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Review Article

A review on craniofacial trauma in children

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ABSTRACT

The most frequent site of trauma and a major contributor to morbidity and mortality in children is the head. Facial fractures in very young children are rare because of their larger cranial-to-facial volume ratio and face elastic cartilage composition compared to adults. Age-specific fracture patterns are determined by facial growth and differ from those of adults mostly because of paranasal sinus pneumatization and secondary dentition eruption. Paediatric patients may sustain isolated face fractures. Because of their distinct physical and developmental traits, children require sophisticated care and assessment techniques. A thorough understanding of related injuries is essential since face fractures frequently occur in conjunction with more extensive trauma. Potential airway compromise, head trauma, and concurrent injuries should receive special attention.

1. Introduction

The maxillofacial trauma in youngsters are much less prevalent than various other kinds of complications. Furthermore, minor facial injuries in children typically consist of lacerations, hematomas, bruises, or tooth trauma. Due to children's high levels of activity, which progressively decline with age, paediatric face injuries are common. Self-fall, sports-related injuries, interpersonal aggression, and, finally, traffic accidents are the primary causes of paediatric age group instances. The pattern and treatment of face fractures in children varies from those in adults. Although relatively uncommon in children, craniofacial trauma is a significant cause of hospitalization, severe injury, and death. Surgeons face significant hurdles when dealing with facial damage related to severe injuries. The developing child may experience functional and aesthetic consequences, and the patient and family may experience an unbearable financial and emotional burden.

The paediatric patient can be divided into groups based on different developmental phases. The new born to one year of age is included in the infant. While a child is described as someone who is eleven to thirteen years of age or younger, preschool is the time between the ages of two and six years old. The age range of six to ten to twelve is known as school-age.[1,2] A child's higher cranial mass to body ratio makes them more vulnerable to craniofacial injuries. However, a high level of adult supervision, enhanced facial skeleton flexibility, modest sinus dimensions, relatively bigger adiposity pads, and unerupted, strengthening teeth may all greatly lower the frequency at which injury evolves into fracture.[3]

Severe harm and incapacity are linked to paediatric trauma damaging the facial bones. The epidemiology of face fractures in adults is well understood, but less is known regarding the trends and consequences of injuries in children.

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2. Discussion

According to studies, younger children are far less likely than teenagers and adults to sustain cranio-facial injuries. Socio-environmental, general physical, and cranio-maxillofacial anatomic variables all contribute to the reduced incidence of facial injuries in infants and early children. As the patient ages, fracture sites typically move from the upper to the lower part of the face.

The paired maxillae, mandibles, zygomae, nasal, and frontal bones are among the bones that make up the face framework. The maxilla is a component of the upper jaw, cheek, and tooth sockets. The only bone in the skull that can move is the mandible, which forms the lower jaw. The zygoma supports the orbit and adds to the prominence of the cheeks. Because they are relatively thin, the nasal bones, which make up the nose's bridge, are prone to fracture. The forehead and upper portion of the orbit are made up of the frontal bone, which shields the brain from the front. Sphenoid and ethmoidal bones inferiorly, occipital bones posteriorly, temporal bones laterally, and parietal bones supero-laterally are among the cranial bones that shield the remainder of the brain.

Understanding the distinction between facial fractures in children and adults requires an appreciation of face growth. The first two years of life account for around 80% of the cranial growth, which is finished by the age of seven. At birth, the craniofacial ratio is 8:1, but as an adult, it can range from 2 to 2.5 to 1. The two mandibular halves have merged in the midline by the end of the first year of life. The majority of the transverse maxillary growth is finished by age two, along with the full symphysis fusion from the inferior boundary to the alveolus (followed by vertical and finally anteroposterior). The mixed dentition phase, during which the antrum is present and fully formed, occurs in the sixth year. By the ages of eight through twelve, the sutures in the palatal, premaxillary, and midline maxillary regions have completely grown and obliterated. By the ages of twelve or thirteen, the adult dentition is established. Throughout childhood, the mandible and maxilla continue to expand, maintaining a high cancellous-to-cortical bone ratio and giving the jaws more suppleness.

Consequently, the paediatric age group has a higher prevalence of nondisplaced fractures and greenstick fractures.[4] The mandibular, nasal, and maxillary/zygoma fractures are the most frequent facial fractures. The most frequent causes of injuries include falls, violent crimes, and auto accidents. As people age, their fracture patterns and injury processes change. Adolescents are more likely to get mandibular injuries, while toddlers and newborns are more likely to sustain cranial and central facial injuries.

The likelihood of a skull fracture in very young children is higher than that of a facial fracture from blunt frontal trauma because of the cranium's frontal protrusion and the face's relative retrusion; the skull absorbs the full power of the first hit, shielding the face. The face projects forward and downward as physiologic development and age increase, with the mandible and midface taking center stage. From birth to adulthood, the size of the face increases twelvefold, while the size of the cranium quadruples. Compared to adults, children are more susceptible to greenstick fractures and have a stronger defense against face fractures due to the configuration of the bones in their paediatric facial skeleton. The juvenile face skeleton is more elastic and flexible due to the quantity of cartilage and cancellous bone, poor mineralization, and underdeveloped cortex, as well as the more flexible suture lines and blurred corticomedullary junction. These bones are further shielded by the fat pads that encircle the upper and lower jaws and the dense layer of adipose tissue that covers a large portion of the paediatric facial skeleton.

Adult and paediatric patients differ in anatomy and development, which affects how injuries are diagnosed and treated.[5] Five to fifteen percent of all facial fractures occur in children. Infants have the lowest rate of paediatric facial fractures, which gradually rises with age. Children under the age of five only experience 1.0% of face fractures, while patients over the age of sixteen experience 1.0 to 14.7%.[6] There are two known peaks in the frequency of these fractures: the first occurs between the ages of six and seven and is linked to the start of school. Sports involvement and increased physical activity during puberty and adolescence are linked to the second, which occurs between the ages of twelve and fourteen.[7] Children often experience facial fractures, with mandibular fractures being the most common. These fractures can lead to growth abnormalities, long-term facial bone deformity, and infection. Nonaccidental trauma, such as child abuse or neglect, can also cause facial fractures. Other factors include risk-taking behaviors, failure to wear protective gear, suicide attempts, and certain bone facial fractures.

Facial fractures can result in tooth avulsions, soft tissue wounds, lacerations, penetrating wounds, septal or auricular hematomas, eye injuries, ductal and glandular injuries, and neurovascular damage. Poor vision acuity can result from the deformity, and peripheral nerves may cause ongoing paresthesia or muscle weakness. Face trauma can also cause chronic or posttraumatic face pain, and patients may exhibit symptoms of psychosocial sequelae. Proper diagnosis and care of facial injuries can significantly impact functional and aesthetic recovery. In summary, children's facial fractures are often caused by forceful hits and can lead to long-term consequences.

Although isolated facial fractures in children are rare in general, they are more likely when they are linked to severe trauma. These fractures are more common in boys and become more common as people age. Sports-related injuries, falls, and auto accidents are the primary causes of face fractures in children. While mandibular fractures

are the most common paediatric face fracture encountered in a hospital context, nasal fractures are by far the most common form among children of all ages.[8–10] As per the views of Rowe,[11] the low prevalence of face fractures in young children is likely caused by the relative elasticity of their bones and the fact that their facial skeleton is less noticeable than their cranium.

According to Singh et al.[12] children under five years old had a 0.1% incidence of face fractures. Several researchers including MacLennan 1%,[13] Hagan and Huelker 1.2%,[14] Rowe and Killey 0.87%,[15] and Halazonitus 0.68%[16] have also documented the low rate of facial fractures in children under five years old. This may be because parental supervision keeps kids in this age range from suffering serious accidents. In children, midface fractures are very uncommon. According to a study, the incidence of these fractures was 0.09%.[12] MacLennan 0.25%,[13] and Rowe 0.2%[17] all proposed this low rate of middle third fractures. In young newborns, the cranium provides adequate defense for their facial skeletal system, which is additionally protected by the substantial adipose layer of soft tissue. In the case of the maxilla, well-pneumatized air cavities do not separate it from the base of the cranium. This is consistent with Rowe's findings.[11] The male to female ratio was 3:1, meaning that male children were impacted around three times as often as female children. This is most likely because guys are more physically active. Hall also reported a similar 3:1 male to female ratio.[18]

Although most paediatric face injuries are unintentional, there are a few ways to lessen their incidence and severity. Among these measures are assessments for potential child abuse, suicidal thoughts and behaviours, and risky social behaviour, such as participation in high-impact sports and leisure pursuits. Using age- and size-appropriate restraints in motor vehicles reduces the risk of injury and death for both adults and children.[19,20] Sports and other activities that could result in high-energy impacts, such riding an all-terrain vehicle, snowmobiling, skiing, skating, and cycling, should also promote the use of personal protection equipment, particularly helmets with face shields or visors.[21,22]

3. Conclusion

Face fractures in children can be severe and potentially life-threatening, leading to brain injury, spine or neck fractures, or compromised airways. Advanced trauma life support standards should be followed when evaluating patients with catastrophic facial injuries. Children's facial bones are less thick and more malleable than adult bones, and the presence of fontanelles and growth plates complicates fracture patterns. Interprofessional collaboration is crucial for comprehensive care during the acute period. Children's craniomaxillofacial fracture patterns differ from adults, necessitating different treatment approaches. The facial skeleton is particularly vulnerable in early years due to excessive activity and lack of fine motor control. Boys are more likely to suffer from maxillofacial trauma, while over-ten-year-olds are more likely to get bone injuries. Early detection and treatment of facial injuries in children are difficult due to poor communication, radiological evaluation, and delayed patient presentation.

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5. Conflict of Interest

None.

References

1. Dorland WAN. Dorland's Illustrated Medical Dictionary. 28th ed. Philadelphia: W B Saunders Co Ltd; 1994.
2. Spraycar M. Physician's desk reference medical dictionary. 1st ed. Baltimore: Williams and Wilkins; 1995. p. 1182.
3. Sawhney CP, Ahuja RB. Faciomaxillary fractures in north India. A statistical analysis and review of management. *Br J Oral Maxillofac Surg*. 1988;26(5):430–4.
4. Posnick JC, Wells M, Pron GE. Pediatric facial fractures: evolving patterns of treatment. *J Oral Maxillofac Surg*. 1993;51(8):836–44.
5. Zimmermann CE, Troulis MJ, Kaban LB. Pediatric facial fractures: recent advances in prevention, diagnosis and management. *Int J Oral Maxillofac Surg*. 2006;35(1):2–13.
6. Haug RH, Foss J. Maxillofacial injuries in the pediatric patient. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2000;90(2):126–34.
7. Ferreira PC, Amarante JM, Silva PN, Rodrigues JM, Choupina MP, Silva AC, et al. Retrospective study of 1251 maxillofacial fractures in children and adolescents. *Plast Reconstr Surg*. 2005;115(6):1500–8.
8. Vyas RM, Dickinsion BP, Wasson KL, Roostaeian J, Bradley JP. Pediatric facial fractures: current national incidence, distribution, and health care resource use. *J Craniofac Surg*. 2008;19(2):339–49.
9. Stylogianni L, Arsenopoulos A, Patrikiou A. Fractures of the facial skeleton in children. *Br J Oral Maxillofac Surg*. 1991;29(1):9–11.
10. Kos M, Luczak K, Godzinski J, Rapala M, Klempous J. Midfacial fractures in children. *Eur J Pediatr Surg*. 2002;12(4):218–25.
11. Rowe NL. Fractures of the jaws in children. *J Oral Surg*. 1969;27:497–507.
12. Singh G, Mohammad S, Pal US, Hariram, Malkunje LR, Singh N. Pediatric facial injuries: It's management. *Natl J Maxillofac Surg*. 2011;2(2):156–62.
13. Maclennan WD. Fractures of the mandible in children under the age of six years. *Br J Plast Surg*. 1956;9:125–8.
14. Hagan EH, Huelke DF. An analysis of 319 case reports of mandibular fractures. *J Oral Surg Anesth Hosp Dent Serv*. 1961;19:93–104.
15. Rowe K. Fracture of facial skeleton. 2nd ed. Edinburgh: Churchill; 1968.
16. Halazonetis JA. The 'weak' regions of the mandible. *Br J Oral Surg*. 1968;6:37–48.
17. Rowe NL. Fractures of the facial skeleton in children. *J Oral Surg*. 1968;26:505–15.
18. Hall RK. Injuries of the face and jaws in children. *Int J Oral Surg*. 1972;1(2):65–75.
19. Murphy RX, Birmingham KL, Okunski WJ, Wasser TE. Influence of restraining devices on patterns of pediatric facial trauma in motor vehicle collisions. *Plast Reconstr Surg*. 2001;107(1):34–7.
20. Tyroch AH, Kaups KL, Sue LP, O'Donnell-Nicol S. Pediatric restraint use in motor vehicle collisions: reduction of deaths without contribution to injury. *Arch Surg*. 2000;135(10):1173–6.

21. Hergenroeder AC. Prevention of sports injuries. *Paediatrics*. 1998;101(6):1057–63.
22. Stracciolini A, Sugimoto D, Howell DR. Injury Prevention in Youth Sports. *Pediatr Ann*. 2017;46(3):99–105.

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