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Case Report

Transverse Clival Fracture with Vertical Displacement: A Case Report

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Abstract

Clival fracture is a rare traumatic injury that usually occurs in patients suffering high-energy trauma to the head and neck. Here, we present and discuss our experience in a patient with a transverse clival fracture associated with significant vertical displacement.

A 52-year-old comatose patient was admitted to our emergency department after a high-energy motor vehicle accident. The physical examination revealed a Glasgow Coma Scale (GCS) of 6 (with a motor scale of 4) associated with a left-sided six cranial nerve palsy, a left-sided fixed and dilated pupil; and quadriparesis that was more severe on the right side. The imaging tests revealed brain contusions, pneumocephalus, and generalized brain edema without local mass effect or midline shift. Also, it showed TCF with significant vertical displacement and a signal change within the medulla oblongata. The clival fracture was managed using a mild head flexion position without bracing, and a routine ICU exchange body positioning program. The follow-up imaging three months later showed complete bone fusion without any displacement. After 18 months, he was ambulated, and cranial nerve deficit improved except for mild diplopia due to a remnant 6 cranial nerve paresis.

Transverse clival fracture, as most of the authors report, does not need surgical treatment. Bracing can be used in conscious ambulatory patients. A mild head-on-neck flexion position associated with supporative care for bedsores must be done for unconscious patients.

Keywords: Clival fracture, Vertical displacement, Conservative management, High-energy trauma.

Introduction

Clival fracture is a rare traumatic injury that usually occurs in patients with high-energy trauma to the head and neck. In the past, the clival fracture was found only in the autopsy, but after imaging modalities improvement consisting of computed tomography (CT), the diagnosis of this injury increased in alive patients. In the literature, clival fractures are classified as transverse, longitudinal, and oblique types based on CT scans.[1,2]

Occasionally, the patients with clival fractures presented with cranial nerve palsies and intracranial vascular injuries. Loss of consciousness as a result of direct brain stem injury or severe traumatic brain injury in other sites of the brain following high-energy trauma is common in these patients.[3] Here, we present and discuss a patient with transverse clival fracture (TCF) associated with a significant vertical displacement and briefly review the literature.

Case Presentation

A 52 years-old comatose patient was admitted to our emergency department after a high-energy motor vehicle accident. He was a healthy man with no known history of diseases or hospitalization. Initial physical examination demonstrated a Glasgow Coma Scale (GCS) of 6 (with the motor scale of 4) associated with a left-sided six cranial nerve palsy; a left-sided fixed and dilated pupil; and quadriparesis that was more severe on the right side. Because of the unserviceable CT scan of our center at that time, an emergent left decompressive bur hole surgery was performed. Then there was no epidural or subdural hematoma. When the

brain CT scan was performed, the finding included brain contusions, pneumocephalus, generalized brain edema without local mass effect and midline shift, and a TCF with a significant vertical displacement (Fig.1).

Figure 1: Sagittal reconstruction of the cervical CT scan shows transverse clival fracture with a large vertical displacement.

Cervical magnetic resonance imaging (MRI) showed a signal change within the medulla oblongata (Fig. 2).

Figure 2: Sagittal T2 craniocervical MRI demonstrated clival fracture and brain stem signal change.

Conservative management was performed in the intensive care unit (ICU). At the end of the first week, he was conscious while was dependent on the ventilator and feeding tube for breathing and feeding, respectively. So, due to prolonged intubation, a tracheostomy and gastrostomy were performed. His neurological deficits improved gradually within a month. At the end of the first month, he was conscious with no significant improvement in neurologic examination. At the end of the second month, he had tracheostomy and gastrostomy, was ventilated under the SIMV setting of the ventilator, and had mild improvement in limb movement (muscle force of 3/5). Examination at the end of the third month revealed the alertness of the patient. He could tolerate the CPAP ventilator setup. The motor examination demonstrated only mild progression compared to the last month. During the 4th month, following the intermittently weaned ventilator off, the patient was ambulated, aiming at a wheelchair. After four months, he was discharged while wheelchair-bound and had a tracheostomy and a feeding tube. He was scheduled for appropriate physical and occupational therapy.

The patient suffered from occipital bedsore despite the preventive interventions during three months of hospitalization, which probably is the consequence of the prolonged supine position, presence of neurological deficiencies, being bedridden, compression effect of the collar, nutritional deficits, and initial not profound traumatic occipital ulcer. So it was impossible to use an appropriate brace for the clival fracture. Considering the patient's clinical condition, a mild head-on-neck flexion position associated with suppurative care for bedsores can be a good option for unconscious patients. The follow-up imaging three months later showed complete bone fusion without any displacement (Fig. 3).

The following months after discharge, the patient came to the clinic weekly for the first month, monthly for three months, and then bimonthly. During the fifth month, he regained the weight and was able to sit independently and stand dependently. During the following two months, he was able to stand and swallow soft foods. Tracheostomy and gastrostomy were taken off. At the 12th month, he walked independently with only a mild problem. Another examination was ordinary except for the 6th nerve paresis. After 18 months, he was ambulated, and cranial

nerve deficits improved except for mild diplopia due to the remnant of 6th nerve paresis.

Figure 3: Sagittal reconstruction of the cervical CT scan shows complete healing of the vertical displaced clival fracture.

Discussion

TCF is a type of clival fracture with poor long-term outcomes in alive patients. It occurs in patients with high-energy trauma and has a high mortality rate. Compared with other kinds of clival fracture, intracranial vascular injuries are more common in TCF. Proper decision-making and management could help reduce the rate of complications and increase the effectiveness of the treatment.[1,4]

Although there are many reports of clival fracture and TCF, a review of the literature demonstrates only limited articles with six patients with TCF that explained the treatment protocol and management in detail and noted their outcomes (Table 1). All seven reported cases had at least three months of follow-up. Akar et al.[5] reported a 44 years old male with TCF without any neurologic deficits and no other related manifestations and comorbidities. This report is different from the other six reported cases with a variety of cranial nerve deficits and traumatic injury of other organs; three cases were unconscious at arrival, emphasizing the association of TCF with high energy trauma in most cases.

The review of these six cases revealed that the neurologic deficits were common in TCF. Cranial nerve palsies, especially third nerve palsy, were the most common neurologic deficits (four cases). But in most of them, third and sixth nerve palsies were improved at long-term follow-up. All patients with hemiparesis or quadriparesis were improved at long-term follow-up, too. Only in the case of Menku et al.,[6] there was no improvement in second and seventh nerves deficits.

Considering the treatment approach, none of the authors used surgical treatment, but there were some differences in the type of conservative approach. On one hand, Khan, Melo, et al., and Menku et al.[6,7,8] treated the patients with a wait and watched procedure with no active interventions or bracing. In three months of follow-ups, all 3 cases were treated uneventfully with a relative improvement in their deficits without complications. On the other hand, Evers et al. and Chan et al.[1,9] treated their patients with halo bracing. Chan et al. reported no bony fusion in the first three months but documented bony fusion at 18 weeks of follow-up. So they recommended using a cervical collar for three months after the halo brace was off (after 18 weeks).

Besides, Akar et al.[5] treated their patients using a simple cervical collar; the outcome was good. In comparison to the previous cases, our case was unconscious and had an occipital sore at the end of the first week; as a result, we could not use bracing. It is theorized that a hyperextension force entered to the craniocervical junction can result in disruption of soft tissue, ligamentous, and even bony elements located anterior to the brainstem, so clivus can be fractured and distracted and subsequently result in a variety of cranial nerves deficits. In the present case, a 12 millimeters vertical displacement occurred that can be an effect of a high-energy hyperextension mechanism. As a result, a mild flexion position at the site of this distraction could improve and anticipate bony fusion. Based on our patient's outcome, we think using a mild head-on-neck flexion with supportive and preventing care for bedsores (intermittent changing position with more time on lateral or semi-lateral position, anemia correction, anti-bedsore mattress, ETC can be a suitable treatment approach for unconscious patients with TCF.

Conclusion

Transverse clival fracture does not need surgical treatment, as most authors reported. Bracing can be used in conscious ambulated patients. A mild head-on-neck flexion position associated with suppurative care for bedsores can be a good option approach for the unconscious patient.

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Conflict of Interest Disclosures

The authors declare that they have no conflict of interest.

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Authors' Contributions

All of the authors have a role in planning, writing, editing, and reviewing the submission.

Ethical Statement

The Ethical Committee of Iran University of medical sciences approved this article.

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