

**CASE REPORT: SEVERE CRANIOFACIAL TRAUMA IN A PEDIATRIC PATIENT**

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**ABSTRACT**

Facial trauma is one of the main causes of patients visiting to the reconstructive plastic surgery specialist in third-level hospitals in Ecuador. Furthermore, it requires multidisciplinary management (craniofacial, maxillofacial surgery, and neurosurgery); the primary objective is to generate a functional and esthetic facial reconstruction of the patient. In this case, the clinical surgical management of a 2-year-old male patient suffering from severe facial trauma secondary to a traffic accident was a challenging facial reconstruction due to the age of the boy and the loss of several facial structures such as the right eyeball, occipital bone, and pan facial fractures. This case showed the management of pan facial fractures with fixation in inferior maxilla and the surgical procedures performed. The surgical procedure in infants is different to the adult because it has factors such as growth and development. Furthermore, due to the risk of facial deformities, facial injuries in children need to be managed taking in consideration the grown and development as well as anatomical, physiological, and psychological factors.

**Keywords:** Severe facial trauma, Facial injury, Facial reconstruction.

**INTRODUCTION**

The cranial facial trauma is one of the lesions of polytrauma that requires a multidisciplinary approach with the aim of guaranteeing the patient's life and, as far as possible, a functional esthetic facial reconstruction. It corresponds to small lesions or single skin wounds and the destruction of face and brain tissues [1].

The majority of these incidents are encountered by males from 53.7% to 80% who are involved in motor vehicle accidents from 5% to 80.2% [2]. Indeed, the worldwide prevalence for traumatic wounds is 1.7% [3].

The most frequently affected population is children (under 15 years old, constituting 55.8%, which are involved in domestic and traffic accidents, followed by animal bites. In the adult population, the most frequent causes are traffic and sport accidents, falls, and aggressions by the third parties. It is estimated that two-thirds of the participants in automobile accidents will present facial injuries [4]. Facial fractures occur when the action of a more intense trauma happens, usually caused by bruising. The mortality of these conditions is low, but they are associated with cranial encephalic trauma; this increases significantly [4].

Maxillofacial injuries in infants are difficult to manage, and growth and development are a key factor to take into account when treating infant patients. Around 80% of the cranial growth occurs in the first 2 years of life and is completed by the age of seven. By the end of the 1<sup>st</sup> year of live, the two mandibular halves have joined in the midline. At 2 years old, complete symphysis fusion from the inferior border to the alveolus and most of the traverse maxillary growth is complete. The 6<sup>th</sup> year marks the mixed dentition phase; the antrum is present and well developed. Palatal, premaxillary, and midline maxillary sutural growth are complete with suture obliteration by ages 8–12. The adult dentition is present by ages 12–13 [2].

The mandible and maxilla continue to grow throughout childhood, maintaining a high cancellous to cortical bone ratio and resulting in greater elasticity of the jaws. As a result, the incidence of greenstick fracture and non-displaced fracture is common in pediatric age children [2].

Cranial facial trauma should always be evaluated in patients with deformity, ecchymosis, and visible bruising in the region. Besides,

radiological assessment is essential; a simple X-rays and cranial tomography (axial, sagittal, and coronal section with three-dimensional reconstruction), which is of significant help at the time of surgery [5].

The lesions that affect the facial mass, determined by three defined areas, the upper, the middle, and lower third of the face include the involvement of the soft bone tissue and tooth alveolus structures [6].

The clinical characteristics that can be found in these fractures are the alteration of the dental occlusion, loss of the contour of the dental arch, laceration of the gingival tissues, alteration of the sensitivity due to compromise of the inferior alveolar nerve, presence of bruises in the vestibule floor oral and/or oral floor, and change in mandibular dynamics [7]. The recommended imaging studies in this type of fracture are the orthopantomography or panoramic radiography, which gives a total vision of the jaw, although computed tomography scan has a higher level of diagnostic support [7].

In addition to the common facial fractures, we must do an eye physical examination looking for orbital fractures and trauma optic as in this case [8].

The therapeutic objectives of mandibular fractures include the achievement of reduction and stabilization, occlusion before the trauma, contour and facial symmetry, and height and facial projection, internal fixation, and closed reduction [9].

The management of facial trauma includes three phases: (a) Emergency phase, (b) early phase, and (c) deferred phase. Emergency management discards and treats life-threatening injuries, maintaining patency of the airway and the search for underlying lesions until the radiological study. In the early management evaluates the location, extension, and depth of the wound, which cannot be repaired in a time not exceeding 6 h. In delayed management, the scheduled surgery must be performed to stabilize the bone fragments based on a precise and correct image diagnosis [6].

**CASE REPORT**

A 2-year-old male patient who was traveling in his mother's lap in the front seat of a vehicle suffers a head-on collision with another moving car which causes to the patient to be expelled through the windshield and beat his face against another car. He was stabilized by another



**Fig. 1: Day 1 panfacial fracture in a pediatric patient**



**Fig. 2: Post-surgery panfacial fracture in a pediatric patient**

hospital and later transferred to Hospital Pediátrico Baca Ortiz in Quito, Ecuador.

Due to the accident, the patient showed a severe facial trauma with a panfacial fracture, loss of frontal bone substance, and exposure of meninges without evidence of loss of cerebrospinal fluid. Furthermore, the patient lost his right eyeball. We saw a complete loss of nose tissue, multifragmentary fracture of the lower maxilla, and pulmonary contusion that remained for 9 days since the patient entry with the support of a mechanical ventilation by tracheostomy in a controlled assisted mode. After, he was switch to spontaneously breathe and then the medical team decided to place oxygen support with a mask on him.

Since the admission and due to the facial trauma that the patient presented, he had have remained orally suspended feeding. Due to the injuries caused by the facial trauma at the 3<sup>rd</sup> day of admission, it was impossible to place a nasogastric tube. The input started through total parenteral feeding nutrition, and on the 5<sup>th</sup> day of hospitalization, a gastrostomy was performed in the patient, and the feeding was initiated with a good patient tolerance, which was increased to complete basal needs and withdrawal to parenteral nutrition contribution on the 11<sup>th</sup> day.

The emergency management was carried out due to the loss of the upper airway with the performance of tracheostomy; therefore, the patient received mechanical ventilation in controlled assisted mode. Besides, the patient was in a hypovolemic shock, which required the administration of boluses of saline solution, red blood cell concentrates,

fresh frozen plasma, and cryoprecipitates. These improved his hemodynamic state and it maintained low blood pressure values normal. The intravenous support started with vasoactive medications such as norepinephrine. Blood pressure was achieved over the 50<sup>th</sup> percentile for age and sex and maintained with norepinephrine support for 11 days more. The doses of medications were regulated until arterial pressure kept without the support of vasoactive agents.

After the hemodynamic stabilizing of the patient, the surgical management was made.

The early phase of the trauma was carried out with the performance of a surgical debridement every 72 h. After that time, the surgical management and surgical debridement were performed to the patient next to the surgical repair of the dural defect with muscle fascia lata flap from the right hip, and then, the right orbit was emptied for irreversible tissue injuries. The mandibular fixation, cutaneous flap approximation, surgical fixing of osteo muscle, and cutaneous defect were debridement of devitalized tissue and made a flap plasty.

Six days later after the accident, we proceeded to perform a mandibular reduction and fixation with double wire rod placement with circumferential fixation and Ernst type wiring plus fixation in compression zone with wiring.

Fifteen days after the accident, a rigid fracture fixation was made with placement of circumferential wire, reduction of maxillary fracture, and installation of a 3-hole straight plate in the nasomaxillary region. The manual reduction of the fracture in the mandibular body was with a placement of a straight 5-hole plate. Finally, after 27 days, the rotation flaps were made and plated.

## DISCUSSION

In the treatment of this patient, an attention plan was formulated that began with the hemodynamic stabilization and then continued with the surgical procedure by plastic surgery. The surgical team saw the loss of part of the frontal bone, loss of the right eyeball, and total loss of tissues in the nose with the consequent exposure of the turbinates; therefore, all radiological studies were performed and panfacial fractures were diagnosed.

Multiple surgical debridements were performed in the area of injury, and the right eyeball was removed because the tissues were damaged, and it was impossible to keep it. After completing the procedure, the maxillary and mandibular fixations were achieved with anatomical reduction. The factors such as the existence of the patient's injury, the anatomical site, the complexity of the damage, and time were analyzed because in pediatrics population, the bones are growing [2]. Therefore, we used a thinner wire to tie the arch bar to the dentition; although this technique in children between 2 and 5 years can cause the resorbed teeth; in the future, it was necessary because the patient presented multifragmental fracture of the mandible [2]. It is necessary to keep the mandibular fixation even though feeding is compromised by avoiding biting and eating tough foods such as meat, nuts, and carrots [10].

The surgical treatment was prioritized in maintaining the function of each structure and facial harmony although it was challenging due to the loss of tissues and organs such as the eyeball.

## CONCLUSION

The severe facial pediatric trauma should be managed by many medical specialists such as emergency, plastic surgery, neurosurgery, dentistry, pediatrics, and radiology, which means that the patient must be attended at a third-level hospital with highly specialized staff and technical equipment. Facial injuries in children are different than in adults; therefore, it should be taken in consideration, the grown and development including anatomical, physiological, and psychological factors because there is a risk of facial deformities caused by these injuries.

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**CONSENT FOR PUBLICATION**

Written informed consent was obtained from patient legal guardians for publication of this case report and any accompanying images. A copy of the written consent is available for review by the editor-in-chief of this journal.

**DECLARATION OF CONFLICTS OF INTEREST**

The authors declare that they have not had conflicts of interest.

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