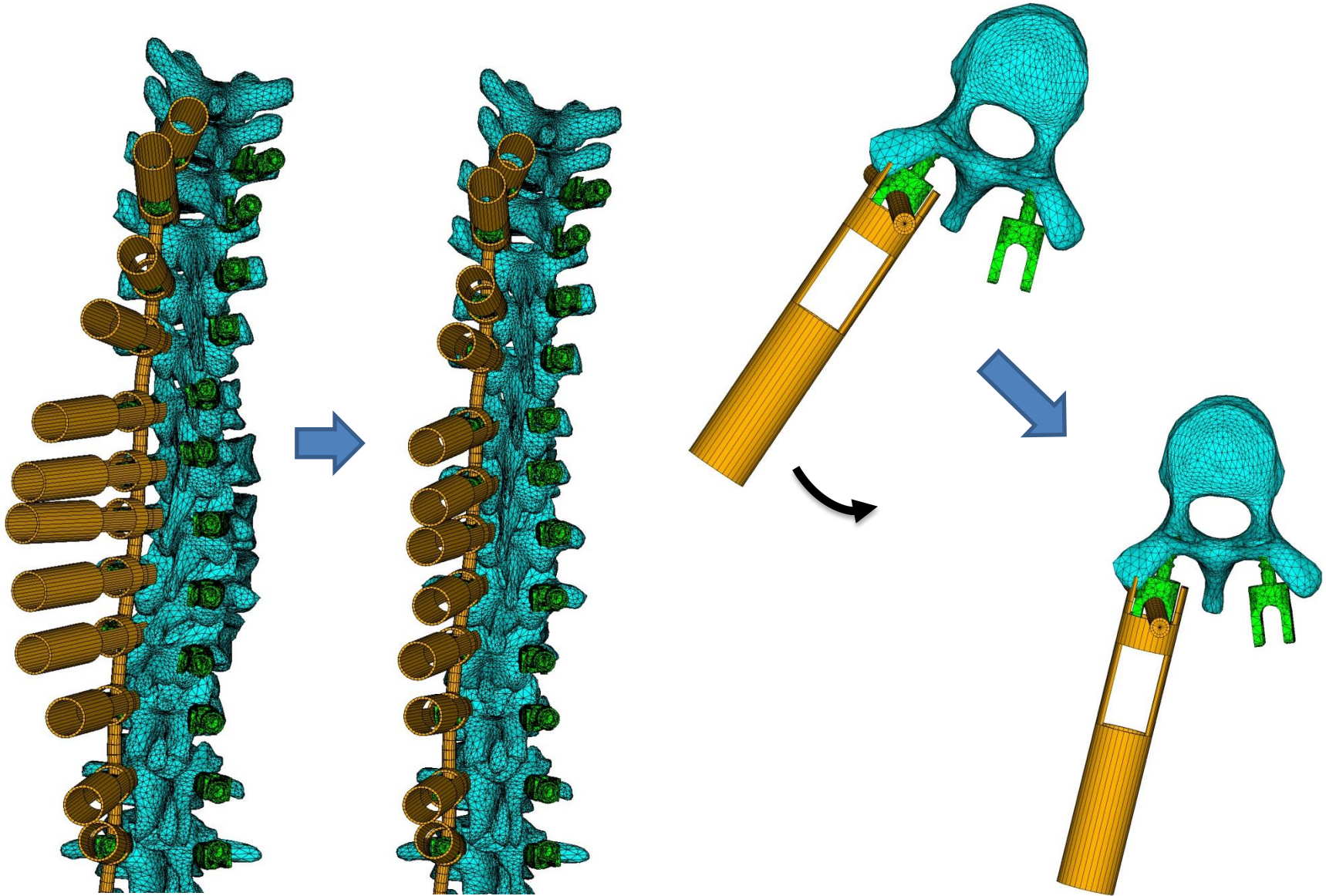
4: Final state after
several iterations



Simulation: Vertebral Derotation



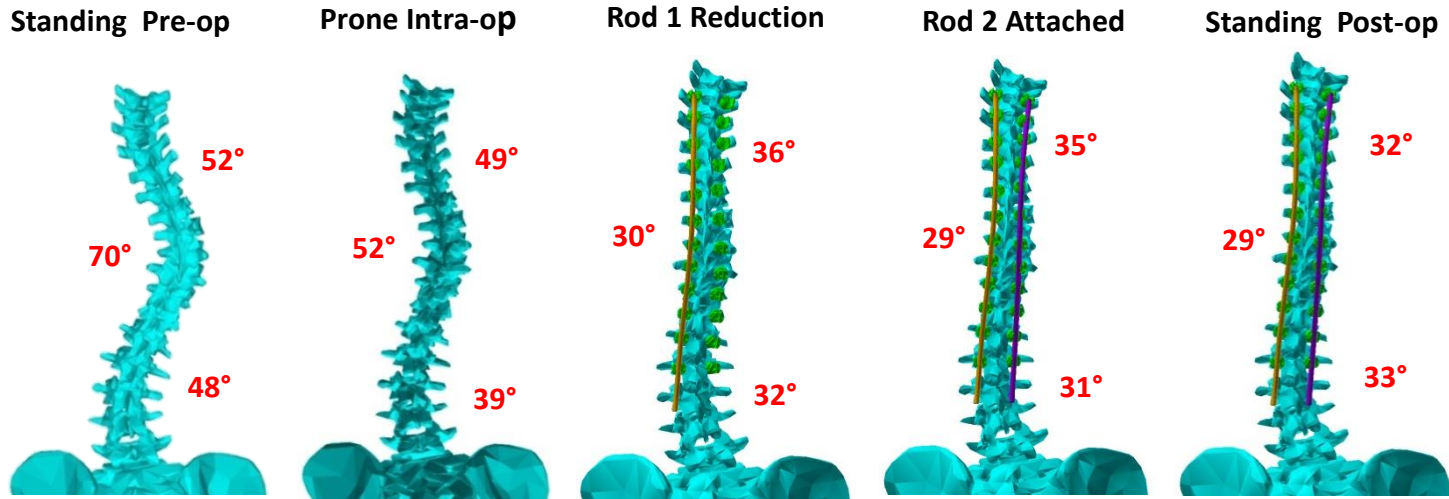
Simulation: Vertebral Derotation



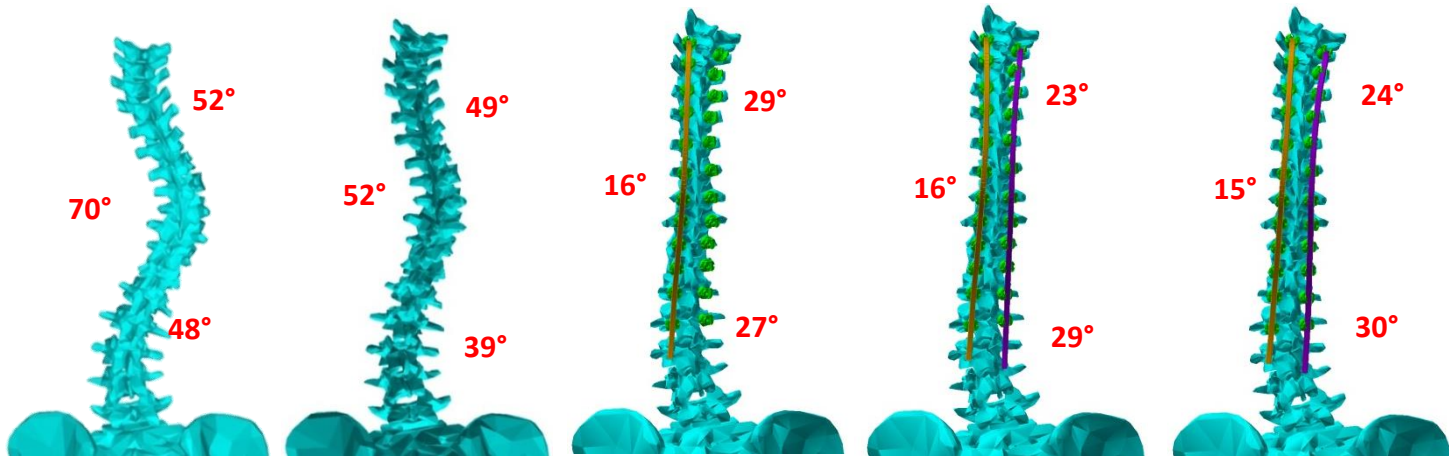
Simulation Output: Geometrical Corrections

Coronal Plane (Cobb Angles)

Generic
System



System X

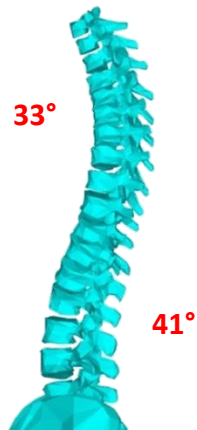


Output: Geometrical Corrections

Sagittal Plane (Kyphosis, Lordosis)

Generic
System

Standing Pre-op



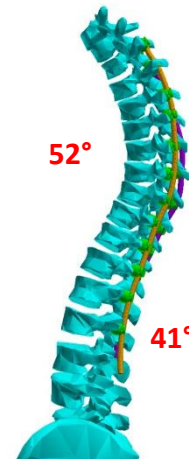
Prone Intra-op



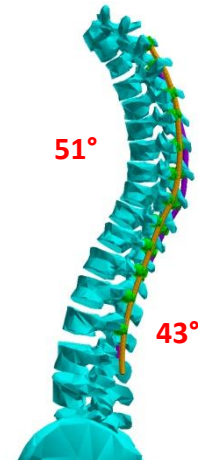
Rod 1 Reduction



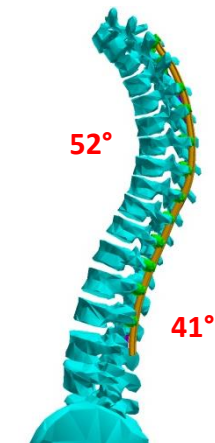
Rod 2 Attached



Standing Post-op

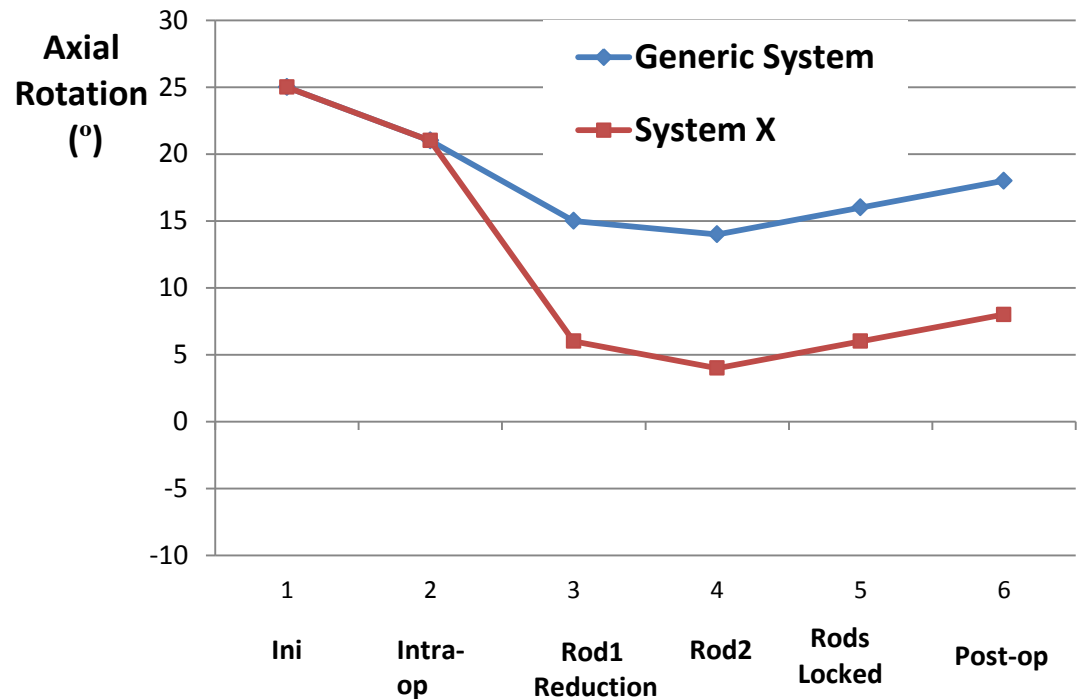
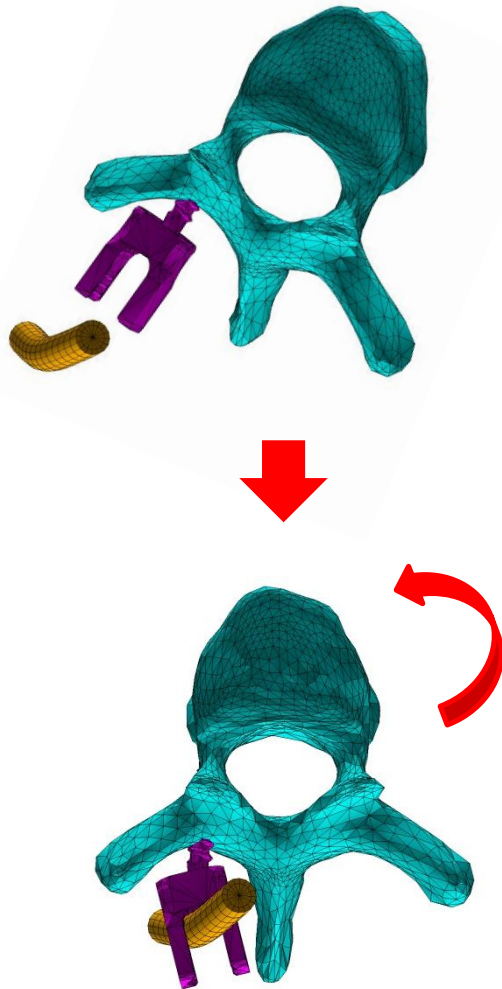


System X

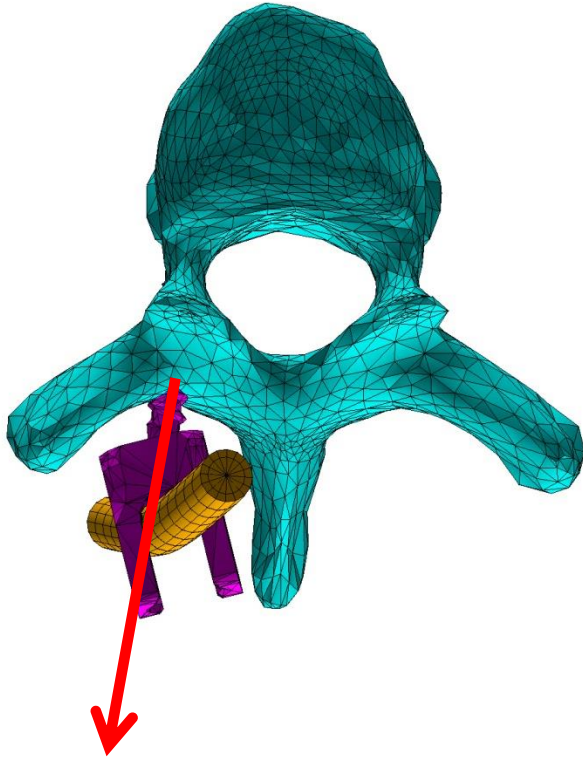


Output: Geometrical Corrections

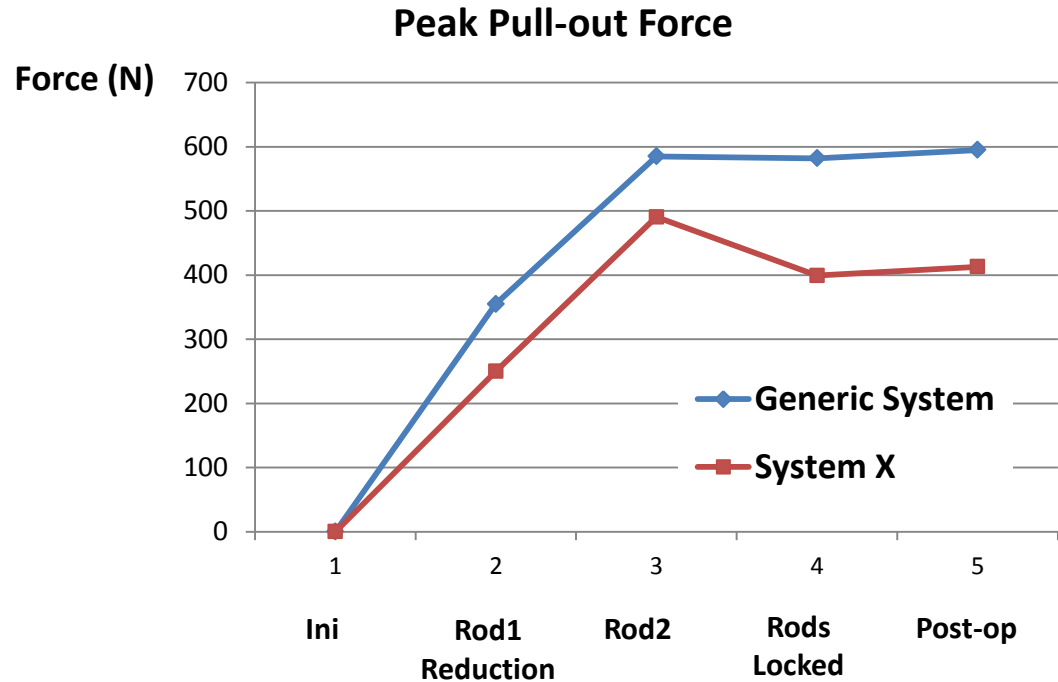
Transverse Plane (Axial Rotation)



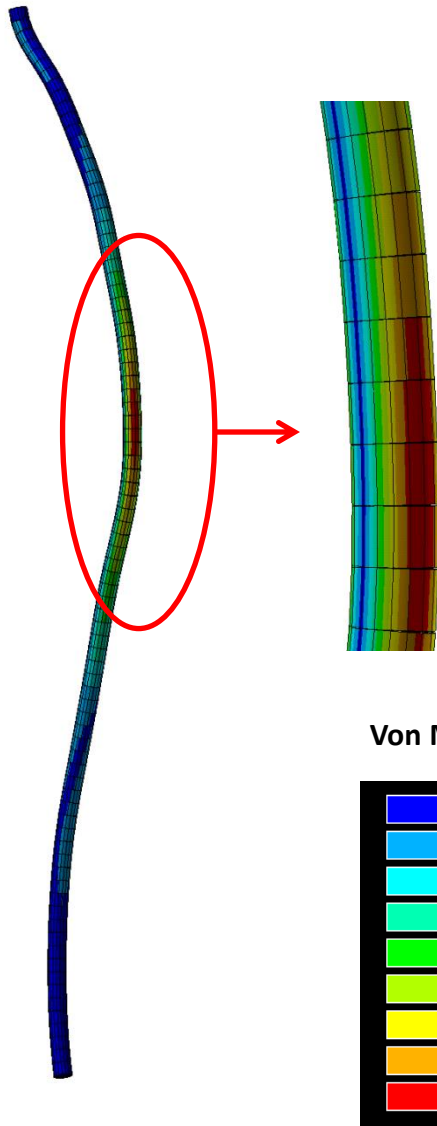
Output: Peak Pull-out Forces



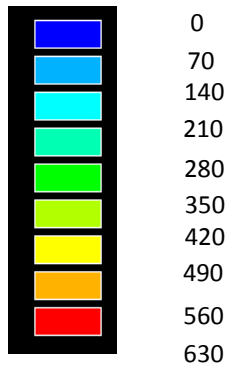
**F = Axial Pull-out
Force (N)**



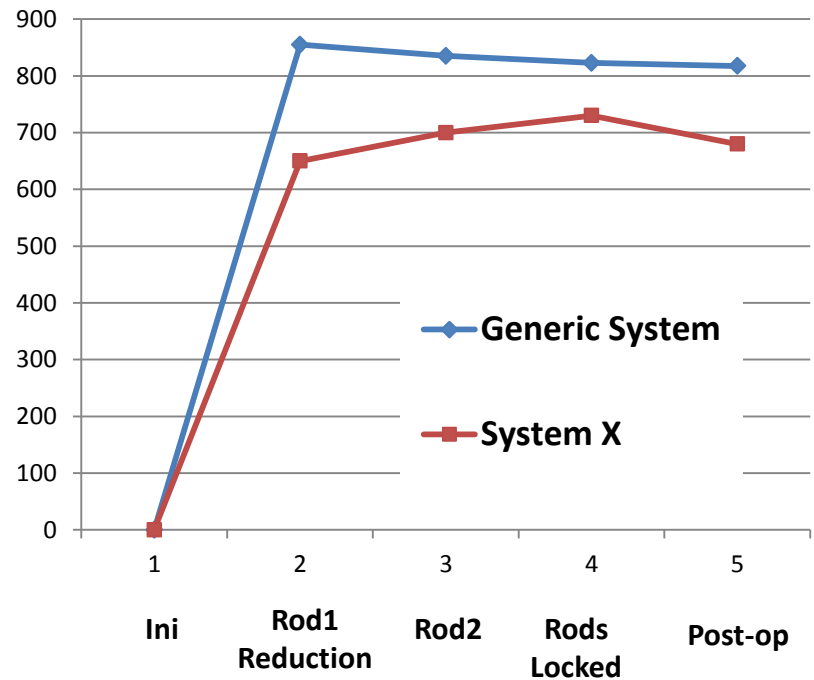
Output: Rods Stresses



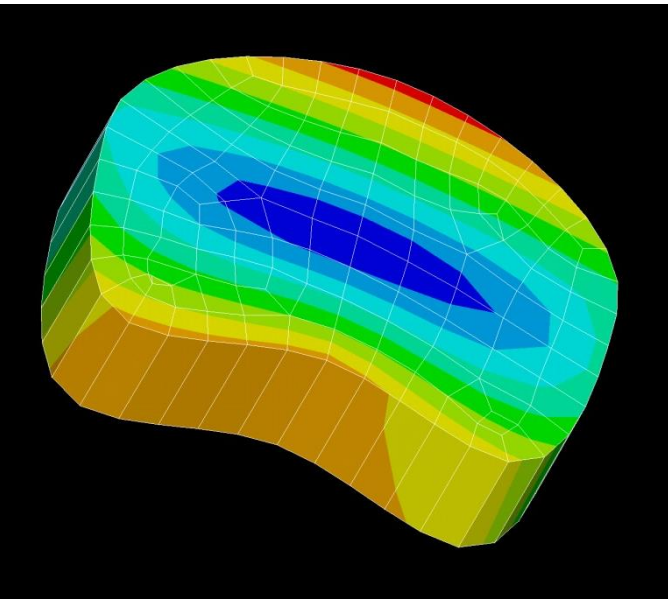
Von Mises Stresses (MPa)



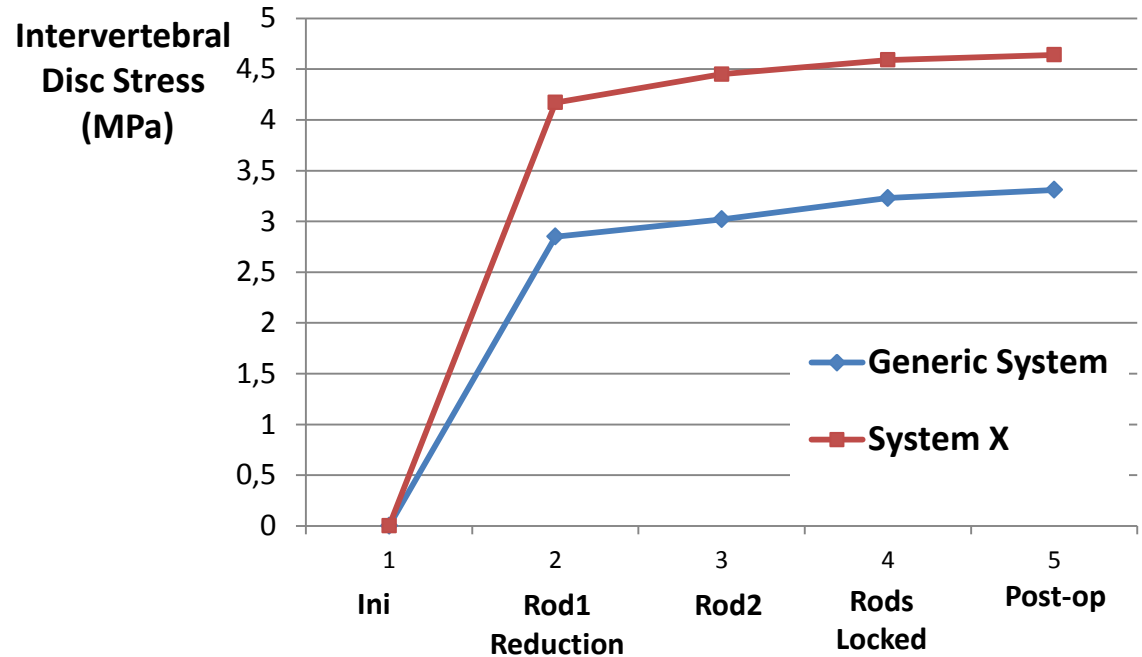
Rod 1
Von Mises
Stress
(MPa)



Output: Intervertebral Disc Stresses



Von Mises Stresses (MPa)



Scoliosis Surgery Simulation

- To **test/optimize** your spinal instrumentation design during or after product development.
- To **compare** your spinal instrumentation to a generic design.
- To prove your new spinal instrumentation design is an **improvement** over previous versions or other existing designs.
- To assist in obtaining **regulatory approval**.



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CONCEPT

DESIGN

PRACTICE



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