INTRODUCTION:
Spinal fusion techniques including anterior lumbar interbody fusion (ALIF) have been used to alleviate chronic low back pain and segmental instability. Supplemental fixation using pedicle screws, translaminar screws, facet screws, anterior plates or spinous process plates is often used to increase the stability of the ALIF construct to enhance fusion and prevent subsidence and migration of the standalone cage. However, these traditional fixation methods often require additional posterior surgery and/or increased anterior exposure leading to increased complications and poor clinical outcomes. ALIF devices with integrated screws provide the opportunity to provide stable fusion constructs, eliminating the need for additional exposure and potentially allowing for standalone use.

The purpose of this study was to evaluate the ability of an interbody cage with integrated fixation screws (Brigade®, NuVasive®; Inc., San Diego, CA) to resist motion and to compare the construct rigidity to traditional ALIF fixation methods and cages without supplemental fixation. It is hypothesized that ALIF cages with integrated screws will provide similar stability to traditional constructs, potentially allowing standalone use and alleviating the need for additional fixation.

RESULTS:
The average ROM of each type of construct at L4-L5 is shown in Figure 2.

Comparison of Cage (0 Screws) with Cage + Integrated Screws
The cage without integrated screws decreased FE ROM from $8.7 \pm 2.7^\circ$ in intact to $5.3 \pm 2.3^\circ$ and in LB from $7.6 \pm 2.0^\circ$ to $3.9 \pm 1.6^\circ$. The addition of supplemental integrated screw fixation led to a further decrease in the motion as compared to the cage alone ($p < 0.05$) in all the 3 loading modes. The cage (3 screws) construct decreased the ROM by $40\%$ of the intact spine in AR as compared to the standalone cage which decreased by only $4\%$. However, ROM of the cage with 3 integrated screws was not significantly different ($p > 0.05$) from the cage with 4 screws, although there was a trend towards more motion in FE ($0.4^\circ$ ($p = 0.72$), LB ($0.2^\circ$ ($p = 0.93$), and AR ($0.3^\circ$ ($p = 0.57$) with 3 screw constructs.

Comparison of Cage with Integrated Screws with Traditional ALIF Fixation Techniques
The cage (4 screws) provided comparable ROM to that of cage (0 screws) + anterior plate in all the 3 loading modes ($p > 0.1$ in FE, $p > 0.87$ in LB and $p > 0.75$ in AR), similar to cage (3 screws) + spinous process plate in LB ($p < 0.16$) and AR ($p < 0.89$) and comparable with cage (0 screws) + bilateral pedicle screws in AR ($p > 0.65$). The cage (3 screws) was not significantly different from that of cage (0 screws) + anterior plate in LB ($p > 0.91$) and AR ($p > 0.10$) and comparable to cage (3 screws) + spinous process plate in LB ($p < 0.06$) and AR ($p < 0.23$). The cage (3 screws) + spinous process plate construct was the most rigid construct in FE and the cage (0 screws) + bilateral pedicle screws was most rigid in LB and AR.

DISCUSSION:
The results indicate that the standalone cage with integrated screws provides more post-operative stability than a standalone cage and provides comparable stability to traditional ALIF constructs, particularly in lateral bending and axial rotation. The results showed that there was no statistical difference following the insertion of 3 or 4 integrated screws into the cage, although there was a trend towards more motion with 3 screws. Thus, this device may provide enough stability to eliminate the need for the traditional techniques as it limits the exposure of the spine and the need for posterior surgery, leading to a possible decrease in complications and morbidity.

REFERENCES: