Esthetic Splint - A Novel Concept for the Management of Bilateral Condylar fracture

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Mandibular condyle is one of the most common sites of injury in the facial skeleton. But many condylar injuries remain undiagnosed. In rare situations, these injuries may result in serious adverse sequel in the patient's growth and development that are more difficult to treat at a later stage. In growing individuals, conservative management results in better functional outcome and good remodelling of the condyle. The aim of this article is to present a case report of a bilateral sub-condylar injury in a young child with a novel concept - an esthetic splint.

Keywords: Mandibular Condyle, Dental Injury, Trauma, Fractures, Esthetic Splint
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INTRODUCTION

In maxillofacial region, the integrity and health of the mandibular condyle determines the occlusion, growth of mandible and development of jaw, to a great extent.[1, 2] The condyle forms the cornerstone in mandibular form and function. Maxillofacial fractures are less common in children than adults.[1,3,4,5,6] Condylar fractures account for 50 per cent or more of all mandibular fractures in children.[7,8] Even though condyle is one of the most common sites of injury in the facial skeleton,[3,4,5] it is the most overlooked and least diagnosed site of trauma in the head and neck region.[9,10]

Many factors complicate the management of pediatric mandibular fractures like tooth eruption, short roots, developing tooth buds, inherent unstable occlusion[10] and growth issues.[11,12]

It is complicated by its structure that is inherently dynamic and unstable. In growing children, likelihood of impaired function of the temporomandibular joint (TMJ) appears to be proportional to the increasing age. Other factors such as severity of the injury and degree of dislocation of the condyle are perhaps more consequential in adults.[7,8,13,14]

The management of mandibular condylar fractures in children has long been a topic of controversy. Some authors suggest open reduction or short term intermaxillary fixation.[16,17] Sahm and Witt[16] documented that following displacement and even dislocation with conservative treatment, remodeling was observed and the temporomandibular joint (TMJ) function was re-established. Functional treatment of condylar fractures with or without short term (1 ± 3 weeks) intermaxillary fixation resulting in good healing and condylar remodelling has been reported previously.[15,18,19] In children, if detected early and managed appropriately, even severe condylar injuries will rarely lead to long-term problems.[2] Still there is a small, yet finite potential that condylar fractures may lead to untoward sequel.[2] So these patients with condylar fractures require long-term follow-up.[11,12]

Injuries to key areas of the face like the eyes, ears and dental injuries often increase vulnerability to stress and impede recovery.[20] Significant difficulties in returning to premorbid levels of occupational functioning have been noted in these patients.[21] The professional team should be aware of published clinical literature on the psychosocial adaptation of patient's with acquired facial trauma, as it enhances patients' psychosocial rehabilitation.[22]

This manuscript presents the conservative management of bilateral subcondylar fracture with a novel concept of an esthetic splint in 7 year old girl.

Case report

A 7-year-old girl had a fall from bicycle and presented with painful facial swelling. According to her parents, she had been treated in an Accident and Emergency department for the chin laceration and referred to dental department. Patient reported difficulty while moving her lower jaw. Upon presentation to the emergency room, the patient had a Glasgow coma score of 15 and normal vital signs. All other potential clinical signs of ear, nose and throat (ENT) and

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neurologic injury were investigated and ruled out. The swelling was localized over the left and right condylar region. Clinical examination showed limited mouth-opening (<13mm) and mandibular deviation to the left. (Figure 1) Patient was unable to close in centric relation. Other than a minor laceration to her lip, chin, and subluxated 51, 61; patient had no additional injuries.

An orthopantomogram (OPG) view (Figure 2) confirmed the green stick fracture of the left and right condyle. Additionally naked view of OPG showed an uncomplicated crown root fracture of 84. Based on the clinical & radiological examination, treatment plan was decided.

Alginate impressions of both jaws were taken and stone working models were poured (Figure 3). Arch bars with 4-5 cleats made from hard stainless steel wire were incorporated with splints on both sides (right and left) to each splint. Custom made acrylic splints made from clear autopolymerising resin cold cure acrylic resin (DPI-RR Cold Cure, DPI, Mumbai, India) at the posterior region and jacket crown material with A1 shade was used for the anterior region (Dpi Cold Cure; DPI, Mumbai, India) (Figure-4). For both jaws, approximately 0.5-1mm thickness was maintained in order to avoid bite disturbance. The splints were trimmed with a tristar bur and several vent holes were drilled through the occlusal surfaces to allow for cement escape.

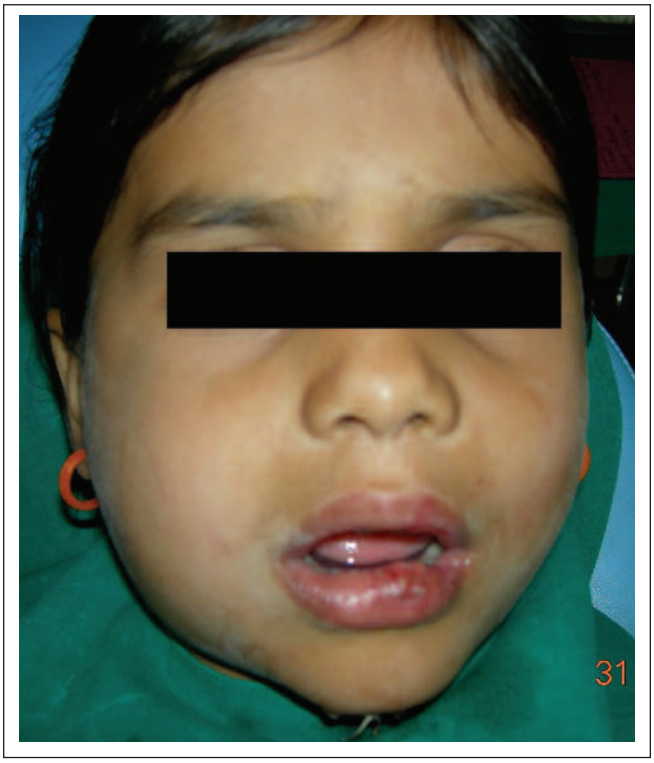

Figure 1. Preoperative photograph.

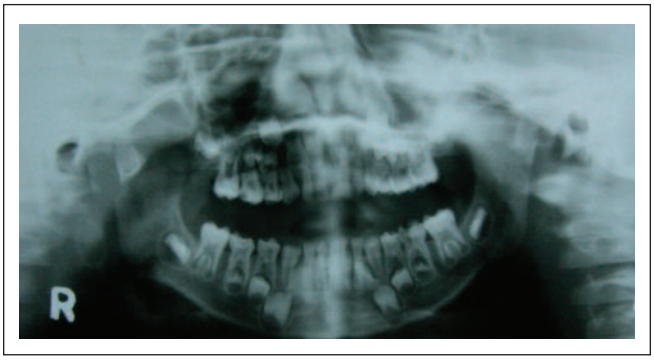

Figure 2. Preoperative radiograph

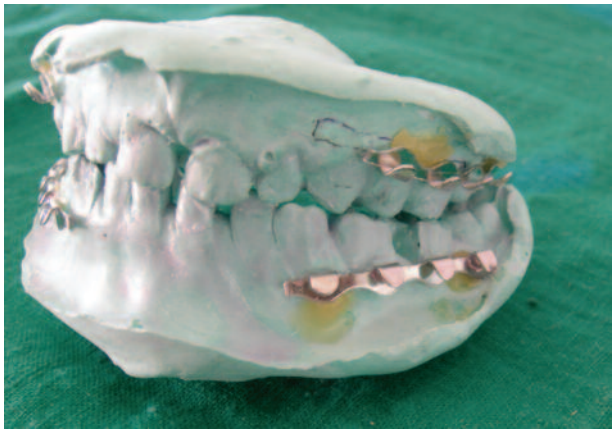

Figure 3. Arch bar stabilized before processing

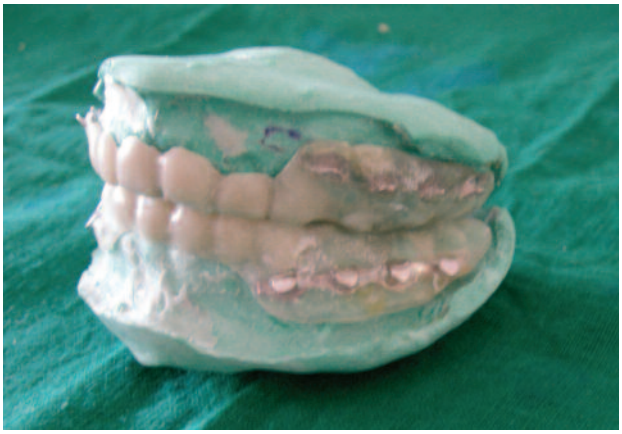

Figure 4. Esthetic splint

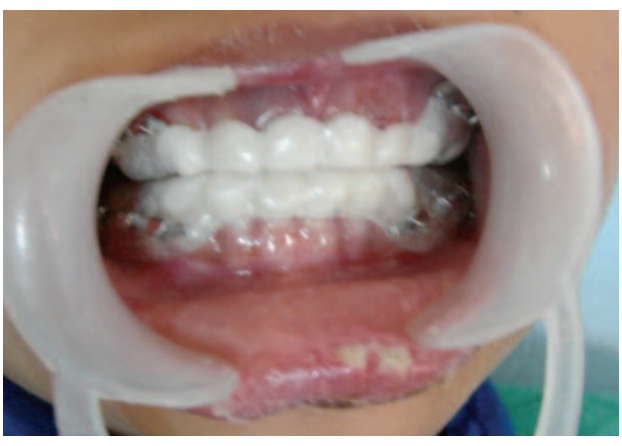

Figure 5. Esthetic splint after cementation

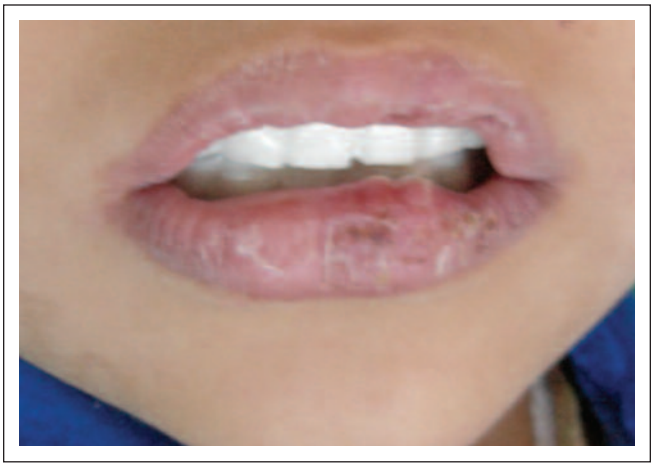

Figure 6. Post operative view with uncompromising smile

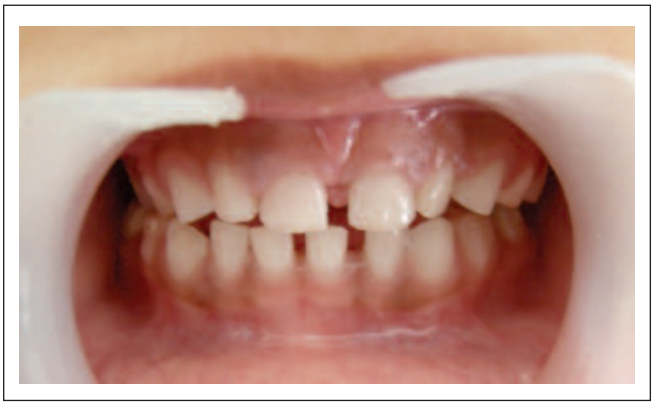

Figure 7. Post operative view after three weeks

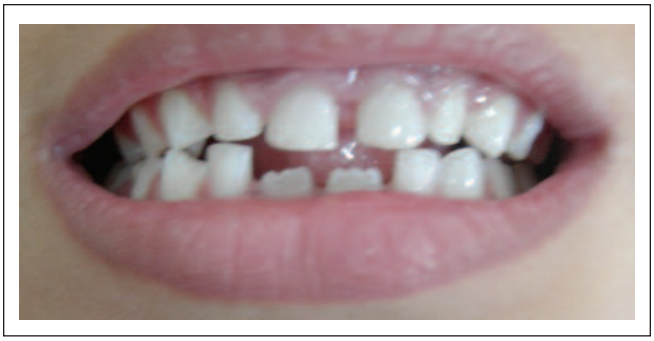

Figure 8. Post operative view after 5 months

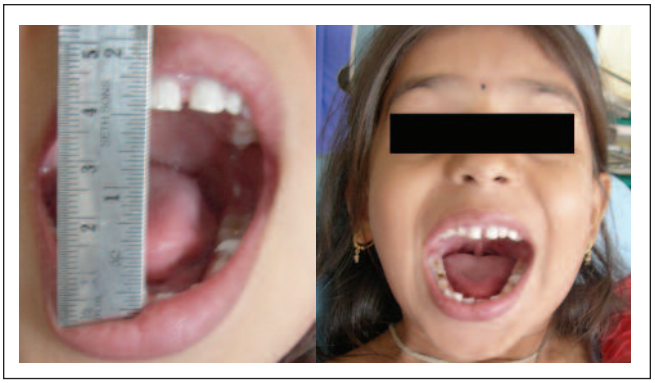

Figure 9. Mouth opening after 5 months

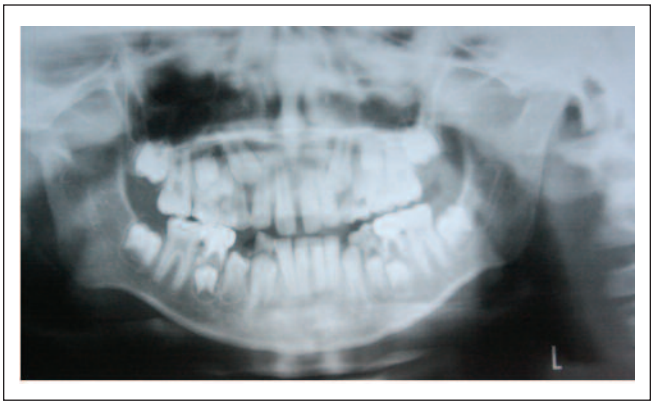

Figure 10. Post operative radiograph after 30 month

The splints were polished with pumice and cemented intraorally by using glass ionomer cement (GC Fuji I, GC Corporation, Japan) (Figures 5 and 6).

To guide the mandible back to centric occlusion, orthodontic elastics were positioned, with due consideration to their direction of pull. Under local anaesthesia, soft tissue lacerations were cleaned; the wound debrided and sutures were placed. The patient was reviewed on 3, 7 and 14 days later, and the elastic force was gradually reduced. Four weeks later, the splints were removed. Patient's occlusion was normal and her mouth opening was within normal limits. Soft tissue healing was uneventful. (Figure 7) The fractured 84 was extracted and removable functional space maintainer was given. Parents were informed about the possibility of the ankylosis and temporomandibular joint dysfunction and movement exercises were instructed to the child.

During the follow up, she was able to open her mouth fully (Figure 8, 9), with some deviation to the left and at her most recent follow-up appointment her maximal mouth opening was >34 mm. Two years later, radiographic images showed that the condylar fractures healed completely. (Figure 10).

DISCUSSION

In reports of large case series of maxillofacial trauma, children younger than 6 years constitute only 1% of the fractures.[23,24] The incidence increases to 5% at the age 6 year or older, as the relative size of cranium decreases.[11] When compared with adults, mandibular fractures occur occasionally in children due to various factors like parental supervision, resiliency of the bone, and well-padded facial soft tissues plus lower impact forces.[1] Still condylar fractures account for 50 percent or more of all mandibular fractures in children.[7,8] Condylar neck is the weakest region of the entire mandible.[2] As the condylar process positioned and protected as well as possible, the injuries are often a result of indirect forces, where the forces are transmitted along the mandible from distant sites such as the angle, body or symphysis to the condylar neck.[2,7]

Diagnosis of condylar injuries is mainly based on key

clinical features and appropriate radiological investigations. Clinical examination of painful conditions, particularly in young children can often be difficult due to the child's lack of insight and poor compliance.[25,26] Definitive diagnosis of condylar fractures is only possible with radiological investigations.[25, 26, 27] Frequently, orthopanoramic radiograph is the most accessible radiograh and available to dentists also it constitutes an excellent baseline investigation.[2] More advanced imaging techniques such as CT-scans and MRI are usually set aside for complex injuries of the condyle where surgical intervention is anticipated.[27]

Like adults, conservative management is the mainstay of treatment in the vast majority of condylar injuries in growing children.[2] In the absence of occlusal disruption, no active treatment other than analgesics, soft diet and rest is required.[2] When there is excessive pain and/or persistent malocclusion, a short period (7-10 days) of intermaxillary wire fixation may be beneficial.[2] In rare situations like gross occlusal disruption or severely restricted jaw function, consideration may also be given to surgery with plating with mini plates or resorbable plates.[24,28,30-32]

However, if the patient is unable to achieve passive centric occlusion, graceful active treatment is indicated. Commonly this involves a short period of intermaxillary fixation with orthodontic elastic bands used to guide and maintain the mandible in centric occlusion. By immobilizing the mandible, pain is significantly reduced. Moreover, in 3-12 year age group, jaw function is encouraged to promote growth by virtue of the high regenerative and remodelling potential which is also inherent in this age group.[7,8,2,13]

There are various methods of attachment of the elastic bands[14] archbars, buttons or hooks, fixed to the dentition under local or general anaesthesia, silver cap splints or simply orthodontic brackets bonded to the teeth have all been used. However, they all have substantial disadvantages.[33]

Chairside Fixation of archbars to the teeth with stainless steel ligatures is awkward and uncomfortable under local anaesthetia. Although preformed variety is commercially available, constructing customized archbars requires considerable laboratory time. Eventhough we can overcome this discomfort if procedure is performed under general anaesthesia, it has associated with other problems like, competition for the theatre time and the risks that accompany with general anaesthesia.[33]

Moreover, in primary dentition or mixed dentition, the arch bar fixation or wiring is difficult due to the morphology of the primary teeth i.e, the area of maximum convexity is at the gingival third of the crown resulting in slipping of wires. Moreover, the roots of the primary teeth could not tolerate the force while wire tightening.[34]

Cap splints are made up of steel or acrylic and usually needs a technician's assistance. They are also very thick and may interfere with occlusion. Silver cap splints are of historical interest only. Their cumbersome fabrication and difficulties associated with their removal have discouraged their use.[33]

Placing individual orthodontic brackets in isolation and then applying elastic traction from these potentially causes disruption of the occlusion, as the bonded teeth have high chance for irreversible extrusion.[35] Furthermore, to bond brackets in every tooth in a position to support a passive wire of sufficient rigidity to withstand elastic force is impossible without resorting to complicated wire bending.

The present method by using esthetic splint overcomes these disadvantages. Moreover, the patient was managed entirely in the out-patient ward and experienced minimal discomfort. The splints were inexpensive; easy to make. The direction and magnitude of the intermaxillary fixation could be varied simply and swiftly at every visit as required. Inevitably, the bite was opened uniformly due to the even thickness of the splints and cement. Still, it helps to maintain the occlusion in a reasonable relationship and also provides an increase in joint space. Moreover, it affords adequate immobilization for fracture. Since it is just an intraarch stabilization, it allows active mouth opening which is an important to avoid any ankylosis of the temperomandibular joint. Moreover, with addition of jacket crown material, this splint appears as natural dentition, thus adding a value in aesthtic quotient, more acceptable to young patients.

Retention of the splints was achieved primarily by mechanical means as it is contoured closely to the occlusal surface. In addition, further retention was ensured by the luting cement, glass ionomer, which has the ability to bond chemically to enamel.

Wood *et al*[36] (1996) found that the force required to deband first molar orthodontic bands from unetched third molars was greater for glass ionomer cement (a mean force of 1.23 megapascals (MPa) for debanding) than polycarboxylate and zinc phosphate cements. Direct comparison with orthodontic bond strengths is not applicable in this instance, as here bond strength is achieved between plastic, glass ionomer cement and unetched enamel. As this indirect trauma most commonly involve with multiple tooth fractures which are mostly unattended due to the less severity during the initial visit. The luting cement shold not irritate the pulp tissue in that situation. However, it also has the advantage of leaching fluoride which minimizes decalcification.[33] Removal of the splints and cement was straightforward.

In growing children, there are three potential long-term problems that may arise from acute injuries to the mandibular condyle: tempromandibular dysfunction (TMD), disturbed mandibular growth, and tempromandibular joint ankylosis.[2] Thus patient should be followed up by long term.

Treatment for the pediatric patient is considered unique, eventhough the etiological factors and clinical manifestations of these injuries are similar to those in adult patients, due to the psychological, physiological, developmental and anatomical characteristics of children. [37]

The face is often the seat of recognition for a human being. Living with a change in the appearance of one's face as a result of injury, disease, burns or trauma is always a challenging task.[38] Depression and anxiety associated with facial trauma is often coupled with worries regarding recovery and length of the treatment process.[39]

It has been reported that many disfigured individuals may express unhappiness regarding facial appearance after facial trauma[40,41] and narrowly limit their range of social interactions to immediate family members and to those social contacts required for occupational functioning.[42, 43] In its most extreme form, social withdrawal can result in what has been termed "social death."[44,45] More over, Traumatic dental injuries in children may negatively influence the social activities such as speaking and laughing.[46-52] The present method reduces or merely avoids the above psychological issues as it constructed estheticaly and limits the discomfort and morbidity that may be associated with maxillomandibular fixation or open reduction and internal fixation in pediatric patients.

CONCLUSION

Dental practitioners should be aware of the implications of condylar injuries in growing children. It is believed that non-surgical treatment avoids external scars and abnormal post-traumatic growth, and provides better results. Esthetic splinting as a method of immobilizing pediatric mandibular fractures is a novel and easy technique, less time consuming. The entire treatment can be done at the chair side thereby increasing patient compliance and reducing stress to the child.

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