Traumatic Atlantoaxial Unifacetal Joint Dislocation Associated with Fractures of Ipsilateral C2 Body and Contralateral Pars

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The traumatic C1-C2 unifacetal joint dislocation associated with oblique fractures of the C2 body and arch is a rare injury that can be effectively treated with gentle closed reduction under fluoroscopic guidance followed by halo vest immobilization. To our knowledge, however, there are only a few reported cases of this injury. Recognition of associated conditions including vertebral artery compromise, concomitant cervical spine fractures, and life-threatening injuries is paramount to the successful treatment of these patients. A 29-year-old patient, who presented a unifacetal dislocation at C1-C2 with associated oblique fractures of the C2 body and arch, is reported. Closed reduction with Gardner-Wells tong and halo vest application was performed. After 3 months of application of halo vest, the fractures of C2 body and arch had the complete union and the C1-2 dislocation had the good reduction. He had no pain and discomfort in his neck for about 2 years after halo vest removal.

Key words: atlantoaxial fracture, unifacetal dislocation, halovest

CASE REPORT

A 29-year-old man was admitted with severe neck pain and painful swelling of right lower leg after a motor vehicle accident. He was a driver with wearing a seat belt. He had neither consciousness loss nor neurological symptom. A full trauma assessment revealed neck and right leg injuries (tibia mid-shaft fracture). Plain radiographs, computed tomography (CT), and magnetic resonance imaging (MRI) of the upper cervical spine were performed. The open-mouth odontoid view revealed slight rotation of C1 lateral mass (Fig. 1) and the lateral view showed a fracture of C2 pars interarticularis (Fig. 2). But there was no translation or angulation of C1-C2 and C2-C3 (Fig. 2). The three-dimensional CT scan demonstrated an atlantoaxial unifacetal dislocation combined with oblique body and pars interarticularis of axis (Fig. 3). The MRI showed no signal change of spinal cord except increased signal intensity of posterior soft-tissue of atlantoaxial joint on the sagittal T2 weighted image.

The initial treatment consisted of a conservative treatment. Traction was performed by Gardner–Wells tong within continuous monitoring. Fortunately, it was easy to obtain the reduction of C1–2 alignment when Gardner–wells tong was applied 10 pounds–weight.
The next day, Halo vest was applied. Using fluoroscopy, with the patient fully conscious, gentle traction and manipulation for reduction of atlantoaxial unifacetal dislocation was performed. After we confirmed the maintenance of C1–2 dislocation and fractures of axis, CT angiogram was subsequently performed to evaluate the patency of the vertebral arteries. After then, the halo vest was applied for 3 months until the union of the axis fracture was obtained. After halo vest removal, the complete union of C2 fractures (body and pars interarticularis) and the maintenance of stable reduction of C1–C2 dislocation were confirmed by radiographs during flexion and extension (Fig. 4). There was no complication. He had no pain and discomfort of his neck for about 2 years at last follow up.

Figure 1. The open-mouth odontoid radiograph revealed slight rotation of C1 lateral mass.

Figure 2. The radiograph of the lateral cervical spine showed a fracture of C2 pars interarticularis. But there was no translation or angulation of C1–C2 and C2–C3.

Figure 3. (A) The coronal view of computed tomography (CT) show the oblique body fracture of axis. (B) The three-dimensional CT scan demonstrated an atlantoaxial unifacetal dislocation and pars interarticularis fracture of axis.

Figure 4. The plain lateral radiograph and the open-mouth odontoid radiograph showed the complete union of C2 fractures (body and pars interarticularis).
DISCUSSION

Traumatic atlantoaxial joint dislocation in combination with a C2 fracture is a rare injury in adults. Only a few cases have been reported in the literature. Traumatic atlantoaxial unifacetal dislocation, also known as rotatory displacement, rotatory deformity, rotatory subluxation or dislocation.

Upper cervical spine injuries with severe neurologic symptoms result in death due to respiratory failure. However, most of survivors have mild neurologic symptoms. Only a few of them have severe neurologic deficits. Miyamoto et al. reported that only 16% of atlantoaxial injuries produce neurologic deficits in survivors. Francis et al. reported significant neurological deficits occurred in 6.5% in the hangman’s fractures. The reason is the anatomical character of upper cervical spine. The sagittal diameter of the spinal canal in the upper cervical region becomes wider above C2-3 compared with the lower cervical region. The transverse ligament and alar ligaments provide the majority of ligamentous stability at C1-C2. Rotation of atlantoaxial joint is limited to 50° as the ligaments tighten with rotation. The spinal cord can move somewhat up and down according to the movement of the cervical spine, and the spinal cord itself can expand and contract somewhat. These properties may prevent the upper cervical spinal cord injury from being extended.

It may be difficult to identify the upper cervical injury if the patients had no or mild symptoms. The plain radiographs often had non-specific findings. It is sometimes difficult to set patients position for radiographic examination due to another combined injuries. If there is only clinical concern without conclusive radiological evidence, early CT scanning with the three-dimensional reconstructions should be performed. Early diagnosis is very important, because the interval between the injury and its reduction correlates with failure rate of reduction by non-surgical treatment.

Because the atlantoaxial dislocations are associated with high-energy injury, other life-threatening conditions must be ruled out with a full trauma assessment before definitive treatment of the cervical spine. Clinical stability of the occipitocervicalatlantoaxial complex depends on both osseous and ligamentous constraints. Based on the classifications, a grossly unstable fracture recommended surgical stabilization, while others have recommended non-surgical treatment as the cervical collar and the halo vest.

This patient had Hangman’s fracture type I and C2 body fracture. The radiographic patterns suggest a correlation between the type of fracture and the mechanism of Hangman’s fracture. According to Levine and Edwards, Type-I injuries probably result from a hyperextension-axial loading force that fractures the neural arch posteriorly but is not strong enough to disrupt the intervertebral disc or seriously compromise the integrity of the anterior or posterior ligaments. Thus, type-I fractures are stable injuries and are treated with cervical collar or halo Vest.

Reduction of the dislocation needs axial skeletal traction or rotatory manipulation. This can be performed by halo traction or immediate manual reduction. If reduction is impossible, it should be reduced by surgical techniques. Then early open reduction and internal fixation of this injury would be indicated.

In addition, the mechanism of injury in this case most probably involves a combination of many forces. Due to the lateral translation or rotatory dislocation, there is a risk of vertebral artery compromise following this type of injury. A CT angiogram should be performed to determine vertebral artery patency.

REFERENCES

제2경추의 동측 경추체와 반대측 경추 협부 골절을 동반한 외상성 환측추 편측 후관절 탈구

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제2경추의 동측 경추체와 반대측 경추 협부 골절을 동반한 외상성 환측추 편측 후관절 탈구는 매우 드문 손상이며 이러한 손상과 치료를 보고한 증례가 거의 없다. 치료에 있어 최추동맥의 동반 손상, 동반된 다른 경추의 손상 및 생명을 위협할 만한 다른 손상의 동반을 확인하는 것이 무엇보다도 중요하다. 29세 남자 환자에서 발생한 제2경추의 동측 경추체와 반대측 경추 협부 골절을 동반한 외상성 환측추 편측 후관절 탈구를 도수 정복 및 halo vest 고정을 통해 효과적으로 치료하였기에 이를 보고하고자 한다.

색인단어: 환측추골절, 편측후관절 탈구, 할로베스트

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