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CASE REPORT

Resection of a Hemivertebra Within the Craniocervical Junction

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Study Design. Case report on resection of a hemivertebra at the craniocervical junction.

Objective. To describe technique and result of a hemivertebra resection within the craniocervical junction (axis).

Summary of Background Data. To our knowledge, this is the first report on a transoral and posterior hemivertebra resection at C2.

Methods. A 42-year-old patient presented with coronal imbalance due to a hemivertebra at C2. Correction was performed by a combined anterior (transoral) and posterior approach with hemivertebra resection and compression instrumentation.

Results. The postoperative course was uneventful. The radiographs showed a complete correction of the deformity with a perfect clinical result.

Conclusion. Hemivertebra resection at the craniocervical junction can be performed safely with good clinical and radiographical outcome.

Key words: congenital scoliosis, craniocervical junction, hemivertebra resection, transoral approach.

Level of Evidence: 4

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Hemivertebrae of the cervical spine have been described as a part of more complex congenital malformations, for example, Goldenhar or Klippel-Feil syndrome. Clinical course and surgical treatment of a craniocervical hemivertebra is described here.

MATERIALS AND METHODS

A 42-year-old female Caucasian patient first presented with intractable pain along the right-sided root of C2. Computed tomographic scan of the craniocervical junction gave evidence of a complex bony malformation consisting of a bilateral assimilation of the atlas to the occiput and a right-sided hemivertebra at the level of the axis (Figure 1). To identify the source of pain, an injection was applied to the right-sided root of C2. This was effective and, as a consequence, a decompression of the root was performed combined with a C1–C2 fixation/fusion according to Goel and Laheri[1] and Harms and Melcher.[2] Within the upcoming 15 months, the patient was satisfied with the result. However, she then presented again with local pain and—dominantly—was unhappy with regard to the position of the head (Figure 2).

The patient was informed that correction of the position of the head within the coronal plain is possible by resection of the hemivertebra, which was initially planned to be performed *via* an isolated posterior approach. A routine computed tomographic scan angiogram, however, gave evidence that the junction of the vertebral arteries is very close to the apex of the odontoid (Figure 3) and possibly would be encroached by the apex when correction would be performed. Thus, we decided a transoral approach to remove the odontoid as well as the right-sided lateral mass of the axis as a first step and a posterior approach for resection of the remaining bony structures including fixation and fusion being a second surgical step.

Surgery was performed with the transoral procedure first. A mucosa-submucosa flap was dissected, based on the right side. Bony resection was started at the odontoid and processed continuously to the lateral aspect of the C2 lateral mass. The anterior margin of the transverse process was resected and the vertebral artery was identified. A wedge-shaped defect was created (Figure 4). Seven days later, the posterior approach was performed, including resection of the right-sided pedicle and lamina of C2. The gap was closed by compression instrumentation that was applied between

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Figure 1. Coronal reconstruction of the computed tomographic scan of the craniocervical junction. A right-sided cervical hemivertebra is named C2.

the occiput and C4, consisting of screws, rods, and an occiput plate.

RESULTS

The postoperative clinical course was uneventful. Radiographical workup demonstrated a perfect alignment within the coronal and sagittal plane, a complete closure of the surgical defect (Figure 5), and a perfect clinical-cosmetic result. Trunk shift and head tilt have resolved (Figure 6).

Figure 2. Photograph, showing the position of the head in the anteroposterior view before corrective surgery started.

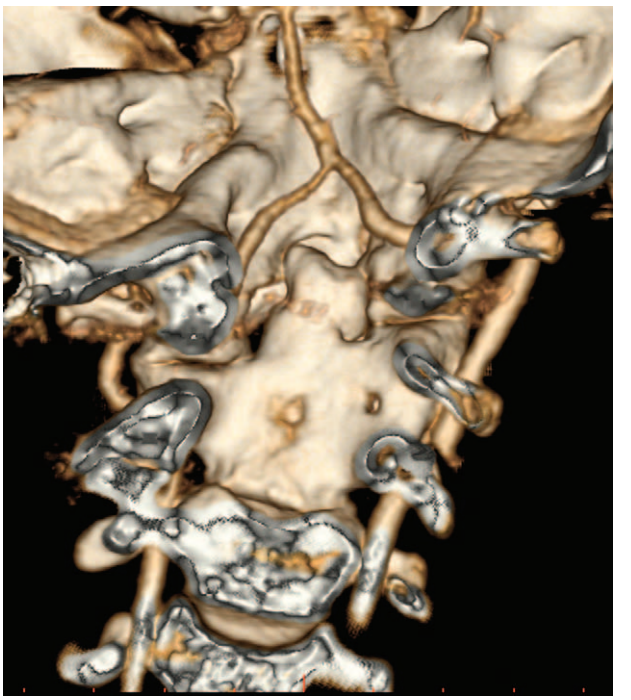

Figure 3. Three-dimensional reconstruction of the angio computed tomographic scan. Direction of view is from occipital to rostral. Note the distance between the tip of the odontoid process and the course of the vessel (arteria basilaris).

DISCUSSION

Hemivertebrae of the cervical spine have been described previously.[3–6] They are frequently seen in individuals

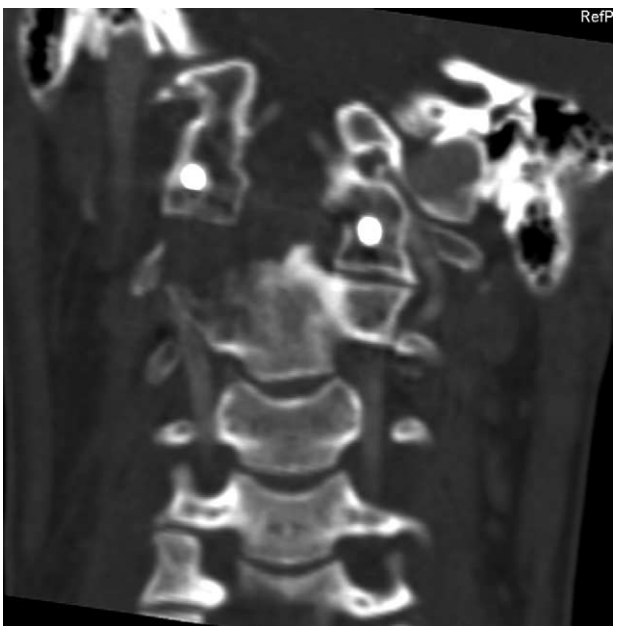

Figure 4. Coronal reconstruction after transoral wedge osteotomy. Note the wedge-shaped defect.

Figure 5. A, Coronal reconstruction of the postoperative computed tomographic scan. Note that the wedge defect, as performed *via* transoral approach, is completely closed. Conversely, the joint gap on the left side has opened during/after realigning.

Figure 6. Photograph, showing the position of the head in the anteroposterior view after corrective surgery.

experiencing Goldenhar[4] or Klippel-Feil syndrome.[6] The existence of a hemivertebra often results in imbalance within (dominantly) the coronal and sometimes sagittal plane of the spine. As a result of imbalance, patients experience aspects of malposture as well as local and/or radicular pain. Both aspects have been seen in the case presented here.

There is evidence that thoracic or lumbar hemivertebrae may be resected *via* an isolated posterior approach: high initial stability, good fusion rates, and low complication rates have been described previously.[7–10] In the cervical spine, due to the course of the vertebral artery, a combined anterior and posterior approach was recommended.[11]

In the case described here, the course of the vertebral artery was lateral and below the corpus of the hemivertebra at C2. This would have enabled the surgeon to perform resection of the lateral mass *via* an isolated posterior approach. However, this procedure was considered to be connected with a high risk of the encroachment of the arteria basilaris by the remaining odontoid during and after realignment maneuvers. Also, it was thought that the release, necessary to realign the spine, could be insufficient due to incomplete removal of the bony structures in front of the spinal cord.

As a consequence, we felt that the hemivertebra could be resected with minimal risk to the vessel *via* transoral approach. Stabilization and realignment, however, was planned *via* posterior approach. Thus, an interdisciplinary decision was made to perform a combined transoral and posterior approach, resulting in a perfect clinical result without complications.

➢ Key Points

- ❑ A hemivertebra at the craniocervical junction was resected safely by means of a combined anterior and posterior approach with good clinical and radiographical outcome.
- ❑ A preoperative computed tomographic scan angiography is recommended to evaluate the course of the vertebral arteries and to allow for intraoperative visualization.

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