INTRODUCTION
- Cervical disc arthroplasty (TDA) has been proposed as an alternative to prevent ASD.
- Optimal & suboptimal placement of a viscoelastic cervical disc (Rhine, K2M Inc.) will replicate natural kinematics (Figure 1).
- Segmental kinematics will improve with optimal placement.

Purpose: To assess the effect that a viscoelastic cervical TDA prosthesis has on spine kinematics after optimal versus sub-optimal placement.

MATERIALS & METHODS
Specifications
- 7 cadaveric C3-T1 spines: 5 Male, 2 Female,
- Age: 40.0 ± 10.2 years
- TDA placement was confirmed by fluoroscopy

Experimental Testing
- ROM was assessed in Flexion/Extension, Lateral bending, and Axial rotation (±1.5Nm)
- Flexion-Extension with 0 N and 150 N preload (Figure 2)
- 3-D motion of each vertebral body was tracked using optoelectronic motion measurement (Figure 2)
- Fluoroscopic imaging was used to document implant position (Figure 3)

Experimental Protocol

Results
- Optimal C5-C6 TDA placement:
  - No change in flexion-extension ROM compared to intact under 0N and 150N preload (p>0.05).
  - LB and AR ROM decreased with TDA (p<0.01).
- Optimal C6-C7 placement:
  - Increased flexion-extension ROM with and without preload (p<0.01).
  - LB and AR ROM decreased with arthroplasty (p<0.01).
- Flexion Stiffness:
  - No change with optimal C5-C6 placement.
  - No change with optimal C6-C7 placement under no preload.
  - C6-C7 stiffness decreased with 150N preload (p<0.01).
- Compared to anterior placement, optimal placement resulted in no significant change in ROM under flexion-extension without preload, LB and AR. Under preload, flexion-extension ROM increased after optimal placement (p=0.014).

CONCLUSIONS
- Biomechanical testing at best mimics the immediate postop condition, therefore changes in the soft tissues, such as annular scar tissue formation, bony remodeling, are not incorporated.
- Inability to entirely replicate in-vivo physiologic loading. Although the follower load technique provides a key component of the in vivo environment (Patwardhan 2000), the complicated musculature of the neck creates loading conditions nearly impossible to reproduce on a cadaveric spine in the laboratory.
- TDA maintained flexion-extension motion at intact levels.
- LB - TDA maintained 42% ROM at C5-C6 and 60% at C6-C7.
- AR - TDA maintained 57% ROM at C5-C6 and 70% at C6-C7.

These findings are supported by literature showing cervical TDA results in restoration of approximately 50% ROM in LB and AR. This is a multifactorial phenomenon encompassing TDA design and anatomical constraints.

ACKNOWLEDGEMENTS:
- US Department of Veterans Affairs, Washington, DC
- K2M Inc., Leesburg, VA