

Anatomical Study of Transverse Foramen and Vertebral Artery in Subaxial Cervical Spine for Safe Pedicle Screw Insertion

Background

Cervical pedicle screw (CPS) is technically-demanding procedure, it should pass cervical pedicle, between spinal canal (SC) and transverse foramen (TF). During surgery with lateral X-ray, probe tip passes lateral to SC first, then medial to TF. TF usually exists anterior to the posterior wall of vertebral body (PW). So, the knowledge, how deep TF exists from PW, is important. This study clarifies the distance from PW to TF and vertebral artery(VA) for safe insertion of CPS.

Methods

Consecutive 96 cases' cervical CT angiograms (CTA) were evaluated retrospectively. The age was 72.6 ± 6.2 (range 61-85) yrs, and they were 85 male and 11 females. The distance from PW to posterior margin of TF (PW-TF), to posterior margin of contrast medium, equivalent to VA lumen, (PW-VA) were measured with axial section of CTA. The heights for evaluation were subaxial spine, from C3 to C6.

Results

There was no case with VA entering C7 TF, so measurement was for C3-C6. VA enter from right C5 in 5 cases, left C5 in 8 cases (in them, 2 cases were both side), right C4 in 1 case, and left C4 in 1 case. Typical VA entering C6 was in 83 cases. Lack of right VA was in 3 cases and left VA was in 5 cases. PW-TF were 2.7 ± 1.2 mm at C3, 3.3 ± 1.3 mm at C4, 3.2 ± 1.3 mm at C5 and 2.8 ± 1.4 mm at C6. The PW-TF of C4 and C5 were higher than of C3 and C6 with significance. PW-VA were 3.6 ± 1.2 mm at C3, 4.2 ± 1.3 mm at C4, 4.5 ± 1.6 mm at C5, 4.2 ± 1.3 mm at C6. From C3 to C5, that increased with significance.

Conclusions

The distance from PW to TF was 3mm and to VA lumen was 4mm, approximately. When screw is proceeded over the distance, there is risk of VA injury. So, when inserting the CPS, it is necessary to confirm that there is no perforation before proceeding. If it is not

certain, it is safe to not proceed anteriorly beyond the PW. It is enough strong if the screw bites the cortex of spinal canal. There are individual differences, so preoperative evaluation is mandatory.