INTRODUCTION:
The potential for harm following low speed rear-end impact for cervical total disc replacement patients is yet unknown. These are among the most common motor vehicle accidents. With FDA approval and as widespread implantation becomes reality, questions of occupant safety must be addressed. Previous studies have tested the cervical spine using isolated head-neck specimens. Yet, such work does not consider compressive loads developed in the spinal column by straightening of thoracic kyphosis or occupant-seat interactions, thus resulting in altered kinematics and kinetics (Figure 1). This study is the first to test full body post mortem human subjects (PMHS) under low speed rear-end impacts for cervical response in the orthopaedic literature, per the authors’ knowledge.

METHODS:
8 PMHS specimens had 3.2 mm diameter lead markers implanted from C1 through C7 (Figure 2). Markers were placed in the vertebral body and spinous process of each vertebra percutaneously under fluoroscopic guidance. Previous studies have tested the isolated head neck complex. Such work does not consider compressive loads developed in the spinal column by straightening of spinal curvature or occupant-seat interactions, thus resulting in altered kinematics and kinetics (Figure 1).

RESULTS:
None of the PMHS specimens demonstrated any signs of loosening, subsidence, motion with respect to the endplate or failure of the ProDisc-C prosthesis. While cervical spine motion in extension was substantially greater with no headrest, the Prodisc-C prosthesis was stable following impact. (Figure 2a through d) Post-test implant retrieval analysis demonstrated no signs of damage or wear. (Figure 3a and b)

DISCUSSION:
The findings of this study demonstrate that the ProDisc-C prosthesis is stable under the loading of a low speed rear-end impact, even with the heightened severity of a seat with no headrest. While all tests indicate that immediate post implantation stability of the Prodisc-C total disc replacement is sufficient to sustain low speed rear-end impact, findings of this study may suggest guidelines for further reducing potential implant loading such as proper use of headrests and occupant positioning. The results of this study address the safety of occupants in low speed rear-end impacts following Prodisc-C total disc replacement.

REFERENCES: