Surgical Morphometry of Cervical Spine for Lateral Mass and Pedicle Screws : A Technical Note

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Introduction

Patient specific morphometric analysis is essential for optimal spinal instrumentation, espacially in absence of navigation guidence. Earlier studies with Image based measurements fail to consider the effect of third dimension on measurements and hence are not sufficient for optimal instrumentation. Cadaver based measurements are not patient specific and cannot be applied in clinical practice.

Methods

Computed Tomography images of cervical spine were taken with 64 slice scanner, 1 mm thin axial sections with sagittal and coronal reconstructions were used to take initial measurements. On -Screen Caliper and Protractor were used in any Window or Mac Personal Computer to correct the effect of third dimension.

CT Cervical Spine of 75 patients with poly trauma but without osseous - ligamentous injury of cervical spine were studied initially to asses the feasibility of measurements in individual patients.

20 patients who underwent Lateral Mass Screw and Pedicle Screw placements for varied indications were prospectively studied with details of screw length and surgeons perspective of optimal placement; post operative CT of cervical spine were analyzed for the length of the screw used and actual position of screw.

Results

The measurements obtained by use of On-Screen caliper and protractor correlated well with actual length of screws used at surgery and measured in post operative CT images.

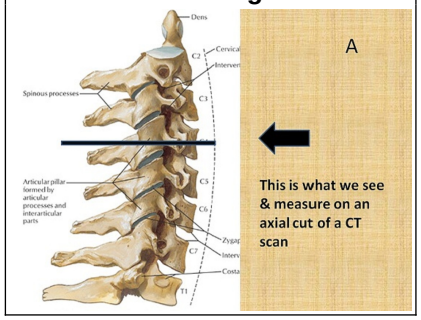
Conclusions:

Preoperative morphometric analysis using on-screen calliper and protractor is a very simple, inexpensive and accurate method of 3D measurements. It's a very useful adjunct in lateral mass screw and pedicle screw placement in cervical spine surgery.

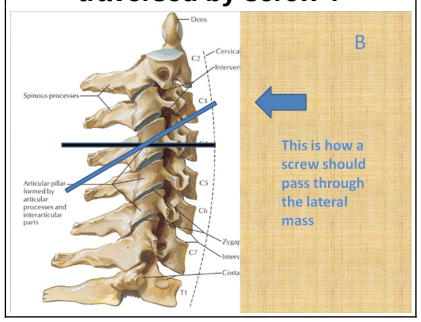
Clinical Application:

In institutions without intra operative navigation, this simple and inexpensive technique will improve the accuracy of Lateral mass and Pedicle screw placement

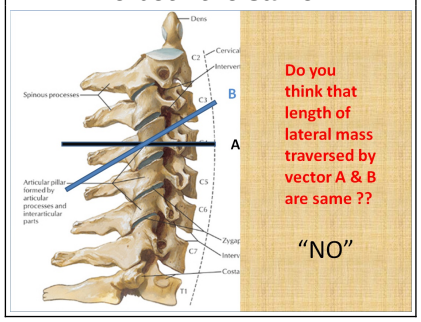
What we measure routinely as screw length.



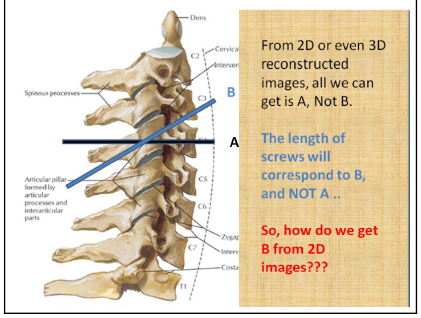
Whats the actual span of bone traversed by screw ?



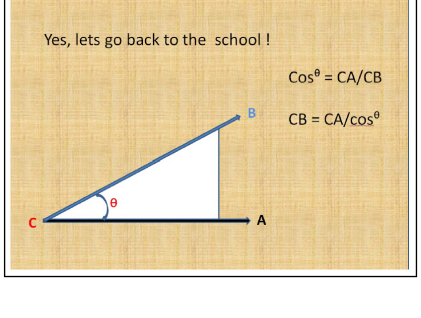
Are both the same ?



How do we correct the difference ?



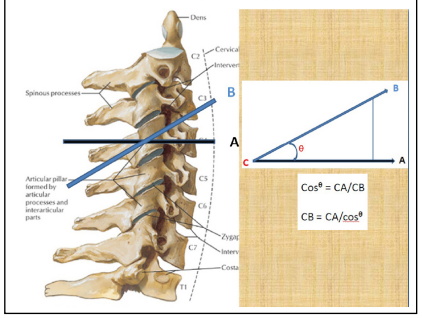
Back to school !!



Formula

$$\text{Actual length of screw} = \frac{\text{Measured length}}{\text{Cosine of craniocaudal angle}}$$

Correction Factor.



Using Protractor for measuring craniocaudal angulation