Anomalous vertebral artery at the extraosseous and intraosseous regions of the craniovertebral junction detected by 3-D CT angiography: analysis on the 100 consecutive operative cases

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Recent progress of instrumentation surgery at craniovertebral junction (CVJ)

**Advantage**
Rigid internal fixation

**Complication**
Risk of vertebral artery (VA) injury

**Importance of pre-operative evaluation of VA course**
Objectives

In the present study, we used 3DCTA, and examined the extraosseous and intraosseous anomalies of VA in patients who underwent instrumentation surgery at the CVJ.
Patients

100 consecutive patients who submitted to instrumentation surgery at the CVJ (1998.7 - 2009.1, Chiba Univ. Hospital)

- **59** patients: atlanto-axial subluxation (AAS)
- **41** patients: middle-lower cervical fixation including C2 was required (MLC+C2)
AAS cases (n=59)

AAS/CSA: 22
AAS/RA: 12
AAS/dens fracture: 8
AAS/unknown: 6
AAS/Down syndrome: 5
AAS/CP: 3
AAS/trauma: 3

Congenital skeletal anomaly (n=27)

Os odontoideum
Occipitalization of C1
Middle-lower cervical fixation including C2 (MLC+C2) cases (n=49)

Spine tumor: 11
Cervical spondylosis: 10
CP: 8
OPLL: 8
Spinal cord tumor: 2
CSM+CSA: 1
CSM+NF-1: 1
Trauma: 1

Congenital skeletal anomaly (n=1)
Total 100 cases

- CSA-positive cases: CSA(+) (n=28)
- No CSA cases: CSA(-) (n=72)
Abnormal course of VA at extraosseous region

11 cases (11% of total 100 cases)
  Persistent 1st intersegmental artery: 9
  Fenestration: 2

All 11 cases had CSA
  (P < 0.01)

39.2% of 28 CSA(+) cases had abnormal course of VA at extraosseous region
Anomalous VA at intraosseous region

High-Riding VA:

29 cases (29% of total 100 cases)

14 cases had CSA (p < 0.01)

50% of 28 CSA(+) cases had high-riding VA
16y. Female, AAS/Down syndrome

Os odontoideum

Rt VA: Fenestration

(Yamazaki M, Spine 2004)
67y. M  AAS/CSA

Os odontoideum

Lt VA: Persistent 1\textsuperscript{st} intersegmental artery

High-riding VA
Conclusions

In patients having osseous anomalies at the CVJ, the frequency of anomalous course of VA at the extraosseous and intraosseous regions (persistent 1st intersegmental artery, high-riding VA) is increased.

With preoperative 3DCTA, we can precisely identify the anomalous VA, and reduce the risk of intraoperative VA injury in advance.

No VA injury occurred.

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