Ponticulus posticus

The ponticulus posticus is a bony bridge in the atlas between the lateral mass and the posterior arch. It results due to ossification of the posterior atlantooccipital ligament of atlas and encloses the vertebral artery and the first cervical nerve root.

It is a normal anatomical variant of atlas vertebrae (C1) and resides in the posterior arch of atlas in relation to the vertebral artery. It is an incidental finding visualised from lateral cephalograms taken for routine orthodontic treatment purposes. Ponticulus posticus in Latin means ‘little posterior bridge’. Other synonyms for ponticulus are arcuate foramen, kimerle anomaly, retroarticular foramen and retocondylar foramen.

An overall incidence of ponticulus posticus has been reported to be 16.7%. Literature reveals a higher incidence in females compared with males and this anomaly was age-independent.

Diagnosis

Failure to detect ponticulus posticus can have grave complications during cervical spine surgical intervention, especially those requiring screw placement in lateral mass region of Atlas vertebra [1].

Consecutive computed tomography scans (n=210) were reviewed for PP and high-riding vertebral artery (HRVA) (defined as an internal height of <2 mm and an isthmus height of <5 mm). In scans with PP+HRVA, we measured the ipsilateral pedicle width, pars length, and laminar thickness and compared them with controls (those without PP or HRVA).

PP was present in 14.76% and HRVA in 20% of scans. Of the 420 sides in 210 scans, PP+HRVA was present on 13 sides (seven right and six left). In scans with PP+HRVA, the length of the C2 par was shorter compared with controls (13.69 mm in PP+HRVA vs. 20.65 mm in controls, p<0.001). The mean C2 pedicle width was 2.53 mm in scans with PP+HRVA vs. 5.83 mm in controls (p<0.001). The mean laminar thickness was 4.92 and 5.48 mm in scans with PP+HRVA and controls, respectively (p=0.209).

The prevalence of PP+HRVA was approximately 3% in the present study. Our data suggest that, in such situations, C2 pedicle width and pars length create important safety limitations for a proposed screw, whereas the translaminar thickness appears safe for a proposed screw [2].

In CT scans some anomalies, such as abnormal facet complex and arch anomalies, have to be differentiated from fractures in a trauma patient. Other anomalies, like PP, have to be looked for during preoperative planning to avoid complications during surgery. Therefore, knowledge of these anomalies is important as different anomalies have different clinical courses and management [3].

Case series

Thirty-three consecutive patients with unstable odontoid fractures underwent Goel technique and Harms technique (C1–2 arthrodesis). Surgery was performed with the aid of lateral fluoroscopy control in 16 cases (control group) that was supplemented by Doppler ultrasonography in 17 cases (Doppler group). Two patients in each group had a C1 ponticulus posticus. In the Doppler group, Doppler probing was performed during lateral subperiosteal muscle dissection, stepwise drilling, and tapping. Blood flow velocity in the V3 segment of the VA was recorded before and after posterior arthrodesis. All patients had a 12-month outpatient follow-up, and the outcome was assessed using the Smiley-Webster Pain Scale. Neither VAI nor postoperative neurological impairments were observed in the Doppler group. In the control group, VAIs occurred in the 2 patients with C1 ponticulus posticus. In the Doppler group, 1 patient needed intra- and postoperative blood transfusions, and no difference in terms of Doppler signal or VA blood flow velocity was detected before and after C1-C2 posterior arthrodesis. In the control group, 3 patients needed intra- and postoperative blood transfusions.Useful in supporting fluoroscopy-assisted procedures, intraoperative Doppler may play a significant role even during surgeries in which neuronavigation is used, reducing the chance of a mismatch between the view on the neuronavigation screen and the actual course of the VA in the operative field and supplying the additional data of blood flow velocity [4].

References

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