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Treatment dilemma with displaced sagittal mandibular fractureunder 3 years:A rare case report

Dr. Rajesh B. Dhirawani	MDS – Oral & Maxillofacial Surgery, Prof. & HOD Dept. of Oral & Maxillofacial Surgery, Hitkarini Dental College & Hospital, Jabalpur (M.P.) India.
Dr. Ankit Sharma	MDS – Oral & Maxillofacial Surgery, Consultant, Jabalpur Hospital & Research Centre, Jabalpur (M.P.) India.
Dr. Indraj Arora	PG – Resident 2nd year, Dept. of Oral & Maxillofacial Surgery, Hitkarini Dental College & Hospital, Jabalpur (M.P.) India. Corresponding Author
Dr. Irfan Zunzani	PG – Resident 2nd year, Dept. of Oral & Maxillofacial Surgery, Hitkarini Dental College & Hospital, Jabalpur (M.P.) India.
Dr. Sanchit Jain	MDS, Senior Lecturer, Dept. of Oral & Maxillofacial Surgery, Hitkarini Dental College & Hospital, Jabalpur (M.P.) India

ABSTRACT

Aim – Treatment goal is to achieve 3-dimensional stable reduction with minimal functional impairment with displaced saggital split fractures.

Background – Reported incidence of pediatric facial fractures accounts from 0.6 to 1.2 % of total fractures. Falls & road traffic accidents are considered as two main etiologic factors. Management of pediatric mandibular fracture requires thoughtful reconstruction to prevent injury to developing tooth germ & significant growth disturbances.

Case Description – This paper describes a case of 3 years old, male patient with saggital mandibular fracture on right side body region. ORIF was done to gain absolute reduction followed by implant removal after 3 months.

Conclusion – Treatment plan for pediatric mandibular fractures ranges from conservative treatment to closed or open reduction. **Achieving 3-**dimensional stable reduction with minimal facial impairment is the ultimate treatment objective.

Clinical Significance – Not in all the cases stable occlusion determines 3-dimensional anatomical reduction of bone. Saggital split fracture of pediatric mandibular bone (relatively rare) serves as an indication for ORIF.

KEYWORDS : Saggital split pediatric mandibular fracture, tooth germ, ORIF.

BODY OF THE MANUSCRIPT

BACKGROUND

Pediatric mandibular fractures contributes approximately 0.6% - 1.2% of total facial fractures.These arerare with male predilection. (3) Reason of rarity being the flexibility of the facial skeleton, relative protection offered by existing fat in the subcutaneous tissue around bone and protective parental care (2).Falls androad traffic accidents are considered as two main etiological factors in pediatricmandibular fractures. Fractured mandible in children is diagnosed clinically based on step deformity, hematoma in the floor of mouth, ecchymosis andmobility of fractured segments. (1)The goal of the treatment should be accurate, functional, esthetic three dimensional restoration of pre injury form and function. (6) Management of pediatric mandible fracture is different from adult fracture due to presence of multiple tooth germs throughout the substance of mandible.

This paper describes a case of pediatric mandibularfracture with sagittal fractureof right side body where open reduction internal fixation was done to gain absolute reductionfollowedby implant removal after 3 monthswith minimal esthetic and functional impairment.

CASE DESCRIPTION

A 3 year old boy reported to our oral&maxillofacial surgerydepartment along with his parents with the chief complaintof extraoral swelling and difficulty to eat following fall from terrace(Figure 1). Alleged history of fall from height while playing 4 days back. Patient was taken to primary health care centrewhere first aid was given and was referred to highercentre.There wasno positive history of LOC, vomiting or seizures. Positive history of oral bleed was present; while there was no history of nasal or ear bleed. GCS on arrival was 15.Clinical examination reveals extraoral swelling on theright lowerthird of face extending supero-inferiorly from ala tragus line to submandibular region; antero-posteriorly it is extending fromalatragus line to corner of mouth. Ecchymosis presenton the right submandibular and submental region (Figure 2). Discontinuity at the lower border of themandibleat thebody region was felt on palpation. Abrasion were seen on right submandibular, chin& forehead region.Mouth openingwas restricted which was measuredapproximately 8mm.

Intraorally there was stepdeformity, tenderness and mobility of the bonysegment distal to second deciduous molaron theright side.Occlusion was deranged. CTscan was done in which displaced bony fracture can be appreciated; fracture line can be seen distal to second molar running in oblique direction towards the body of mandible. Sagittal split of bone can also be appreciated in CT cuts (Figure 3 and 4).

Undernaso-endotracheal intubation, arch bars were placed. Right submandibular incision was given, dissection was done, fracture segments were exposed and reduced; functional occlusion achievedfixation was done at the lower border of mandible using 1.5 mm 6 hole plate with six 6 mm screws (Figure 5 and 6). Closure wasdone in layers using 3-0 vicryl and 5-0ethilon. Post-operative period was uneventful.Patient camefor regular follow up for 3 months. A second stage surgery of implant removal was performed after 3 months via same approach (Figure 7) with stable occlusion post-operatively which can be appreciated in 6 months follow-up (Figure 8 and 9).

DISCUSSION

Incidence ofpediatricmaxillofacial fractures are generally rare. The high elasticity of young bone thick layer of adipose tissue covering

them, low tooth to boneratio, highcancellousto cortical bone ratio and flexible suture lines are some of the factors contributing to low incidence of facial fracture and minimal displacement of fractured fragments. (4)

Pediatric mandibular fractures require thoughtful consideration in management to avoid further injury to developing tooth germs and significant growth disturbance. Treatment of pediatric mandibular fracture depends on the location of the fracture, degree of bone displacement,occlusal status and dentition status of child.

Management of pediatric fracture ranges from conservativeapproach to surgical intervention. Minor greenstick fractures of mandible can be dealt with soft diet and minimal functional intermaxillary fixation. This relieson plasticity of occlusion in pediatric patients. (6) Loiset al, concluded that fracture with displacement in range of 2-4 mm, there is no difference betweenboth the treatment options i.e.either MMForORIFcan be done. However,in cases where there is displaced or comminuted pediatric fracture where other means of reduction modalities fail to achieve anatomical reduction, ORIF is recommended.

Various methods of immobilization are by acrylic splints, circumferential wiring, arch bar, gunning splints or lingual splints. (1) Closed reduction provides a good reduced position, continuity of periosteal sleeve andmaintenanceof soft tissue, thus creating a positive environment for rapidosteogenesis and remodeling.Despite being considered as the most acceptable treatment modality for displaced fracture reduction in pediatric patients, challenges associated with MMFincludes loose anchorage of deciduous teeth and physiologicalresorption of root, precarious dental stability in mixed dental development period, conical shape of deciduous teeth and taperedocclusal surfaces making placement of wires technically difficult anddamage to the periodontal tissue caused by wires.Psychological stress to the patient as well as parents is also an added disadvantage with MMF.Many authors have indicatedthat becauseof restricted dietary intake causing significant reduction in weight of child and protein loss along with greater risk of aspiration of gastric contents in children less than 3 years old, arch bars are safe in children older than 9 to 11 years. (3)Ridson cable wires overcomes the designand bulk of arch bars and loosening and sliding offcircumdental wires thereby serving as a better option in comparison to arch bars.

Prefabricated acrylic splints are considered as better option than MMF as they are comparatively less technique sensitive, requires less operative time and causes minimal trauma to the adjacent anatomical structures thereby comfortingpatients; but in cases of unfavorable&comminuted fractures,where anatomicalreduction cannot be achieved by closed reduction; open reduction internal fixation is indicated. (1)

Fabrication of lingual splintis another treatment option for pediatric fractures where MMF alone fails to achieve proper alignment orthere iscondyle fracture requiringjaw function and physiotherapy. However lingual splinting poses certain disadvantages like it is time consuming and is a multistep procedure which includes taking dental impressions, splint fabrication&wiring the splint to the teeth.Another treatment modality is placement of MMFand atransoralmonocorticalplate placed at the inferior border of mandible. This combination of internal fixation and arch bars placed with guiding elastics helps inmanaging unstableanterior mandible fracture along with condyle fracture. (7)

Sagittal fractures of mandibularbody can be treated eitherbyplacingcircum--mandibular wires with lingual splinting (semi closedfixation) or by monomaxillaryfixation such as with a lingual splint or open reduction of unstable fracture and placement ofmonocorticalplate at the lower border of mandible. (7)Shorter(4mm) and broader screws (2mm) should be used as they are more retentive in pediatric bone. (4)
Laser et al.described a minimally invas ive technique of placing nickel titanium staples across a fracture line. This technique allows easy placement and easy retrieval of metal components, while minimizing the amount of foreign body placed at fracture site. (8)

Bioresorbableplates madeup of high molecular weight poly lactic acid, poly glycolic acid and their copolymers minimizes the second stage surgery of plate removal especially in pediatric patients. The ratio of PLLA & PGA determines the properties of implant material. These products are broken down by hydrolysis and eventually metabolize into carbon dioxide and water. These materials hold their strength for 4 to 6 weeks and then completely degrade within 1-2 years. However, bio resorbableplates also have certain disadvantages like low strength, high cost&difficult manipulation in comparison to titanium plates.

Decision to use ORIF in pediatric fractures is controversial due to presence of developing tooth germs, interference with growth, allergic reactions to the metals, second surgery to remove implants, stress shielding causing weakness of bone after removal of implants. The use of titanium rigid fixation has resolved some of these issues. Some surgeons advocate removing plates routinely after 2-3months in pediatric patients while others state that removing plates inflicts further injury and may in itself adversely affect growth and development. (3,8)

Davidson et al.in 2001 stated that risk of facial growth disturbance in ORIF has not been supported. The potential damage to tooth roots and follicle can be minimized with a careful technique of placing bicorticalscrews in the lower border of mandible with monocorticalscrews placed in the more superior place. (2)

Stable 3D reconstruction not only promotes primary bone healing but also shortens treatment time and eliminate the need of maxilla-mandibular fixation. (Zimmerman et al. 2006). Fellar et al.(2002)stated thatstability of fracture fixation can be explained asfracture healing is a dynamic process in which masticatory forces are slowly intensifying and increasingly carried by healing bone. (6)
As a rule, plate fixation is possible in symphysealregion after the eruption of the permanent incisors (usually around 6 years); at parasymphysisafter eruption of canine (around 9 years). The same principle is true forother sites once the tooth germshave movedocclusallyfrom the inferior border of mandible. Angular fractures, together with the fracture of ramus and the condyle can be internally fixed with microplatesor miniplates. In young patients, a single plate along the inferior border fulfills the requirement of stable fixation. (8)Ellis et al.found lower complication rates in young patients with comminuted mandibular fracture, who underwent open reduction internal fixation (10.3%) than in those who were treated with closed reduction (17.1%)(3).

In our study we have minimized the amount of metal utilizedby using only one titanium miniplateat inferior border of mandiblefor fixation of sagittal body fracture and used dental traction band instead of using second plate of traction. Thus minimizing the useof metal without compromising the required stability needed for fracture healing.

CONCLUSION

Childisnot just a small adult. The anatomical complexity of the developing mandible and teeth and concerns regarding biocompatibility of implanted hardware often mandate the use of surgical techniques that differ markedly from those used in adults. Treatment plan of pediatric mandibular fracturevaries from conservative treatment to closed or open reduction."Little alloplastic material as possible but as much as necessary" is required to achieve 3D stable reduction with minimal facial impairment should be the treatment goal of ORIF used for treating unstable pediatric fractures.

FIGURES :

Figure 1. Profile photo showing swelling.

Figure 2. Submental & submandibular ecchymosis.

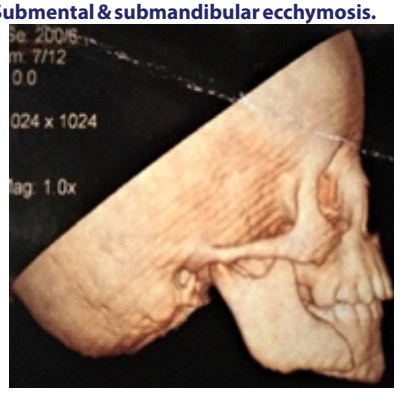

Figure 3. 3-D CT scan showing fracture at body region.

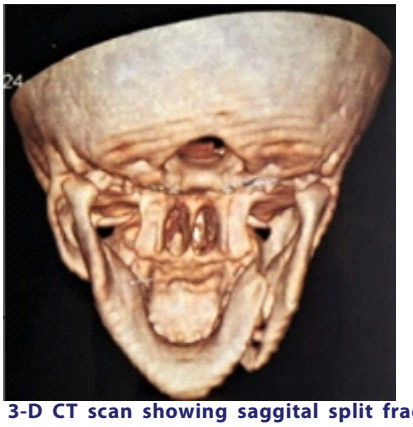

Figure 4. 3-D CT scan showing saggital split fracture of mandible.

Figure 5. Exposure of segments using submandibular incision.

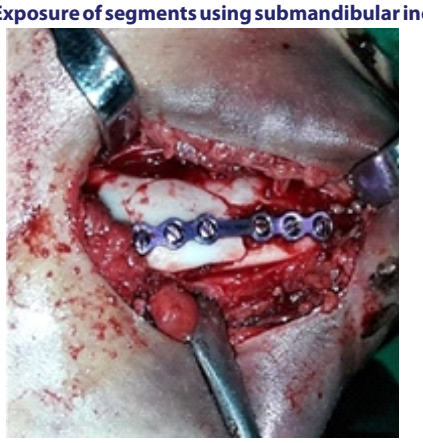

Figure 6. Fixation done using 1.5mm 6 hole plate using 6mm screws.

Figure 7. Implant removal after 3 months.

Figure 8. Stable occlusion after 6 months

Figure 9. Profile photo after 6 months.

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