ONLINE FIRST

CASE REPORT

Unusual Cause of Panfacial Fracture in Paediatric Patient: A Case Report

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ABSTRACT

Due to the rarity of pediatric panfacial trauma, there are unclear effects on the developing child. Treatment algorithms largely follow adult panfacial protocols. These include limited exposure to prevent disruption of osseous sutures and synchondroses' growth centres, enhanced healing and remodelling capacities that favour nonoperative management, and innovative fracture fixation techniques in the context of an immature craniomaxillofacial skeleton in the pediatric population. The resulting damage to soft tissue and bone structures is frequently so severe that it calls into question of the previously established guidelines for the treatment of pediatric facial fractures. Due to the unique characteristics of the developing facial skeleton, surgeons frequently face challenges when managing facial fractures in children. The goal of therapy for fractures in children should be as conservative as feasible, use the least intrusive surgical technique to access the fracture and the least invasive surgical fixation to allow for stable reduction and avoid any disruptions to growth. We report a case of a rare cause of panfacial fracture with split palate in an eight-year-old boy and its management.

Keywords: Paediatric, Panfacial fractures, Protocol, Maxillofacial trauma, Dental trauma, Orif

INTRODUCTION

Though only 4.6% of all pediatric trauma cases involve craniofacial skeletal fractures, these individuals typically have higher injury severity scores, more extended hospital stays, and a greater morbidity/mortality rate. A young person's (less than 5 years old) inherent bone flexibility, combined with certain social circumstances, reduces their risk of fracture. Furthermore, the likelihood of a palatal fracture in children and adolescents is under 0.5% [1]. The frontal bone, the midface, and the occlusal unit are the three primary bony subunits that make up the craniofacial skeleton. Panfacial trauma affects two or more of these regions. It is usually caused by a high-energy injury, such as a high-speed car accident, a fall or leap from three or more storeys, a severe crush injury, or a close-range gunshot wound [2].

Facial trauma in pediatric children frequently affects soft tissue and dentoalveolar structures [3]. Multilevel damage is typically suggestive of a high-energy trauma with potentially fatal implications, which must be prioritized in accordance with Advanced Trauma Life Support (ATLS) procedures. Pediatric panfacial fractures are extremely rare and carry unique implications for long-term craniofacial growth and function. Reporting such cases provides critical insights into diagnostic challenges, treatment decisions, and outcomes in this vulnerable group, thereby justifying the significance of this case report.

CASE PRESENTATION

An eight-year-old boy was presented to the Emergency Department with a history of trauma from being crushed by a cylindrical cement block that is commonly used for well construction. The patient was inside the hollow cement cylinder when it collapsed, breaking apart and striking his face and head after being rolled by his friends. He developed a transient loss of consciousness and recovered with a full Glasgow Coma Scale at the primary hospital.

Upon examination, the patient presented with a concave dish face appearance and loss of upper lip support. However, there was no depression nor deviation of the nasal bridge. Interestingly, there were minimal extraoral soft tissue injuries, which were a hematoma at the left forehead, abrasion at the right chin and laceration of the lower lip measuring approximately 2 centimetres (**Figure 1**).

Figure 1: Sutured lower lip laceration and frontal hematoma

The same could not be said for the oral cavity. There was a gaping wound over the hard palate leading to oronasal communication, associated with outward splaying of the posterior segment (**Figure 2**).

Figure 2: Gaping wound over the hard palate

However, the maxilla appeared firm, with no palpable mobility at any of the Le Fort levels. Minimal mobility of the mandible was noted between teeth 31 and 41 with the presence of a sublingual hematoma. As for trauma to the dentition, the patient was found to have severely intruded and rotated tooth 11, a lateral luxated tooth 12, and avulsed teeth 21 and 22 (**Figure 3**).

Figure 3: Dentoalveolar injuries to the anterior upper dentition

Post-trauma day 3, the patient presented to the Oral and Maxillofacial Clinic complaining of oronasal regurgitation and hypernasality upon speaking and minimal diplopia of upward gaze. The patient also presented with a bilateral scissor bite.

Investigations

Radiographic examination

Computed tomography (CT) scan revealed multiple facial bone fractures. There was an undisplaced fracture of the symphysis of the mandible, which extended obliquely toward the left parasymphysis region. All walls of both maxillae were noted to have fractures with extension to the bilateral infraorbital rims, associated with fracture of the bilateral pterygoid plates. The palate was also found to have fractured at the mid-sagittal region. There was also a defect of the right orbital floor (**Figure 4**).

Figure 4: Le Fort II, Left paraysmphysis and palatal split fractures.

Hematological examination

Unremarkable

Final diagnosis

Patient was diagnosed with Le Fort II fracture with sagittal split of palate (Hendrickson class II); undisplaced mandible symphysis fracture, right floor of orbit fracture, avulsion of tooth 21, 22; intrusion and rotation of tooth 11 and lateral subluxation of tooth 12.

Immediate management at the emergency department involves soft tissue injury management, transpalatal wiring of the palatal fracture at day 3 of trauma, and simple wiring of the mandible fracture (**Figure 5**).

Figure 5: Transpalatal wiring at day 3 of trauma

Treatment

Patient underwent surgery under general anaesthesia, which involved maxillary mandibular fixation (MMF) via Ivy Loop wiring, open reduction internal fixation of the Le Fort II fracture and reconstruction of the right orbital floor defect via resorbable plate and screw implants, and transpalatal wiring (**Figure 6**).

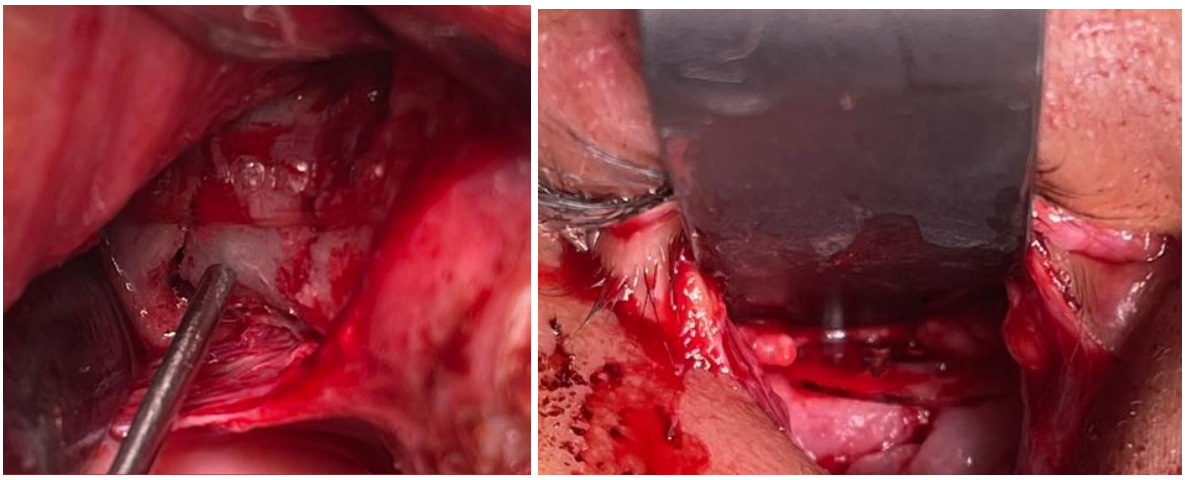

Figure 6: Placement of resorbable plates and screws at bilateral buttresses and right floor of orbit reconstruction

The annual review revealed that the patient had recovered well, and he was referred to a paediatric dentist for follow-up and further management of missing anterior teeth.

DISCUSSION

Paediatric facial bone fracture constitutes 15% of all facial bone fractures [4]. It accounts for 1.5% to 8.0% of injuries in children below the age of 12; less than 1% in children below 1 year old. Facial fractures are more common in males than in females, with a ratio ranging from 1.6:1 to 3:1 [5]. To be more age-specific, the male-to-female ratio is reported to be 1.1:1 in children aged 0-6 years and.6:1 in children aged 7-12 years [5].

This patient presented with panfacial fractures, which is rare for his age. Panfacial fractures, especially those involving a Le Fort fracture, are uncommon in the pediatric population [6]. It is postulated that it is due to the developmental pattern of the craniofacial region. Changes of the skull-to-face ratio from 8:1 to 2.5:1 mean that the cranial region is more prominent and prone to injury, whereas the face is protected from injury [4]. Maxillary pneumatization is minimal up to the age of seven, with the midface being more elastic than the frontal bone. Hence, most of the force is transmitted and absorbed by the frontal bone. Mixed dentition, with the slowing of maxilla pneumatization, at the age of seven to twelve, is said to add extra stability to the midface, leading to force being transmitted to the thin orbital floor. It is only after the age of 12 that maxillary pneumatization is complete, and the force of trauma is transmitted to the maxilla [7,8].

Furthermore, the plasticity of bone in paediatric patients reduces the risk of facial bone fractures[9]. Some found that Le Fort fractures occur at a much younger age, with a mean age of 9.9 [10]. The authors also noted that there was an equal distribution of children with Le Fort fractures across deciduous, mixed, and permanent dentition [10]. Hence, the cement rubble may impact directly on the patient's face, bypassing the more prominent cranium.

Two key requirements govern treatment approaches: the avoidance of future growth disturbance and sufficient reduction and stabilization for bone healing. Due to the bone-healing and growth potential in the paediatric population, treatment is often conservative [2,3,5]. Although conservative strategies are often preferred in children, undertreatment of displaced fractures can result in complex deformities at skeletal maturity, which justifies the surgical intervention undertaken in this case [11]. Several factors have led to this decision; the maxilla of the patient was severely displaced posteriorly and "locked" into position, possibly by the bone fragments. Furthermore, the palate was splayed laterally due to the palatal split, which results in bilateral posterior lingual crossbite. The patient's condition is further complicated by the lack of dentition, which could have served as an anchorage of MMF. The combination of these factors results in a patient with a "class II profile" and bilateral crossbite, which cannot be reduced conservatively and is expected to be unable to be compensated for by the patient's own growth. The median palatine suture ossifies later than other facial sutures. It is rarely completed before the third decade, leading to a higher prevalence of sagittal palatal fractures in adolescence and early adulthood. The sagittal palatal split causes lateral splaying of the palatal shelves, resulting in facial broadening. Controlling transverse facial breadth requires effective manipulation of the sagittal split of the palate [12]. Some authors have suggested open reduction and internal fixation of the sagittal split, as well as intermaxillary fixation with a palatal splint [13]. **Gruss JS 1986**[14] found that a wide exposure of the palatal fracture is required for accurate reduction. Irrespective of the chosen management approach for the panfacial fractures, patients and caregivers should be advised that secondary corrective procedures may still be required at skeletal maturity [11]. Even though titanium plates have been the primary option to fix facial fractures, their use in paediatrics poses several complications, which include growth disturbances, tooth buds' interference and infection [15]. Resorbable plates and screws are a perfect alternative to titanium plates in paediatric patients,

as they are bioresorbable, eliminating the need of another surgery to remove the plate and consequently reducing the risks associated with an operation [15].

This case report emphasizes the importance of optimized treatment in managing a child with panfacial with palatal fractures. Surgeons caring for paediatric patients must understand the differences in fracture patterns between children and adults, as well as the long-term effects on skeletal growth and management. Highlighting this rare presentation underscores the need for individualized treatment planning in pediatric facial trauma. Future treatment protocols may benefit from integrating growth considerations with surgical innovations to improve both functional and developmental outcomes.

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AUTHOR CONTRIBUTION

Abdullah MF: Literature search, drafting and revising of the work, approving final version, accountable for all aspects of the work
Fauzi FA: Literature search, drafting and revising of the work, approving final version, accountable for all aspects of the work
Jim LM: Literature search, drafting and revising of the work, approving final version, accountable for all aspects of the work
Yusoff BM: Literature search, drafting and revising of the work, approving final version, accountable for all aspects of the work

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