Management of Pediatric Mandibular Fracture using Acrylic cap splint & Circum-mandibular Wiring-A Report of 12 Cases

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Abstract:

Trauma to the pediatric patients can have a deep psychological impact on the minds of young children. Management of mandibular fracture in pediatric patient poses a unique challenge to the maxillofacial surgeon in terms of treatment planning, functional and nutritional needs. The principle of treatment of mandibular fracture differs from that of adults due to concerns of mandibular growth and development of permanent dentition. In this clinical study we are showing the outcomes of treatment in terms of fracture healing and functional stability in 12 pediatric mandibular fracture patients using acrylic splints and circum-mandibular wiring.

Key words: Pediatric mandibular fracture, Circum-mandibular wiring, Acrylic cap splint, Mandibular awl.

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Introduction:

Facial injuries are less common in pediatric patients, particularly below the age of 5 years, the incidence of facial fractures are ranging from 0.6% - 1.2%. [1] Amongst the facial fractures, nasal fracture are the most common, whereas the mandibular fractures are the second most common fractures reported in hospitalized pediatric patients.[2] In pediatric patients depending upon the type of fracture and the stage of skeletal and dentition development the treatment modalities range from conservative non-invasive through closed reduction and immobilization methods to open reduction with internal fixation. In pediatric 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 circum-mandibular wiring. [3] Disruption of the periosteal envelop of the mandible may have an unpredictable effect on growth. If reduction is required, closed reduction is favored.

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

Patients and methods:

A total of 12 pediatric patients reported to the department of Oral and Maxillofacial Surgery were included in our study. Patient

with mixed dentition and having symphysis, parasymphysis and body of mandible fractures were included in the study (Fig 1). Angle, condylar and other mandibular fractures associated with panfacial fractures were excluded. Diagnosis was made by clinical and radiographic findings.

Under local anaesthesia, upper and lower arch alginate impressions were made and stone casts were poured and occlusal acrylic splint was fabricated (Fig 2). Under general anaesthesia an mandibular awl was used to pass the 26 gauze wire percutaneously from the submandibular region (Fig 3) and exited in the lingual side close to the alveolus and clamped intraorally, then the tip of the awl was railroaded till the lower border of the mandible was felt, and then the awl passed on the buccal side in close proximity to the alveolus. The awl and the excess wire within were removed after cutting the desired length of wire intra-orally and then the wires twisted to tighten the splint in position (Fig 4a & 4b). Care was taken to avoid injury to the mental nerve and the facial artery.

The patients were followed up clinically after 24 hours, 3rd postoperative day, 7th day and then weekly intervals for 6 weeks and then monthly intervals for 12 months (Fig 5a & 5b). On the third postoperative week, the circum-mandibular wiring and acrylic splint was removed under local anaesthesia. They were followed up radiographically with orthopantomographs in the immediate postoperative period, after 1 month, and at 12 months.

Postoperatively, patients were evaluated for stability, occlusal derangements, malunion, nonunion and infection & the observation were recorded on a standardized proforma.

Results:

Out of 12 patients included in our study were male. Age of the patients ranged from 8 to 11 years with a mean of 9.1. Of the 12 patients, 8 sustained parasymphysis, 3 body of mandible and 1 symphysis fracture of mandible (Fig 6). Fracture healing was satisfactory in all the 12 patients with clinical and radiographical evidence of union of fracture segments at the end of 12 months. There was uneventful soft and hard tissue healing in all the cases with no complications. There was no evidence of any malocclusion or any growth restriction during 12 months follow up period. All the patients had perfect occlusion and masticatory efficiency. Average size of extraoral entry wound was 3mm.

Discussion:

Facial fractures in children account for the approximately 5% of all facial fractures. [4] Male predilection is seen in all age groups. The etiologies of mandibular fractures in children are usually falls and sports injuries. Pediatric patients present with a unique challenge to the maxillofacial surgeon because of type and frequency of fractures sustained by the children are often different from adults. Management of fractures in children differs from adults because of anatomic variation, rapidity of healing, degree of patient co-operation and the potential for changes in mandibular growth. [5, 6] The closed reduction and stabilization can be achieved by means of acrylic splints, circum-mandibular wiring, arch bar or gunning splints. [7] These techniques provide good reduced position, continuity of periosteal sleeve and maintenance of the soft tissue, thus creating a positive environment for rapid osteogenesis and remodeling processes as well as prevention of any type of non – fibrous union. [8]

Currently, open reduction and fixation [ORIF] with resorbable osteosynthesis plates and screws is increasingly being used in children, but these systems are not devoid of complications in terms of poor mechanical property and lack of ease in handling of these resorbable implants. [3, 9]

Complications per se are very rare in pediatric trauma due to the child's greater osteogenic potential, faster healing rate and less frequent requirement of ORIF [4] Nonunion of the mandible may develop due to a number of factors, including poor patient compliance with post operative care, metabolic disturbances and generalized disease states, which can all lead to inadequate bone healing. Yuvaraj V. et al [10] encountered tear in floor of mouth resulting in hematoma in floor of mouth in 3 out of 22 (13.6%) pediatric patients, but in our study none of the patient developed post operative hematoma.

Yuvaraj et al [10] noticed post operative swelling at an average of 5.85mm in 22 pediatric patients, whereas in this study the average of post operative swelling was 5.83mm. We did not find any occlusal complications associated with use of closed treatment. This observation is in accordance with studies done by Ellis et al. [2]

Cap splints are the good remedy that comes in handy to manage pediatric fractures. Circummandibular wires are introduced using Kesley – Fry awl. In the splinted mandible, the fracture segments are tightly fixed and serve in reducing tenderness and pain reactions during a child's daily activity. [8]

In our study, we opted for the occlusal acrylic splint because of its ease in fabrication, preservation of periodontal tissue integrity, patient compliance and ease in assessing the occlusion after reduction.

As we know that this technique is a time tested and oldest treatment modality for the management of paediatric mandibular fractures, but some studies showed that the success rate was not 100% with this modality. With this study, we would like to discuss the surgical method to achieve 100% success rate and to minimize the complications associated with this technique.

Other surgical modalities, like bone plating with stainless steel or titanium plates, can interfere with the eruption of the permanent dentition or it can adversely affect the tooth bud of permanent dentition. Another option is resorbable plating system but it is a technique sensitive and cost effective method. In addition, both these modalities required a large vestibular incision which can produce a sublingual hematoma, post-operative swelling or injury to the mental or facial neurovascular bundle. The incision line also required atleast a time of 10 days to heal and also it will cause fibrosis at the vestibular region. Hence, the treatment modality used in this article is the only alternative in pediatric patients in which mixed dentition is found. To conclude, study clearly states the use of occlusal acrylic splints with circum-mandibular wiring in pediatric fractures of mandible and is a novel and easy technique with minimal or no complications.

Fig. 1–Right parasymphysis fracture (preoperative)

Fig. 2 – Acrylic splint

Fig. 3–Awl with wire taken to the buccal vestibule

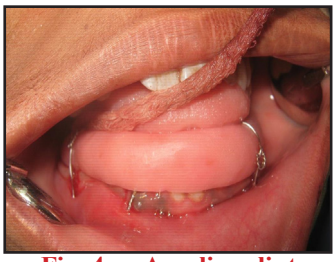

Fig. 4a – Acrylic splint secured with circumman-dibular wiring

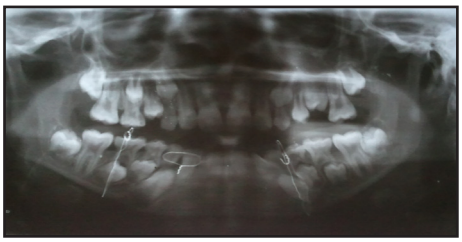

Fig. 4b – Immediate postoperative orthopantomogram

Fig. 5a – 6th month post operative photograph

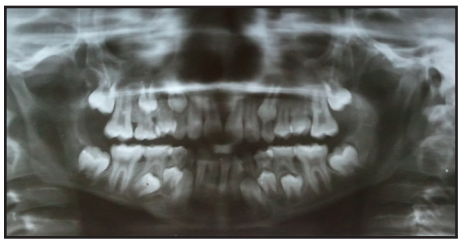

Fig. 5b – Postoperative orthopantomogram after 1 year

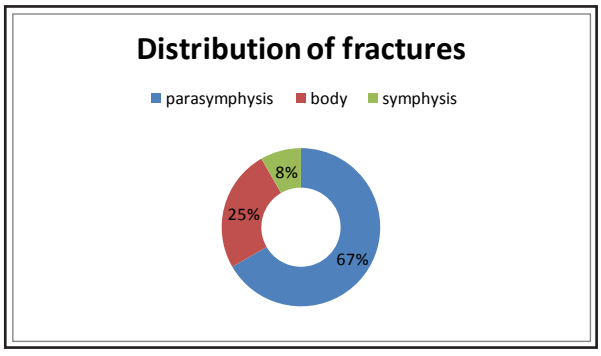

Fig. 6 – Distribution of fracture (Doughnut chart)

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Table – 1 - Details of the patients

S. No.	Age	Diagnosis	Size of extra-oral wound for entry (in mm)	Post operative swelling (in mm)
1	8	RPS	3 mm	5
2	8	LPS	3 mm	5
3	9	RPS	3 mm	6
4	8	LB	3 mm	7
5	10	LPS	3 mm	5
6	8	RPS	3 mm	6
7	11	S	3 mm	5
8	9	RPS	3 mm	8
9	8	LB	3 mm	5
10	8	RB	3 mm	6
11	11	LPS	3 mm	5
12	11	RPS	3 mm	7
Avg.	**9.1**			**5.83**

RPS – Right Parasymphysis, LPS – Left Parasymphysis, RB – Right Body, LB – Left Body, S - Symphysis