Vertebral artery variations

Variability in dimensions and course of vertebral artery (VA) makes it vulnerable to injury during surgery for congenital atlantoaxial instability (AAD) with or without an assimilation of the atlas.

A preoperative detailed risk assessment of anatomical variations in the size and course of VA at the craniovertebral junction (CVJ) significantly reduces chances of its iatrogenic injury [1].

Representative vertebral artery (VA) variations include the persistent first intersegmental artery (FIA), fenestration of the vertebral artery above and below C1 (FEN), posterior inferior cerebellar artery (PICA) from C1/2, and high riding vertebral artery (HRVA).

Occlusion of one of the vertebral arteries can cause many serious consequences, ranging from blindness to paralysis.

The ascending pharyngeal artery (APA) may, in very rare cases, supply the posterior inferior cerebellar artery (PICA). In reported cases, when such is the case, the ipsilateral vertebral artery (VA) does not supply the PICA, and most of the time it is hypoplastic.

For vertebral artery variations, the SFOF-VR technique is an effective tool to delineate the course VA [2].

One hundred twenty patients with basilar invagination and atlas occipitalization who had undergone 3-dimensional computed tomographic angiography (3D-CTA) were retrospectively studied. Imaging data were processed via the separating, fusing, opacifying, and false-coloring-volume rendering technique. Abnormal anatomy of the VA at the CVJ was categorized and related anatomic parameters were measured.

Seven different types were classified. Type I, VAs enter the cranium after leaving VA groove on the posterior arch of atlas (26.7% of 240 sides); Type II, VAs enter an extraosseous canal created in the assimilated atlas lateral mass-occipital condyle complex before reaching the cranium (53.3%); Type III, VA courses above the axis facet or curves below the atlas lateral mass then enter the cranium (11.7%); Type IV, VAs enter the spinal canal under the axis lamina (1.3%); Type V, high-riding VA (31.3%); Type VI, fenestrated VA (2.9%); Type VII, absent VA (4.2%). Distance from the canal of Type II VA to the posterior facet surface of atlas lateral mass (5.51 ± 2.17 mm) means a 3.5-mm screw can be safely inserted usually. Shorter distance from the midline (13.50 ± 4.35) illustrates potential Type III VA injury during exposure. Decreased height and width of axis isthmus in Type V indicate increased VA injury risks.

Seven types of VA variations were described, together with valuable information helpful to minimize VA injury risk intraoperative [3].

References

1)
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