Atlantoaxial fusion case series

In a retrospective cohort study including all pediatric patients (≤ 18 years) who underwent craniocervical and/or atlantoaxial fusion, between 2009 and 2019 at the quaternary care center.

A total of 25 patients met the criteria and were included in the study. The mean age was 9 years (range: 1-17 years). There was a slight female preponderance (N = 13; 52%). Most patients (N = 16; 64%) had non-traumatic/chronic causes of craniocervical instability. Most patients presented with neck pain and/or stiffness (N = 14; 56%). The successful fusion of the craniocervical junction was achieved in most patients (N = 21; 84%). Intraoperative complications were encountered in 12% (N = 3) of the patients. Early postoperative complications were observed in five patients (20%). Five patients (20%) experienced long-term complications. A revision was needed in two patients (8%). Older age was significantly associated with higher fusion success rates ($p = 0.003$). The need for revision surgery rates was significantly higher among the younger age group (3.75 ± 2, $p = 0.01$).

The study demonstrates the surgical outcome of craniocervical fusion and/or atlantoaxial fusion in pediatric patients. The successful fusion of the craniocervical junction was achieved in most patients. A significant association was found between older age and successful fusion, and between younger age and need for revision surgery [1)]

From 2008 to 2018, eleven patients with atlantoaxial dislocation (AAD) and basilar invagination underwent surgical reduction using C1/C2 the joint reduction technique with a fibular graft/peek cage placement followed by C1 lateral mass/C2 pedicle screw fixation. In two cases that we originally planned to perform C1/C2 joint reduction, occiput-C2 pedicle screw fixation was performed instead due to intraoperative challenges.

A total of 13 patients, with an average age of 30.46 ± 13.23 years (range 12-57), were operated. In one patient, iatrogenic vertebral artery injury occurred without any neurological complication. JOA score improved from 10.45 ± 1.128 to 15.0 ± 1.949 ($p < 0.0001$, paired t-test). All radiological indices were improved (p at least < 0.001). No construct failure was seen in any of the patients with C1-2 facet joint distraction technique during follow-up, and no additional anterior decompression surgery was required.

C1/C2 joint reduction technique with fibular graft/cervical PEEK cage of BI patients together with AAD seems to be an effective and safe surgical method of treatment [2)].

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 fluoroscopic 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 [3].

1)
Alharbi A, Alnefaie N, Alkhaibary A, Aledrees A, Almadani WH, Alhussenan M, Khairy S, Alshaya W. Pediatric craniocervical fusion: predictors of surgical outcomes, risk of recurrence, and re-operation. Childs Nerv Syst. 2022 May 5. doi: 10.1007/s00381-022-05541-4. Epub ahead of print. PMID: 35511272.
2)
Yigitkanli K, Simsek S, Guzel A. Posterior realignment of basilar invagination with facet joint distraction technique. Br J Neurosurg. 2021 Apr 28:1-8. doi: 10.1080/02688697.2021.1914818. Epub ahead of print. PMID: 33909516.
3)
Lofrese G, Cultrera F, Visani J, Nicassio N, Essayed W, Donati R, Cavallo MA, De Bonis P. Intraoperative Doppler ultrasound as a means of preventing vertebral artery injury during Goel and Harms C1-C2 posterior arthrodesis: technical note. J Neurosurg Spine. 2019 Aug 16:1-7. doi: 10.3171/2019.5.SPINE1959. [Epub ahead of print] PubMed PMID: 31419805.