



Morphological Study of Cervical Pedicles using 3D Reconstruction Imaging Created by MIMICS[®] 10.01 Software

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Background and objective : Malpositioning of cervical screws risks neurovascular injury. A cervical screw fixation system can provide proper rigidity, alignment correction and high rates of fusion afforded by high pullout biomechanical strength. Knowing the pedicle morphology at each cervical vertebra is therefore necessary for determining the safest insertion method.

Objective: To assess the dimensions and axis of the C3-C7 cervical pedicles to create guidelines for cervical pedicle screw fixation.

Methods : A 1-mm slice thickness CT scan of the cervical spine of 30 patients (15 males, 15 females) were analyzed and reconstructed in 3D using MIMICS[®] 10.01 software. Morphologic assessments of the cervical vertebrae were thereafter undertaken. We measured pedicle axis length (PAL), pedicle and lateral mass length (PL-LM), pedicle length (PL), outer pedicle width (OPW) and pedicle transverse angle (PTA) from the axial image and

outer pedicle height (OPH) and pedicle sagittal angle (PSA) from the sagittal image.

Result : The OPH and OPW at all subaxial cervical spines were suitable for insertion of 3.5 mm cervical pedicle screws. PSA was directed cranially at C3 to C5 (13.84, 7.09 and 2.71) and directed caudally at C6 and C7 (-4.55, -6.94). PTA was greatest at C5 and smallest at C7. The respective difference between the left and right side for nearly all parameters was not statistically significant (except for C6 PL and C7 OPH). Females had a significantly smaller OPH and OPW than males at nearly all level. The PTA was not significantly different between the sexes.

Conclusion : Cervical pedicle screw fixation in the Thai population can be safely performed and guidelines for insertion at each vertebra documented. Appropriate pre-operative planning is necessary to achieve safe and accurate placement of the screws.