



# Biomechanical Study to Determine Change in Range-of-Motion of Human Thoracic Cadaveric Spine with Intact Rib Cage Following Sequential Ponte Osteotomies

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## Learning Objectives

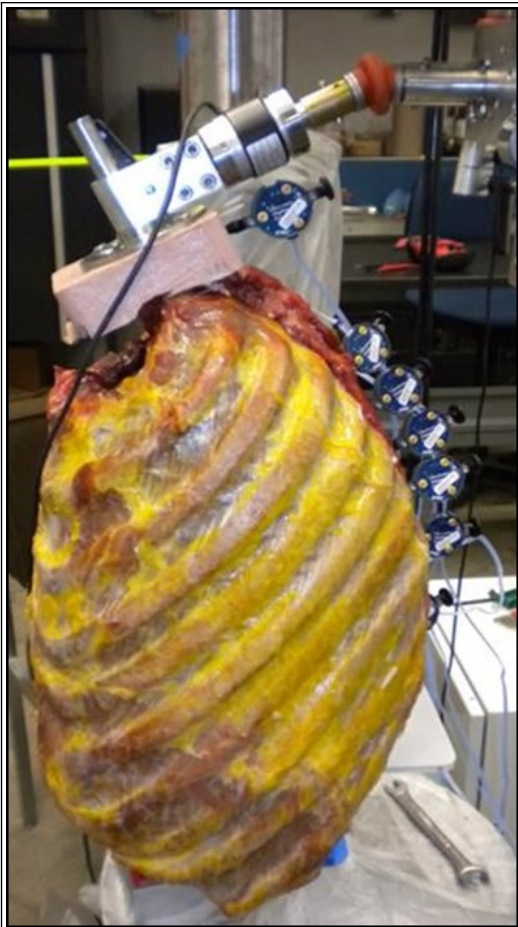
By the conclusion of this session, participants will be able to describe the change in sagittal range of motion in a cadaveric thoracic model with intact rib cage.

## Introduction

Adolescent idiopathic scoliosis and Scheuermann's kyphosis are spinal deformities affecting the lateral and sagittal planes; posterior Ponte osteotomies (POs) are often performed to provide flexibility in the sagittal plane at an estimated correction potential of 5° per PO. POs remove the posterior spinous process, the ligamentum flavum, and the facets at the apex of the sagittal curve. No studies have quantified the change in range-of-motion (ROM) of the human cadaveric thoracic spine with intact rib cage following sequential POs.



Test machine used to apply loads.



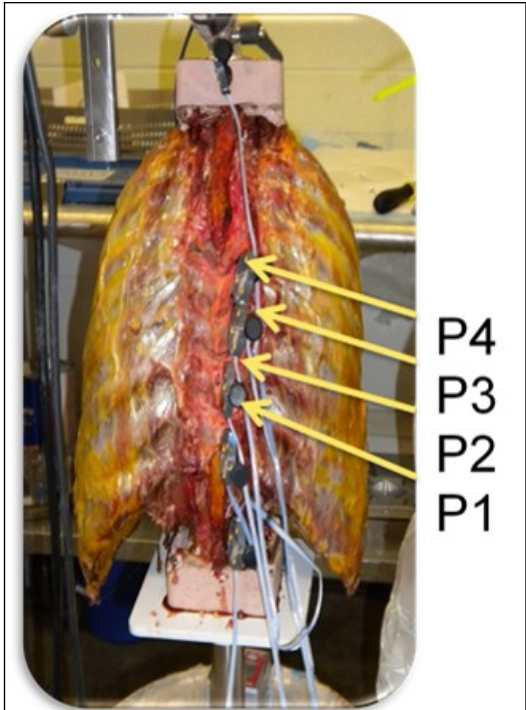
Sagittal view with motion tracking pins in right pedicles.

## Methods

Seven fresh-frozen male human cadaveric thoracic specimens (T1-T12) with intact rib cages were dissected to include stabilizing ligaments, vertebrae, intervertebral discs, and ribs. Specimens were thawed, potted parallel to the T1 and T12 endplates, and mounted in a six-degree-of-freedom spine testing machine (Applied Test Systems, Butler, PA). Motion capture pins were inserted into the right pedicles of T6-T10 and at the top potting, representing T1. Pure moments were applied to T1 in flexion-extension, lateral bending, and axial rotation at a rate of 1°/second to a load limit of 5 N·m for five conditions: intact, PO at T9-T10, PO at T8-T9, PO at T7-T8, and PO at T6-T7. Motion of T1, T6, and T10 were measured, and overall (T1-T12) and regional (T6-T10) ROMs were calculated for each mode of bending at each condition.

## Results

POs increased ROM in flexion only, both overall (T1-T12) and regionally (T6-T10), although the magnitude of the increase was marginal (<1°/PO). No significant differences were found in axial rotation or lateral bending.



Posterior view including four POs.

## Conclusions

POs may increase sagittal correction potential before fusion in patients with hyperkyphosis. More in vitro work should be done to determine the magnitude of the changes, and to examine if the level at which the PO is performed affects correction potential, which could inform surgeons of the most appropriate levels for POs.