Cervicomedullary Angle in Pre- and Postoperative MR Imaging: Evaluation of the Angular Deformity at the Craniocervical Junction
Takashige Takada, MD, Kuniyoshi Abumi, MD, Yasuhiro Shono, MD, Kiyoshi Kaneda, MD (Sapporo, Japan)

INTRODUCTION: The purpose of this report is to evaluate the angular deformity at the craniocervical junction in the pre- and postoperative MR imaging using a cervicomedullary angle in occipitocervical disorders.

METHODS: 25 patients with lesions at the occipitocervical junction were treated by occipitocervical fixation using cervical pedicle screws and O-C plate-rod system. Occipitocervical lesions included in this series were RA in 21 patients, os odontoideum in two and others in two. MR imaging was performed in all patients at before and after surgery. The angle between the lines on the ventral side of the cervical spinal cord and the medulla oblongata on MR imaging was determined as the cervicomedullary angle. Also lateral cervical radiographs were obtained for all patients, and atlantoaxial angle, O-C2 angle and McRae value were measured. On the other hand, MR imaging was performed in 50 adults (male: 26, female: 24. Avg. age 49.3 yrs.) without cervical disorders to serve as normal controls.

RESULTS: The normal value of cervicomedullary angle was 163.0 +/- 5.4 degrees. In patients who had occipitocervical lesions, preoperative value was 136.7 +/- 8.7 degrees. After surgery, malalignment of the occipito-atlanto-axial region was corrected and compression of the medulla oblongata was disappeared or reduced. Postoperative value was improved to 157.2 +/- 5.5 degrees. In 15 of 25 patients, the atlantoaxial angle, O-C2 angle and McRae value were difficult to determine, due to gross bone erosion of the dens, dens abnormalities and atlantoaxial spontaneous fusion. However, bone abnormalities and erosion did not affect measurement of the cervicomedullary angle using MR imagings.

DISCUSSION/CONCLUSION: Lateral cervical radiographs were used to evaluate the instability and subluxation of craniocervical junction using atlantodental distance, McRae value, McGregor value, Chamberlain value and so on. However, in cases of bone erosion of the dens, abnormalities and atlantoaxial spontaneous fusion, it is often difficult to evaluate exact radiographic pathologies of the upper cervical spine. Although the posterior atlantoaxial interval has been a most sensitive indicator to predict paralysis, soft tissue lesions including rheumatoid pannus and inflammatory tissues can not be evaluated by this method. MR imaging is very useful not only for depicting the
bony abnormalities in the cervical spine, but also can directly show the
collision of the spinal cord and brain stem. Soft tissue changes are clearly
demonstrated by MR imaging including distortion of normal ligaments and
bursae around the dens, particularly in rheumatoid arthritis. The
cervicomedullary angle is a useful method to evaluate and diagnose the patients
with compressive cervical myelopathy. Angular deformity at the craniocervical
junction and upward migration of the odontoid process are the main causes of
neurologic symptoms in patients with upper cervical disorders. Therefore,
realignment of the craniocervical junction by application of extension and
distraction force on O-C2 using pedicle screw fixation improves
cervicomedullary angle and reduces the anterior compression of the spinal cord.
Thus, O-C2 fusion using pedicle screw fixation allows decompression at the
craniocervical junction by posterior realignment which enables to obviate the
anterior decompression.