

Feasibility of C1 Translaminar Screw Placement in the Adult Population

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Introduction

Placement of translaminar screws in the cervical spine has emerged as a useful fixation technique for managing cervical spinal instability, particularly in C2. Previous anatomic studies and clinical series have demonstrated the feasibility of such a procedure at the C2-C7 vertebral levels. Thus far, C1 translaminar screw fixation has received limited attention in the literature. To assess the feasibility of translaminar fixation at the atlas, we have described the dimensions of C1 lamina in the general adult population.

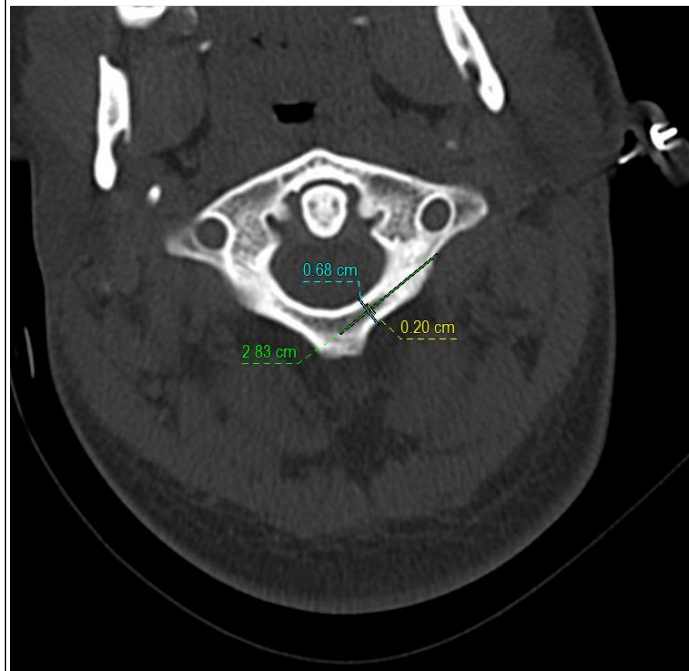
Methods

We retrospectively analyzed 502 consecutive CT scans of the cervical spine performed on patients >18 years of age at a single institution over a 3 month period. We assessed laminar bicortical diameter, length, height, and trajectory bilaterally at the C1 level (Figure 1 and 2). Laminar and screw dimensions were compared to assess instrumentation feasibility.

Results

Average minimum left and right bicortical diameters were 5.62 ± 1.18 mm and 5.58 ± 1.19 mm, respectively. Minimum left and right C1 laminar heights were 10.03 ± 1.72 mm and 10.01 ± 1.74 mm, respectively. Mean left and right C1 laminar lengths were 24.39 ± 2.76 mm and 24.21 ± 2.85 mm, respectively. The average trajectories from midline for left and right laminae were $64.60 \pm 4.49^\circ$ and $66.19 \pm 4.62^\circ$, respectively. We chose a criteria of >4.5 mm minimum bicortical diameter as the threshold for acceptance of a 3.5 mm x 18 mm screw. Using this cut off, 75.9% of C1 lamina had sufficient bicortical diameter to accept bilateral screw placement. We chose >9 mm as the threshold sagittal height to accept bilateral screw placement as this would allow two 3.5 mm screws to each have a 4.5 mm zone for screw placement in a crossing fashion. 63.7% of C1 lamina had sufficient height to accept bilateral screw placement.

Figure 1



Representative measurements of minimum bicortical diameter and laminar length

Conclusions

CT based measurement of atlas morphology revealed that the majority of C1 lamina had sufficient dimensions to accept translaminar screw placement. These findings expand upon previous studies at the C2-C7 vertebral levels by describing the anatomic constraints present at C1. Further study is necessary to assess whether rigid fixation using translaminar screws has comparable fixation strength to more traditional instrumentation methods, such as lateral mass or transarticular screws.

Figure 2



Representative laminar height

Learning Objectives

By the conclusion of this session, participants should be able to describe the morphology and anatomy of the C1 lamina and be able to identify criteria for feasibility of translaminar screw placement.