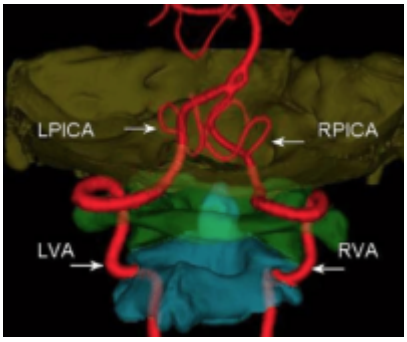
SFOF-VR



Du et al. reviewed 32 patients with basilar invagination and atlantoaxial dislocation who were misdiagnosed as a simple Chiari malformation and received a suboccipital decompression surgery before admission. All patients underwent atlantoaxial facet joint reduction, fixation and atlantoaxial fusion (AFRF) as revision surgery. The separating, fusing, opacifying and false-coloring-volume rendering (SFOF-VR) technique was used to identify the course of the vertebral artery. Clinical and radiological outcomes were assessed after revision surgeries.

Clinical symptoms improved in all patients. The postoperative atlantodental interval, Wackenheims line and clivus canal angle significantly improved (all $P < 0.01$). Intraoperative dural tear and cerebrospinal fluid leakage occurred in 3 patients and were managed by suture repair and lumbar drain. Abnormal VA was identified in 7 patients and no VA injury occurred with the aid of SFOF-VR technique. The average follow-up was 19.1 months and atlantoaxial bone fusion was confirmed in 31 patients.

For BI and AAD patients with failed suboccipital decompression, revision surgery is challenging. Occipitocervical fixation and posterior midline bone grafting are rather difficult due to the large occipital bone defect. The current study demonstrated that the posterior AFRF is a simple, safe and highly effective technique in revision surgery for such cases. For vertebral artery variations, the SFOF-VR technique is an effective tool to delineate the course VA [1)].

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 [2)]

1)
Du YQ, Qiao GY, Yin YH, Li T, Yu XG. Posterior atlantoaxial facet joint reduction, fixation and fusion as revision surgery for failed suboccipital decompression in patients with basilar invagination and atlantoaxial dislocation: Operative nuances, challenges and outcomes. Clin Neurol Neurosurg. 2020 Mar 18;194:105793. doi: 10.1016/j.clineuro.2020.105793. [Epub ahead of print] PubMed PMID: 32283470.
2)
Li T, Yin YH, Qiao GY, Wang HW, Yu XG. Three-Dimensional Evaluation and Classification of the Anatomy Variations of Vertebral Artery at the Craniovertebral Junction in 120 Patients of Basilar Invagination and Atlas Occipitalization. Oper Neurosurg (Hagerstown). 2019 Dec 1;17(6):594-602. doi: 10.1093/ons/opz076. PubMed PMID: 31127851.