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CLINICAL ARTICLE

A CONSERVATIVE APPROACH TO PAEDIATRIC MANDIBULAR FRACTURE MANAGEMENT

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Abstract

Mandibular fractures can be considered as less frequently in children than in adult population, but when considered in children, it's one of the commonest fractures. This less occurrence is mainly due to protective anatomical features. Treatment for pediatric mandibular fractures remains controversial and differs from that of adults. Management is extremely complicated due to developing mixed dentition. The treatment modalities lay in a wide range from conservative management to surgical options. A case of eight-year-old girl with fractures in mandibular ramus and parasymphyseal region that was managed conservatively and kept under observation is presented. This report provides a review of literature regarding the management of mandibular fractures in pediatric patients.

Keywords: *Pediatric dental trauma, soft diet and observation, Open and closed reduction, Mandibular fractures*

Introduction

The reported incidence of pediatric injuries accounts for 4 - 6% of the total.[1] There are many case reports that have mentioned that mandibular fracture is the most common fracture of facial skeleton in pediatric patients.[2,3]

This is less frequent than adults not only due to unique anatomical features but also due to social care of children, which makes them less exposed to trauma.[4,5] Mandibular flexibility, shortness of condyle, non-prominent jaw line is in favor for less frequency of incidence.[6] Road traffic accidents, falls, sports related injuries account for commonest mechanisms of injury of these fractures.[7]

The main principle of management of pediatric mandibular fracture is minimal manipulation of facial skeleton, as disruption of periosteal envelope may lead to unpredictable effect on growth.[4] The goal of treatment of pediatrics mandibular fracture is to restore the underlying bony architecture to a stable pre-injury position in the most non-invasive manner possible, with minimal aesthetic and functional impairment.[4] Treatment modalities of pediarics mandibular fractures range from conservative and

non-invasive by advising a soft diet, through dental splints, closed reduction and immobilization with eyelets or arch bars, circumferential wiring to open reduction and internal fixation with resorbable or non-resorbable bone plates.[8] Treatment modalities for a certain fracture depends on the stage of skeletal development and the type of fracture.

Case Report

An 8-year-old girl, presented to ETU of DGH Kalutara with bleeding from oral cavity following knocked down by a car. On presentation, patient was conscious but drowsy and had a GCS of 15/15. Patient's medical history was unremarkable and no allergic history. Clinical extra-oral examination revealed right side facial swelling, abrasions on right side malar region, tenderness and palpable step deformity over right side angle of mandible. On intra-oral examination, there was a laceration with active bleeding on right side retromolar region and right-side buccal sulcus in relation to 46, 47. Mild ecchymosis was found on right side retromolar region.

The right-side lateral oblique, postero-anterior of mandible and Occipitomental views were taken. Immediate NCCT brain was done to exclude any intra-cranial hemorrhages. With the help of radiographs, patient was diagnosed to have right side mandibular ramus fracture and right side mandibular parasymphyseal fracture.

Intra oral lacerations were sutured with 3/0 vicryl and haemostasis was obtained. IV Co- amoxiclav and IV Dexamethasone were added in managing patient. For the maximum benefit of the patient optimum treatment plan was suggested as conservative management of both mandibular fractures. Patient was advised to keep on a soft diet. Broad spectrum antibiotics were continued to prevent infections and other complications. Regular clinical and radiographic follow-ups were done to monitor the prognosis.

Figure 1. *Occlusion one week after presentation*

Figure 2. *Reverse Towne's view at presentation*

Figure 3. *R/S Lateral Oblique view at presentation*

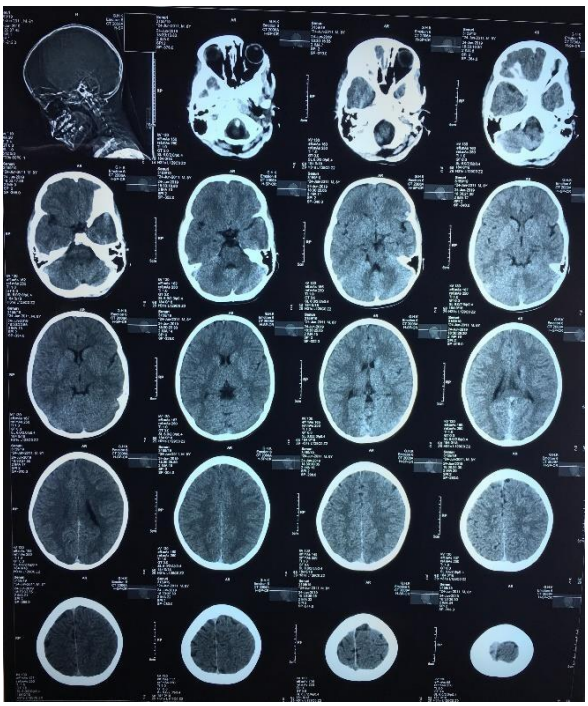

Figure 4. *NCCT brain at presentation*

Figure 5. *At 2 months of follow up*

Figure 6. *2 months of follow up occlusion*

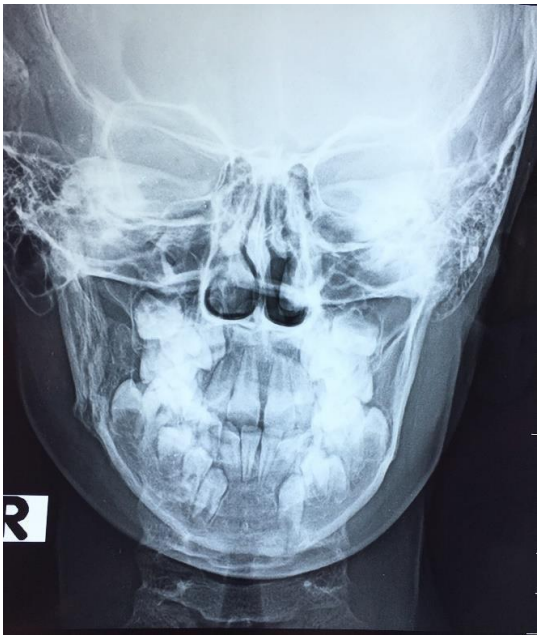

Figure 7. *At 2 months follow up of Posteroanterior view of the mandible*

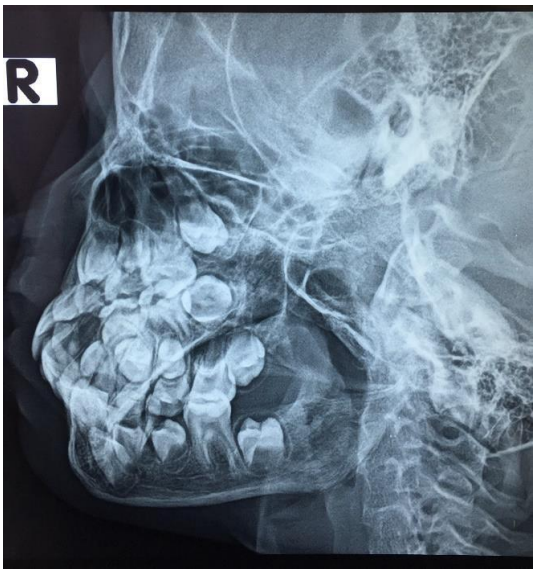

Figure 8. *2 months follow up radiograph of right-side lateral oblique view of mandible*

Discussion

The incidence of facial fractures is lower in the pediatric population than in the adult population and represents 1-14.7% of the facial fractures in the general population.[9] Approximately half of all pediatric facial fractures occur in the mandible.10 A male predilection is seemed in all age groups including children as well as adults.[4]

The natures of pediatric mandibular fractures differ from adults due to varied anatomy, rapid healing, patient cooperation and continued pediatric

mandibular growth. The reasons cited for this low incidence include small volume of facial mass relative to the calvarium, the relative resilience of the pediatric skeleton and the protected environment in which children live, leading to less exposure to typical mechanism of injury.[11,12]

Further more protective anatomic features of children in that in young age, the face is in a more returned position relative to the skull, therefore there is less incident of midface and mandibular fractures and higher incident of cranial injuries.[4] With the increasing age, facial growth directed in a downward and forward direction, prominence of mandible and midface increases thus the incident of mandibular fractures goes up.[13] And also high elasticity of young bones due to high cancellous to cortical bone ratio and flexible suture lines are in favor of high resilience of bones.[14,15]

The clinical features of a fractured mandible in children are more or less similar to those of adults but may be difficult to identify in uncooperative young patients.[4] Those clinical features include pain, swelling, trismus, occlusal de-arrangements, ecchymosis, step deformities, midline deviation, numbness due to nerve damage, bleeding, open bite and crepitus etc.[4] and most of which were identified in our case.

For children, the imagine techniques are in great value to confirm the fractures. Specially the Computed tomography scans are preferred over plain radiographs in young children, since unerupted tooth buds obscure the fracture lines, the increased incident of greenstick fractures and the fact that cortex is undeveloped, leading to difficulty in visualizing fractures.[16]

The factors which affect the treatment plan include patient age, duration between trauma and treatment, location and extent of injury,stage of root formation, the presence of bone fracture, periodontal health of the remaining teeth and whether primary, or permanent teethare affected.[17,18]

Many pediatric fractures are non-displaced or greenstick-type fractures, and observation alone is adequate.[19,9] There is almost no indication to open a fracture becausethe abundance of developing teeth in the bone makes fixation almost impossible without damaging these structures.[19,9] A conservative approach (observation or closed reduction) isthe best approach to consider first for pediatric mandible fractures, as these fractures heal rapidly, and the children grow normally.[19,9]

The degree of precision required in reduction of pediatric fractures is not quite as great as in an adult, as the adaptive potential of the alveolar bone and the replacement of deciduous teeth by permanent teeth can bring about various degrees of self-correction. The high osteogenic potential of the pediatric mandible is responsible for a low complication rate.[20]

The treatment methods for displaced fractures o include closed reduction and immobilization with arch bars and elastics.[20] This technique may lead to a great disturbance in the patient's lifestyle, particularly feeding and speaking. Children on intermaxillary fixation (IMF) are at an increased risk of aspirating gastric contents and the wires cause discomfort and damage to periodontal tissues.[7] Various authors agree thata long period of immobilization (more than two weeks) may cause ankylosis of the temporomandibular joint and damage to developing teeth.[21,22] The issues such as loose anchorage system due to attrition of crowns andphysiologic resorption of roots, instability of partially erupted permanent teeth in pediatric soft bone, conical shape with wide cervical margins and tapered occlusal surfaces make placement of wires technically challenging.[4] However the literature also reveals thatalternative devices such as modified orthodontic brackets, orthodontic resins, orthodontic rubberelastics in combination with fixed orthodontic brackets and modified orthodontic splint appliances have been used successfully for closed reduction of mandibular fractures.[4]

Open reduction and internal fixation are considered as the option of treatment for the fractures that needs active intervention and cannot be secured with closed reduction techniques, especially after the age of 12 years.[23] If the permanent dentition has fully erupted and the root formation is in a satisfactory level, management become similar to that performed in an adult. The use of absorbable plates and screws have nearly no side-effects on the growing facial skeleton but there is still the risk of damaging unerupted teeth during the drilling process. [19]

There are several complications and problems encountered in management of pediatric mandibular fractures. Generally, fewer complications are encountered after treatment of pediatric mandibular fractures than in the adult population. Besides the application of conservative treatment and closed

reduction frequently, favorable pediatric wound healing and a treatment response level than adults' are also the reasons of minimal complication ratio in pediatric patients.[6]

The main complications in the postoperative period are:

- Infection
- mal union
- non-union
- malocclusion
- facial asymmetry
- mandibular growth disturbance
- permanent tooth loss
- temporomandibular joint dysfunction/ankylosis[24]

Infections may be mainly due to fragmented bone fragments, non-vascularized tissues and foreign bodies.[6] It is very important to place onbroad spectrum antibiotics for these patients.[6] In our case, we used IV Co-amoxiclav as the drugof choice for both aerobic and anaerobic cover.

Patients who exhibit persistent malocclusion can often further be treated non-surgically; however,some type of functional therapy isrecommended to address the abnormal occlusal relationship. This functional therapy can be as simple as elastics in conjunction withorthodontic appliances or occlusal splints, or it may require a formal functional appliance, whichare placed by orthodontists. In growing children, over a period, a functional appliance can correct a malocclusion caused by condylar fractures mainly and help correct abnormal mandibular function.[6] Fortunately, in our case at two months follow up the occlusal de-arrangement had corrected to a satisfactory level. Abnormal growth may result in facial asymmetryand deviation of the chin and may not be apparent for several years.[6] So the long-term follow-up would still be needed.

The cause of the actual growth disturbances remains unclear, as different outcomes occur with similar fractures. It is possible that certain children may have lost growth stimuli or suffers from decreased regional vascularity, resulting in growth restriction. Maintaining appropriate range of motion at the TMJ is important in maintaining proper mandibular growth, as well as avoiding ankylosis and TMJ dysfunction. In all cases, restoring facial symmetry is a very difficultchallenge in these patients, and may require additional interventions that may range from fatgrafting, to orthodontics, to combined orthodontic-orthognathic surgery approaches.[6]

Conclusion

In conclusion mandibular fractures in pediatric patients are relatively common, even though the incident is much lower than in adult population.

In approach to these fractures, conservative methods such as soft diet and observation are the front line of treatment, as intact active mandibular growth centers are important for future facial development. These conservative methods are cost effective, safe and minimally invasive with good prognosis and almost complications free outcome, which are more commonly seen in invasive surgical procedures. In cases of mandibular fractures in young patients; disruption of periosteal envelope may have unpredictable effects on growth. Thus, if intervention is required closed reduction is favored.

However long term follow up is absolutely essential in pediatric facial trauma cases of early determination of possible growth disturbances.

Disclosure

Conflict of interest and financial disclosure

The author declares that he has no conflict of interest and there was no external source of funding for the present study. None of the authors have any relevant financial relationship(s) with a commercial interest.

Ethical approval

Research protocol was approved by the local Ethical Committee (2018/23) and in accordance with those of the World Medical Association and the Helsinki Declaration.

Informed consent

Informed consent was obtained from all individual participants included in the study.

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REFERENCES

1. Tandon S. Textbook of paedodontics. *1st ed. Hyderaba: Paras Medical Publisher.* 2001:490

2. Chao MT, Losee JE. Complications in pediatric facial fractures. *Craniomaxillofac Trauma Reconstr*. 2009;2(2):103-12. doi:10.1055/s-0029-1215873

3. Sherick DG, Buchman SR, Patel PP. Pediatric facial fractures: Analysis of differences in subspecialty care. *Plast Reconstr Surg.* 1998;102(1):28-31. doi:10.1097/00006534-199807000-00004

4. John B, John RR, Stalin A, Elango I. Management of mandibular body fractures in pediatric patients: A casereport with review of literature. *Contemp Clin Dent*. 2010;1(4):291-6. doi:10.4103/0976-237X.76406

5. Renato M, Patrício ON, Oliveira SK, Liliane SS, Márcio M. Mandibular fractures in children under 3 years: Arare case report. *Rev Port Estomatol Med Dent Cir Maxillofac*. 2013;54:166-70. doi:10.1016/j.rpemd.2013.06.002

6. Karacor-Altuntas Z, Ismayilzade M. What are the Differences in Pediatric Mandible Fractures? *Journal of Aesthetic & Reconstructive Surgery*. 2017;3(2):11. doi:10.4172/2472-1905.100033

7. Smartt JM Jr, Low DW, Bartlett SP. The pediatric mandible: II. Managementof traumatic injury or fracture. *Plast Reconstr Surg*. 2005;16(2):28e-41e. doi:10.1097/01.prs.0000173445.10908.f8

15. Crean ST, Sivarajasingam V, Fardy MJ. Conservative approach in the management of mandibular fractures inthe early dentition phase: A case report and review of the literature. *Int J Pediatr Dent*. 2000;10:229-33. doi:10.1046/j.1365-263x.2000.00196.x

16. Posnick JC, Wells M, Pron GE. Pediatric facial fractures: Evolving patterns of treatment. *J Oral Maxillofacial Surg*. 1993;51:883-44 discussion 44-5. doi:10.1016/s0278-2391(10)80098-9

8. Maher Aboelgheit, Management of mandibular fracture in pediatricpatients. A case report. *Asian Pacific Journal of Health Sciences*. 2017;4:-81. doi:10.21276/apjhs.2017.4.4.20

9. Ferreira PC, Amarante JM, Silva PN, et al. Retrospective study of 1251 maxillofacial fractures in children and adolescents. *Plast Reconstr Surg.* 2005;115:1500-8. doi:10.1097/01.prs.0000160268.20294.fd

10. Qadri GW, Mokhtar SM. pediatric mandibular fractures: Report of a case. *Dent Traumatol*. 2008;24: 67-70. doi:10.1111/j.1600-9657.2008.00700.x

11. Eppley BL. Use of resorbable plates and screws in pediatric facial fractures. *Oral Maxillofac Surg* 2005;63:385-91. doi:10.1016/j.joms.2004.11.011

12. Tanaka J, Uchide N, Suzuki K, et al. Maxillofacial fractures in children. *Craniomaxillofac Surg*. 1993;21:289-93. doi:10.1016/s1010-5182(05)80349-x

13. McGraw BL, Cole RR. Pediatric maxillofacial trauma, age related variations in injury. *Arch Otolaryngol Head Neck Surg*. 1990;116:41-5. doi:10.1001/archotol.1990.01870010045014

14. Zimmermann CE, Troulis MJ, Kaban LB. Pediatric facial fractures, recent advances in prevention, diagnosis and management. *Int J. Oral Maxillofacial Surg*. 2006;35:2-13. doi:10.1016/j.ijom.2005.09.014

17. Blakey GH, Ruiz RL, Tuarey TA. Management of facial fractures in growing patient. *Oral and Maxillofacial Trauma and Endodontics*. 1997;2:1003-41

18. Priya Vellore K, Gadipelly S, Dutta B, Reddy VB, Ram S, Parsa A. Circummandibular wiring of symphysis fracture in a five-year-old child. *Case Rep Dent.* 2013;2013:930789. doi:10.1155/2013/930789

19. Haug RH, Foss J. Maxillofacial injuries in the pediatric patient. *Oral Surg Oral Med Oral Pathol*

Radiol Endod. 2000;90:126-34. doi:10.1067/moe.2000.107974

20. Qadri GW, Mokhtar SM. Pediatric mandibular fracture: Report of case. Dent Traumatol. 2008;24:e67-70. doi:10.1111/j.1600-9657.2008.00700.x
21. Kaban LB, Troulis MJ. Pediatric oral and maxillofacial surgery. *Philadelphia, Pa., London: W.B. Saunders*. 2004
22. Remi M, Christine MC, Gael P, Soizick P, Joseph-Andre J. Mandibular fractures in children: Long-term results. *Int J Pediatr Otorhinolaryngol*. 2003;67:25-3. doi:10.1016/s0165-5876(02)00288-4
23. Khatri A, Kalra N. A conservative approach to pediatric mandibular fracture management: outcome and advantages. *Indian J Dent Res.* 2011;22(6):873-6. doi:10.4103/0970-9290.94692
24. Andrade NN, Choradia S, Sriram SG. An institutional experience in the management of pediatric mandibular fractures: A study of 74 cases. *J Craniomaxillofac Surg*. 2015;43(7):995-9. doi:10.1016/j.jcms.2015.03.020

ԵՐԵԽԱՆԵՐԻ ՄՈՏ ԾՆՈՏԻ ԿՈՏՐՎԱԾՔՆԵՐԻ ԲՈՒԺՄԱՆ ՊԱՀՊԱՆՈՂԱԿԱՆ ՄՈՏԵՑՈՒՄ

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Ամփոփում

Ստորին ծնոտի կոտրվածքները կարելի է համարել ավելի հազվադեպ երեխաների մոտ, քան մեծահասակների մոտ, բայց երբ դիտարկվում է երեխաների մոտ, դա ամենատարածված կոտրվածքներից մեկն է: Այս ավելի քիչ երևույթը հիմնականում պայմանավորված է պաշտպանիչ անատոմիական հատկանիշներով: Մանկական ստորին ծնոտի կոտրվածքների բուժումը մնում է հակասական և տարբերվում է մեծահասակների բուժումից: բուժումը չափազանց բարդ է խառը ատամնաշարի զարգացման պատճառով: Բուժման եղանակները լայն շրջանակում են՝ պահպանողական կառավարումից մինչև վիրաբուժական տարբերակներ: Ներկայացված է ութամյա աղջնակի մի դեպք՝ ստորին ծնոտի շրթունքի և պարասիմֆիզային հատվածի կոտրվածքներով, որը կառավարվել է կոնսերվատիվ եղանակով և պահվել հսկողության տակ: Այս զեկույցը տրամադրում է գրականության ակնարկ՝ կապված մանկական հիվանդների մոտ ստորին ծնոտի կոտրվածքների բուժման հետ:

КОНСЕРВАТИВНЫЙ ПОДХОД К ЛЕЧЕНИЮ ПЕРЕЛОМОВ НИЖНЕЙ ЧЕЛЮСТИ У ДЕТЕЙ

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Абстракт

Переломы нижней челюсти можно считать менее частыми у детей, чем у взрослого населения, но при рассмотрении у детей это один из самых частых переломов. Это меньшее количество случаев в основном связано с защитными анатомическими особенностями. Лечение переломов нижней челюсти у детей остается спорным и отличается от такового у взрослых. Управление крайне затруднено из-за развития смешанного прикуса. Методы лечения варьируются от консервативных до оперативных. Представлен случай восьмилетней девочки с переломами нижнечелюстной ветви и парасимфизарной области, леченной консервативно и находящейся под наблюдением. В этом отчете представлен обзор литературы по лечению переломов нижней челюсти у детей.