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Fabrication of an Open Occlusal Lateral Compression Splint for Treatment of Pediatric Mandibular Fractures: A Case Report.

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Abstract:
Introduction: *Cranio-facial trauma is more common in children who are below 13 years of age because of their greater cranial mass to body ratio. Mandibular fractures are relatively less frequent in children as compared to adults. Pediatric patients present a unique challenge in terms of their treatment planning and in their functional needs. Treatment is usually performed without delay and can be limited to observation or closed reduction in non-displaced or minimally displaced fractures. Children require long-term follow-up to monitor potential growth abnormalities. Following is a case report on the fabrication of an open occlusal lateral compression splint with circummandibular wiring as a treatment modality of a 3-year-old girl with fractured body of mandible involving fewer risks.*
Conclusions: *Lateral compression open cap splints for treatment of pediatric mandibular symphysis/parasymphysis/body fractures are reliable treatment modalities with regard to occlusion-guided fracture reduction.*
Keywords: *Lateral Compression, Mandibular fracture , Pediatric, Open occlusal splint.*

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I. Introduction:

As it is rightly said that only children believe they are capable of everything , their impetuous nature and adventurous spirit combine to encourage their participation in erroneous physical activities with little thought to immediate consequences[1]. This frequently leads to facial injuries but still, facial injuries in children are much less common than in adults.

Of all maxillofacial fractures, the incidence of pediatric facial fractures ranges from 1 to 15 % showing incidence of mandibular fractures higher than that of midface fractures [2,3,4,5]. With the exception of nasal bone fractures, mandible fractures are the next most common type of facial fractures in children[6]. Mandible fractures account for 5 to 50 % of reported pediatric facial fractures. The condyle is the most common site of mandibular fractures in pediatric patients, followed by the symphysis. Symphysis and parasymphysis fractures occur more commonly in children compared with adults. This may be attributed to the presence of developing canine tooth buds at the inferior border of the mandible, creating a stress point prone to fracture. Various etiologies mentioned in literature are mainly road traffic accidents, falls, sports, and birth trauma[7].

Mandibular fractures are relatively less frequent in children as compared to adults, because of child's protected anatomic features. Treatment principles of mandibular fractures in children differ from that of adults due to concerns regarding mandibular growth and development of dentition in future[8]. Thats why, open reduction and direct fixation is contraindicated in children. Hence, lateral compression splints are used in cases of dentoalveolar fracture of children mainly where there is mixed dentition, there is presence of developing tooth buds and when the number of firm teeth for anchorage are not adequate providing adequate fixation. The reason for this is the large size of the mandibular bone which superoinferiorly houses erupted deciduous tooth and developing permanent tooth buds, thereby increasing the chances of it getting damaged by the screw[1]. The use of splints with circummandibular wiring is a versatile technique that can be used for wide-range pediatric mandible fractures.

Lateral compression splints are custom made appliance which can be constructed using acrylic material (self/ heat/ light cure resins). It is made for the stabilization of mandibular arch after undergoing closed reduction of the fractured fragment. In the following case, we have used a lateral compression open cap splint with circummandibular wiring for the management of pediatric mandibular fracture.

II. Case Report:

A 3 year old girl reported to Government Dental College and Hospital, Aurangabad with a chief complaint of pain & swelling on the left lower jaw due to trauma. Patient had a history of fall from a running bullock cart 2 days before she reported to the department. Patient was on medication for pain as prescribed by her local pediatrician. Clinical examination revealed bruise on her cheek, open mouth appearance and derangement of occlusion [Fig 1]. A step deformity with tenderness and mobility was elicited along the lower border of the mandible on the left side canine region (between lateral incisor and canine)[Fig:1]. Preoperative orthopantamogram (OPG) was taken. Diagnosis revealed it was simple unfavourable horizontal fracture on left side of the mandible. Closed reduction using lateral compression splint and cirummandibular wiring was advised and planned. So the patient was referred from department of pediatrics to the department of prosthodontics for fabrication of lateral compression splint. A written consent was taken from patient's parent before starting the treatment.

Steps for fabrication of lateral compression splint:

1. Maxillary and mandibular alginate impressions were made using prefabricated pediatric trays. [Fig: 2]
2. Stone casts were poured [Fig:3 & 4] immediately after impressions. Obtained mandibular cast clearly showed vertical displacement of fractured fragment in transverse plane indicating an unfavourable horizontal fracture [Fig:5].
3. The fracture line was marked on the cast. Mock surgery was done and the cast was split at the fracture line using a die cutting instrument [Fig:6 & 7].
4. Cast was rejoined using green stick (low fusing impression material) in the correct horizontal and vertical plane. [Fig:8]
5. Proper articulation was made of the upper and rejoined lower cast and occlusion was checked thoroughly. [Fig: 9].
6. The rejoined lower cast was considered as the final cast and was used further for fabrication of splint.
7. A 19 gauge orthodontic wire was used to adapt and encircle at the neck of lower teeth labially, distally and lingually [Fig:10]. The main function of this wire was to reinforce and strengthen the acrylic splint, also it will act as a connector to the lingual & buccal flanges of the splint.
8. Cold mold seal was painted on the cast which would act as a separating agent.
9. An open occlusal lateral compression splint was fabricated [Fig:11] using self cure clear acrylic resin by sprinkle-on method, incorporating the previously bent wire in it.
10. Splint was retrieved and excess was trimmed according to the labial and lingual vestibules [Fig:12]. The occlusal surface of the teeth should be left open, while constructing buccal & lingual flanges.
11. Polishing and buffing was done to obtain smooth surface, avoiding plaque accumulation and easy cleansing of the splint.
12. Under anesthesia, the mandibular body fracture was immobilized and fixed with the acrylic splint which was retained by circum mandibular wiring [Fig: 13].
13. Medications were prescribed and oral hygiene instructions were given to her parents.

Liquid & semisolid diet was advised initially and hard food was completely contraindicated. Maintenance of oral hygiene was advised by regular use of mouth rinses containing 0.2% chlorhexidine. Parents were trained & advised to irrigate the oral cavity with warm saline in a10cc disposable syringe following any food intake.

Patient was reviewed every week, and on the third postoperative week, the circum-mandibular wiring and splint was removed. No mobility was present at the fracture site. Postoperative recovery was uneventful and occlusion achieved was satisfactory. Patient was reviewed monthly for 6 months. On 2 months follow-up, the child showed proper occlusion and good masticatory efficiency.

Fig: 1 Inta oral examination showing fracture between lateral incisor & canine region on left lower jaw.

Fig: 2 Image showing alginate impressions of maxillary and mandibular arches.

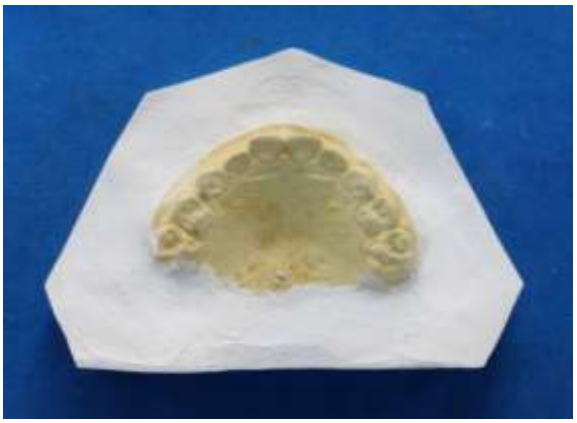

Fig: 3 Maxillary stone cast

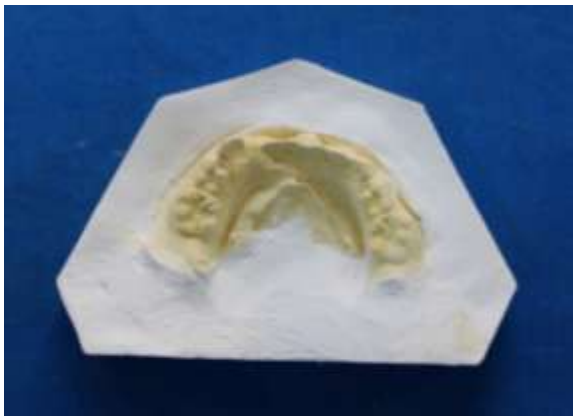

Fig: 4 Mandibular stone cast

Fig: 5 Vertical displacement of fracture fragment in transverse plane.

Fig: 6 Die cutting machine used to split the cast.

Fig: 7 Splitted mandibular cast at fracture line.

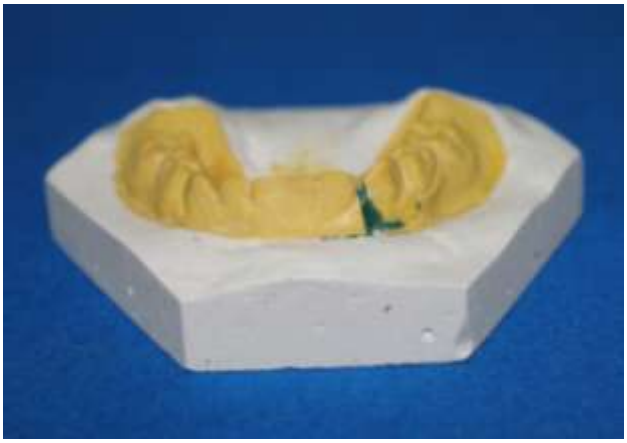

Fig:8 Rejoined cast in correct position.

Fig:9 Rejoined cast was properly occluded and checked.

Fig:10 Orthodontic wire adapted all around teeth.

Fig:11 Lateral compression splint.

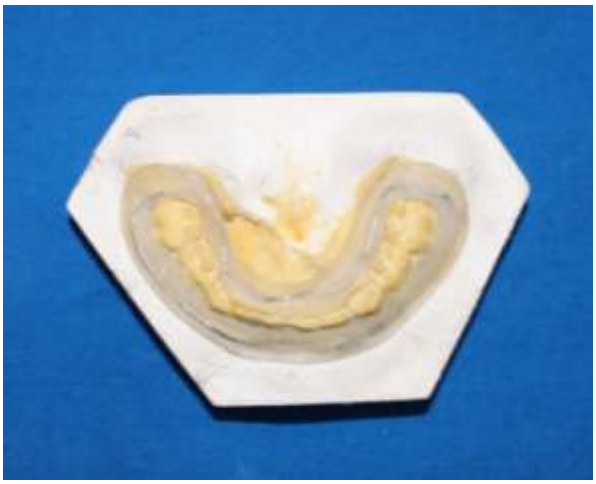

Fig:12 Open occlusal lateral compression splint was fabricated.

Fig:13 Closed reduction of fracture using lateral compression splint and circummandibular wiring.

III. Discussion:

Mandibular fractures are the second most common of the bony injuries in children[6,7,9]. The technical goals of mandible fracture management are the restoration of preinjury occlusion and underlying bony architecture. The most important aspects determining treatment planning of fractures in the pediatric mandible are the child's age, the stage of tooth development, and the nature of the fracture. In general, when ORIF is used on children, it is recommended that plates should not traverse suture lines or the midline of the mandible. Developing tooth buds present near the lower border of the mandible and partially erupted teeth may be traumatized while placing plates and screws or during exerting excessive pressure during wiring maneuvers.

Several studies have recommended the use lateral compression acrylic splints as a treatment for pediatric mandibular fractures for closed reduction. These splints are more reliable than open reduction or IMF techniques with regard to cost effectiveness, ease of application and removal, construction of the splint is easier and quicker, reduced operating time as they can be done without general anesthesia, maximum stability during

healing period, minimal trauma for adjacent anatomical structures and comfort for young patients. The other advantages of open caplateral compression splint is that it included tooth to tooth contact so as to facilitate occlusion-guided reduction, and minimal use of radiograph with ease of maintenance of oral hygiene. Also, we had incorporated wire with the splint as it reinforces the acrylic splint as well as acts as a connector to the both the flanges of the splint.

Only a few limitations are present with the splint, that is; it causes difficulty in feeding. This resulted in gross discomfort to the child due to inability to occlude the teeth, leading to pain in the temporomandibular joint region. Also 3 weeks of wearing splint in mouth causes oral hygiene to detoriate due to deposition of foreign particles between teeth and the splint. Chances of complications like malunion , malocclusion, osteomyelitis, abscess and ankylosis are very less in this method. Also sometimes prefabricated splints are also available which needs modification at the time of insertion[10]. But customized splints are always preferred over them.

IV. Conclusion:

For the treatment of pediatric mandibular symphysis/parasymphysis/body fractures, lateral compression splints are most reliable treatment modalities with regard to occlusion-guided fracture reduction. Also with this treatment modality we can manage the child's dentoalveolar fracture with minimum invasion & with minimum cost by using this splint.

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