Analysis of Development of High-riding Vertebral Artery in Rheumatoid Arthritis

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Introduction: Because vertebral artery (VA) injury is one of the most serious complications during placement of C1-C2 transarticular and C2 pedicle screws for upper cervical lesions in patients with rheumatoid arthritis (RA), the preoperative evaluation of the location and the anatomy of VA is important. Especially, a high-riding VA is considered to be a significant risk factor of VA injury. We examined the occurrence of the high-riding VA and associated radiographic factors in patients with RA.

Methods: Twenty two consecutive women with cervical lesions due to rheumatoid arthritis were included in the analysis (mean age of 66.1 years: RA group). All patients underwent plain radiography and CT reconstruction imaging. Internal height of the lateral mass was measured from the roof of the VA groove to the surface of the superior facet. The high-riding VA was defined to be present when the internal height was less than 2mm or the isthmus height was less than 5mm on sagittal CT images. The height of the C2 superior articular joint from the base of the atlas (C2 facet height) was measured at medial, intermediate, and lateral parts of the facet on coronal CT images (Figure 1). The RA patients were divided into two subgroups; those with atlantoaxial subluxation (AAS) alone (AAS group) and those with vertical subluxation (VS group). As a control group, 14 consecutive women with spinal cord tumor without involvement of the C1-2 facet were analyzed (mean age of 60.5 years: the control group). Radiographic findings including plain radiographs and CT reconstruction images were retrospectively reviewed.
Results: The incidence of the high-riding VA in the RA and the control group was 77% (17 of 22 cases) and 14% (2 of 14 cases), respectively (P<0.001). C2 facet heights at the three parts in the RA group were significantly smaller than those observed in the control group (16.2, 12.9, 10.1 mm vs. 17.3, 14.6, 12.8 mm; P=0.02, P=0.012, P<0.001). There was a highly significant positive correlation between the C2 facet heights and the isthmus heights (R=0.52±0.03). The incidence of the high-riding VA in the AAS and VS groups was 73% (8 of 11 cases) and 82% (9 of 11 cases), respectively (N.S). Collapse of the C2 facet was frequently observed in the AAS group only at the lateral part of the C2 facet joint, compared with the control group (11.3 mm vs. 12.8 mm; P=0.041). In contrast, the collapse of C2 facet in the VS group was seen at all three parts, compared with the AAS group (P<0.001, respectively) (Figure 2).

Conclusions: The high-riding VA was more frequently observed in patients with rheumatoid arthritis. The collapse of C2 facet joint at the lateral part may result in the upper migration of VA grooves in the atlas leading to subsequent development of the high-riding VA.

Figure 1.

Figure 2.