

# Bilateral Occipital Condyle Fracture with Clivus Fracture: Case Report

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## Abstract

Occipital condyle and clivus fractures caused by trauma are rare injuries that are difficult to diagnose. Only a few publications have reported cases involving both fractures. With the widespread use of high-resolution computed tomography in recent years, the diagnosis of these fractures has become more feasible; however, their clinical presentation and treatment approach remain uncertain for clinicians. The concurrent occurrence of occipital condyle and clivus fractures has recently been incorporated in to the Anderson and Montesano classification system for occipital condyle fractures. In this paper, we aim to discuss the clinical presentation and treatment strategies of a 39-year-old female patient who was brought to our hospital with bilateral occipital condyle and transverse clivus fractures following a pedestrian traffic accident, in light of the existing literature.

**Keywords:** Clivus, fracture, occipital condyle

## Introduction

Traumatic injuries of the skull base are rare but have high mortality rates. Occipital condyle fractures have been recognized as complex and poorly understood lesions by clinicians since they were first described by Bell in 1817. Fractures of the occipital condyle and clivus are uncommon and difficult to diagnose. They may be overlooked in routine X-rays and computed tomography (CT) scans (1).

Clinically, due to the numerous neural and vascular structures located at the craniocervical junction, these fractures may present with various symptoms and are associated with high mortality rates (1,2). Diagnosis is generally established in patients with brain stem findings, rhinorrhea, orthrough post-mortem examinations. However, the coexistence of these lesions has been reported in only a fewcases (3-9). In patients with high-velocity head and cervical trauma, careful evaluation of this region facilitates the diagnosis of occipital condyle and clivus fractures (2). With the recent widespread use of high-resolution and 3D CT imaging, the number of reported cases has increased (9).

In this paper, we present a rare case of bilateral occipital condyle fracture complicated by an inferior transverse clivus fracture, which has recently been added to the classification of occipital condyle fractures. Including our case, a total

of eight concomitant clivus and occipital condyle fractures have been reported in the literature to date (8). These types of fractures necessitate intricate clinical decision-making and are challenging to diagnose. This study aims to discuss the clinical presentation and treatment approaches of this rare fracture combination in light of the existing literature.

## Case Report

A 39-year-old female patient, who sustained injuries due to a high-energy pedestrian traffic accident, was brought to the emergency department with assisted ventilation using an ambu bag and secured with a philadelphia cervical collar. Upon initial examination, the patient was unconscious (GCS: 3) and was immediately intubated. A blunt scalp laceration approximately 5 cm in diameter was noted on the left side of the vertex, and the patient's vital signs were stabilized.

High-resolution CT revealed an acute subdural hematoma in the left parietal region and extensive subarachnoid hemorrhage (Figure-1). Following high-resolution CT imaging and 3D reconstruction, fractures extending to both occipital condyles and involving the clivus were identified (Figures-2, 3, 4, and 5). The patient also had fractures of the left hand and ankle, for which orthopedic specialists applied a splint.

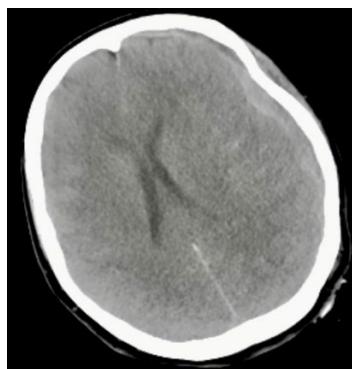
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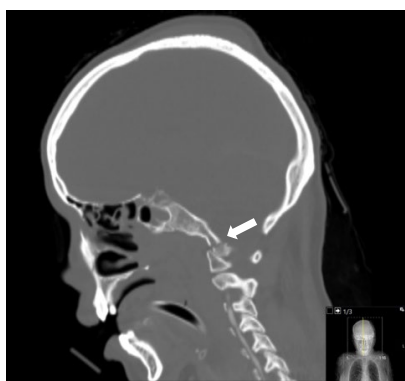
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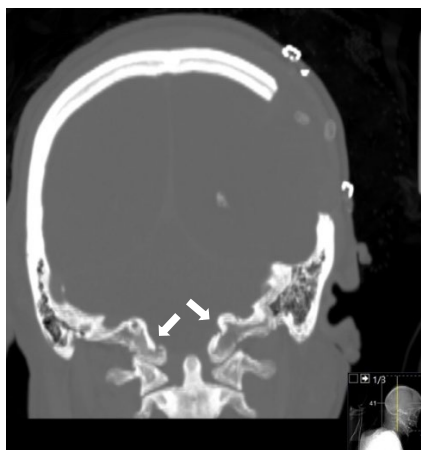
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**Figure 1.** Axial brain CT showing a subdural hematoma located in the left parietal region

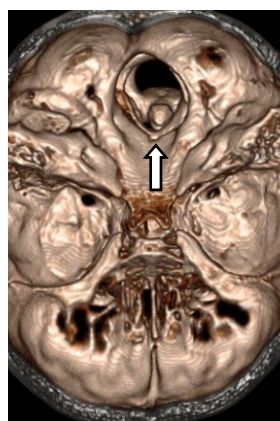


**Figure 2.** Sagittal brain CT demonstrating a transverse fracture of the clivus (white arrow)

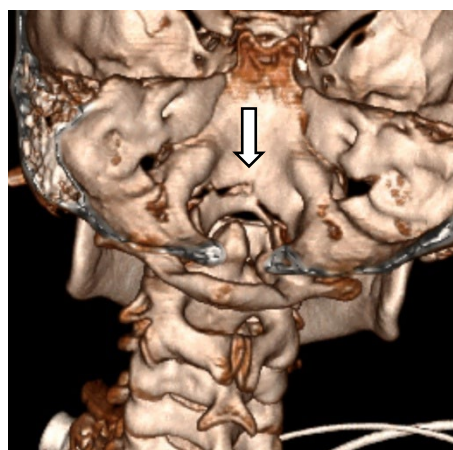


**Figure 3.** Coronal CT scan showing a postoperative left parietal craniectomy defect and fractures of both occipital condyles (white arrows)

Due to the acute subdural hematoma, the patient underwent emergency surgery, and the hematoma was evacuated via left parietal craniectomy (Figure-3). Postoperatively, the patient was transferred to the intensive care unit with a rigid cervical collar and placed on mechanical ventilation. Cerebral anti-edema therapy was initiated. At the 65th hour of hospitalization, the patient developed cardiac arrhythmias, followed by hypotension and circulatory arrest, ultimately leading to death.



**Figure 4.** High-resolution 3D reconstructed CT image showing a fracture line extending from the clivus to both occipital condyles when viewed from the internal surface of the cranium (white arrow)



**Figure 5.** High-resolution 3D reconstructed CT image showing occipital condyle and clivus fractures when viewed from a posterior perspective inside the cranium (white arrow)

## Discussion

The simultaneous occurrence of bilateral occipital condyle and clivus fractures is rare (1). Occipital condyle fractures are difficult to diagnose. High-resolution reconstructed CT imaging is considered the gold standard for diagnosis (9,10). The shape of the fracture, its extent, the degree of displacement, and its impact on treatment planning are crucial factors. The routine use of multi-slice CT in recent years has led to an increase in reported cases of occipital condyle fractures. MRI is of limited value in evaluating the functional integrity of the upper cervical ligamentous complex, as it is hindered by surrounding bone edema and hematoma (11). Although flexion-extension cervical radiographs can indicate occipitocervical instability, this method carries significant risks.

To date, seven cases of concomitant clivus and occipital condyle fractures have been reported in the literature; here, we present the eighth case (3-8).

Occipital condyle fractures are generally classified according to the Anderson and Montesano system,

specifically under type III (12). However, the underlying mechanism of combined occipital condyle and clivus fractures remains unclear (3,11). In 2022, Carriço et al. proposed a four thtype of occipital condyle fracture, suggesting that these injuries result from axial loading and compression mechanisms. Based on the patient's accident video, clinical evaluation, and scene reconstruction, we believe that a blunt force impact on the left side of the vertex caused axial loading, leading to fractures of both the clivus and occipital condyles. Carriço et al. classified occipital condyle fractures associated with clivus avulsion fractures as Type IV A, while fractures involving occipital condyle fractures with comminuted fractures of the lower clivus were designated as Type IV B. Both Type IV injuries are considered highly unstable (1). Based on this classification, we categorized our patient's injury as Type IV B.

Since occipital condyle fractures are infrequently diagnosed, no widely accepted treatment guidelines exist (9,11). Treatment generally involves either external immobilization with devices such as cervical collars or surgical stabilization. Patients with bilateral occipital condyle fractures and concomitant clivus fractures have a higher risk of craniocervical instability, which increases mortality risk. This suggests that more rigid fixation techniques may be necessary (3). Carriço et al. advocated surgical fixation for both Type IV A and IV B injuries (1). However, among the previously reported seven cases, three were treated surgically and three were managed with conservative methods. One case was diagnosed post-mortem (3-8). At the craniovertebral junction, stabilization is supported not only by the bony structures but also by the occipital condyle joint capsules, alar ligaments, and the tectorial membrane. When ligamentous integrity is preserved, external immobilization is generally considered sufficient to ensure stability. In the three cases managed conservatively, treatment involved halo or cervical collar immobilization for upto 14-16 weeks. Fluoroscopy-guided traction testing is recommended to determine the appropriate timing for terminating conservative treatment (8,9). No standardized surgical approach exists for operative cases. Surgical options range from occipital-C1-C2 fusion to C1 laminectomy without fusion, which has been reported as a successful treatment approach (11). In our case, a rigid cervical orthosis was applied; however, the patient unfortunately passed away before the assessment of craniovertebral junction integrity could be completed.

Occipital condyle and clivus fractures carry significant morbidity and mortality risks. The mortality rate for occipital condyle fractures has been reported as 16.1%, while that for clivus fractures reaches upto 80% (3,13). These injuries can lead to fatal outcomes due to brain stem trauma, cranial nerve deficits, and vertebrobasilar vascular injuries (9). Imamura et al. reported a case of a 25-year-old patient who sustained trauma in a motor vehicle accident. Post-mortem

examination revealed bilateral occipital condyle fractures extending into the lower clivus. The authors attributed the patient's death to associated medulla oblongata and basilar artery injuries (14). Similarly, we believe that our patient's fatal outcome resulted from brain stem edema secondary to vertebrobasilar injury.

## Conclusion

In patients who sustain high-energy axial trauma, the concurrent presence of occipital condyle and clivus fractures should be considered. High-resolution computed tomography and 3D reconstruction imaging are recommended for definitive diagnosis. Early diagnosis and appropriate treatment planning for such fractures, which may lead to craniocervical instability, can be life-saving. The choice between conservative and surgical treatment should be determined based on the patient's overall condition and the stability of the lesion.

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