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RESEARCH ARTICLE

MANAGEMENT OF MANDIBULAR PARASYMPHYSEAL FRACTURE USING ACRYLIC OPEN CAP SPLINT IN A THREE YEAR OLD CHILD

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ABSTRACT

Pediatric mandibular fractures are less common when compared to the fractures of adults. The problem associated with mandibular fractures may vary from temporary or permanent loss of one of the important function of oral cavity like speech, esthetics and mastication. The management of these problems are also complicated due to the presence of tooth bud and potential growth difference. Among different management protocols the closed reduction with acrylic splint was found to be one of the safest, compatible with minimal or no complications. Here we describe the experience of a comprehensive management of a 3 years old boy with mandibular fracture caused in a road traffic accident.

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INTRODUCTION

In childhood a generally impetuous nature and adventurous spirit combine to encourage participation in physical activities with a little thought to immediate consequences. The pattern of cranio-maxillofacial fractures seen in children and adolescents varies with evolving skeletal anatomy and socio environmental factors (Sunil Sharma, 2009). Pediatric fractures are estimated to be 5% of all maxillofacial traumas (Guven, 1992). Mandible fractures are rare in the children younger than 5 years of age. (Erik M. Wolfswinkel *et al*., 2013). Mandibular fractures are the most common (56%) facial skeletal injury necessitating hospitalization (Iida, 2002). Males are affected twice as frequently as females. In pediatric patients symphysis and parasymphysis fractures account for 15%–20% and body fracture are comparatively rare (Posnick *et al*., 1993; Imahara *et al*., 2008). The principles involved in treatment of facial injuries almost remains same irrespective of the age of patient, however the techniques in children are necessarily modified based on anatomical, physiological and psychological factors (Sunil Sharma, 2009; Posnick *et al*., 1993). Depending upon the type of fracture, stage of skeletal and dental development, thetreatment modalities range from conservative non-invasive methods through closed reduction and immobilization methods to invasive open reduction with internal fixation. In these patients the bone is elastic and mandibular cortex is thin and less dense than the adults, and the presence of tooth buds are the supporting factors for the circummandibular wiring (Eppley, 2005). Disruption of the periosteal envelop of the mandible may have an unpredictable effect on growth of the facial skeleton. Thus, if reduction is required, closed reduction is favored (Amith Agnihotri *et al*., 2015). Splinting of the

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fractured pediatric mandible with acrylic cap splint using circummandibular wiring is a simple and time honored technique. In this article we are discussing our experience for placement of acrylic cap splint using circummandibular wiring for treatment of pediatric mandibular fractures.

Case report: A 3 year old boy escorted by his parents to our pediatric dental clinic with an injury to oral and perioral region due to road traffic accident. Primary first aid was provided prior to other examination due to uncooperative child behavior. There was no history of loss of consciousness or no history of bleeding from nose ears or injury to head. Patient complained of continuous pain in the lower jaw and was unable to close his mouth. On extraoral examination swelling on the right parasymphyseal region and deviation of face towards right side with limited mouth opening causing difficulty in mastication and speech was observed. The patient experienced spontaneous increased pain, when touched in the right chin mesenteric and right articular region. No disc crepitation was observed while temporomandibular joint was examination. Intraoral examination revealed sublingual hematoma, step deformity and spacing in relation to lower deciduous right canine (83) and first molar (84).

With high difficulty Postero-anterior view radiograph was taken which revealed a radiolucent line extending between mandibular right primary canine and first primary molar upto inferior border of mandible with approximately (2mm) displacement of the fractured segments(Figure 1). The treatment plan was prepared and informed consent was obtained from parents. Maxillary and mandibular impressions were obtained using alginate impression material (Tropicalzan) under midazolam and ketamine intravenous conscious sedation. Casts were fabricated using dental stone (Kalabhai). The fractured site was marked on the mandibular cast and split into two segments using an electric saw (i.e. mock surgery was performed). After mock surgery, the casts were held in their reduced positions and proper occlusion with the opposing maxillary cast was maintained with the help of sticky wax.

Figure 1. Posterior anterior x-ray of the child

Figure 2. Acrylic open cap splint

Later the casts were stabilized and mounted onto an articulator. 19- gauge orthodontic wire was used for the adaptation of U shaped wire on buccal and lingual surface to reinforce the splint. The occlusal surfaces of all the mandibular teeth and all the undercuts were blocked using modelling wax. Closed cap splint was fabricated with self-cure acrylic and was polished (Figure 2). Under strict aseptic conditions, patient was intubated with nasotracheal tube no. 6 and general anesthesia was achieved. Site was prepared and draping was done. The dislocated segments were reduced by bidigital pressure and were stabilized using bridle wire between the fractured segments. Cap splint was then positioned with the lower arch. 18 gauze spinal needle was passed extraorally from below the lower border of the mandible in 83 and 84 region on to the lingual side of the oral cavity. From cannula of spinal needle, 26 gauze stainless steel wire was passed and cannula was then removed leaving 26 gauze wire outside and another lingually. The spinal needle was reinserted intraorally through the buccal vestibule and taken out to same point extraorally. Later the wire end at extra oral region was reinserted into the spinal needle and taken out on to the buccal side. (Figure3).

Figure 3. Stabilization of fractured segment using open cap acrylic splint

Figure 4. Acrylic splint stabilized with Circummandibular wiring

The free ends of the 26 gauze wires were held together and ironed in close approximation to the bone, to prevent soft tissue injury and scar. The acrylic cap splint was then stabilized on the left side following the same procedure as followed on the right side. The right and left twisted ends of the wires were pulled and tightened again in a clockwise direction to achieve additional horizontal stabilization of fractured segments (Figure 4). Post-operative instructions antibiotics and analgesics for a week was advised. The splint was removed at the end of seven weeks and clinically it presented with proper occlusion, no spacing and no mobility of the fractured fragment (Figure 5). Post treatment orthopantomograph revealed continuity of the lower border with no postoperative complication during the follow up period (Figure 6).

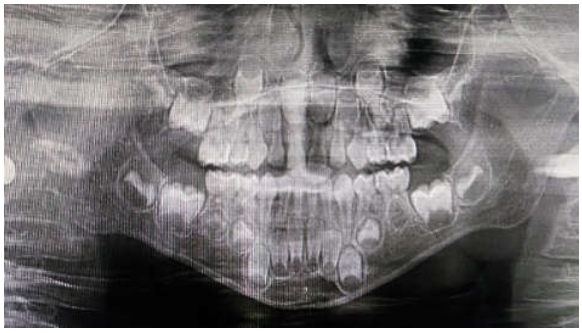

Figure 5. Postoperative orthopantamograph after 6 months

Figure 6. Clinical orthopantamograph after 6 months

DISCUSSION AND CONCLUSION

The incidence of pediatric facial fractures ranges between 1 and 14% for victims under the age of 16 years and 0.87 to 1% for those younger than 5 years. The incidence of pediatric facial fractures among Indians is 5.5% (Kaban, 1990). The cause is most often a motor vehicle accident (5-80.2%), violence (3.7-61.1%), falls (7.8-48%), bicycle accidents (7.4-48%), play (10-42%), and others (Posnick, 1993). For the definitive treatment of the dentoalveolar injury various factors are considered such as age and cooperation of the patient, duration between trauma and treatment, location or extent of the injury, injury to primary or permanent dentition, stages of root development, presence of fracture of supporting bone and periodontal health of remaining teeth (Posnick *et al*., 1993).Various methods have been suggested for closed reduction using prefabricated capsplints, modified orthodontic brackets, orthodontic resin and rubber elastics, modified orthodontic splint appliance (Rowe,1969). The patient in present case was treated with closed reduction using custommade open cap‐splint and circummandibular wiring. The advantage of closed reduction over open reduction is its costeffectiveness, lesser surgical trauma to the patient and reduced risk of any iatrogenic trauma to the developing teeth and other anatomical structures. Furthermore, the rate of associated complications is less in cases of closed reduction compared to open reduction (Thomas, 2010). Theocclusal acrylic splint was opted because of its ease in fabrication, preservation of periodontal tissue integrity, patient compliance and ease in assessing the occlusion after reduction (Amith Agnohitri *et al*. 2015). Routinely, they are used in stabilizing mandibular fractures, as they can be stabilized by the use of circummandibular wiring. It has been suggested that, circummandibular wiring was performed with a mandibular awlas suggested by William Velsey Fry awl (Rowe, 1969), but the wound created when using an awlis more when compared to spinal needle where the wound is inconspicuous (Posnick *et al*., 1993). When the awl travels through the tissue, with the wire crimped, the twisted end of the wire causes trauma to the surrounding soft tissue because of its sharpness and thickness. Repeated use of an awl causes it to lose its sharpness. When using an awl, the crimped wire, which is potentially contaminated by oral fluids, is made to pass around the mandible. Using spinal needle the section of wire exposed to the oral cavity never touches the tissue, but the tip of the needle is exposed to the oral cavity and enters the tissue. Fracture healing was uneventful and complications such as postoperative swelling and haematoma were not observed (Posnick *et al*., 1993; Thomas, 2010). Injuries in the mandibular region may be associated with defective formation, mineralization, discoloration or even failure of eruption of permanent teeth (Aizenbud *et al*., 2009). Care was taken to avoid pulling the wire through the mandible since the child was young and at this stage the mandibular cortex is thin and relatively less dense (Iida, 2002). McGuirt's *et al*. (1987) in their follow-up study of patients with mandibular fractures revealed abnormalities of occlusion and dentition in 35% of patients, including avulsed teeth, nonvital pulps, and hypoplastic teeth and two thirds of patients showing radiographic abnormalities, and about a fifth having multiple radiographic abnormalities (Facial trauma, 1990). He recommended 6-8 weeks of guiding elastics after immobilization (to help pull the jaw forward). In the present case though unpredictable, the patient has higher chances of development of any of the complications, and hence a routine follow‐up which will continue until mandibular growth is complete and all the permanent teeth have erupted is recommended. Pterygoid muscle exercises, and long-term follow-up was advised to the patient. The patient was reviewed monthly for 6 months, the spacing has been closed and good alignment of teeth was present. Patient had good occlusion and good masticatory function.

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