



CAP MacLennan splint: A shield to arm the developing dentition in juvenile mandibular fractures- A case report

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Citation this Article: Dr. Abhinandan Patra, Dr. Sonal Gupta, Dr. Madhukar Yadav, “CAP MacLennan splint: A shield to arm the developing dentition in juvenile mandibular fractures- A case report”, IJMSIR- February - 2022, Vol – 7, Issue - 1, P. No. 59 – 65.

Type of Publication: Case Report

Conflicts of Interest: Nil

Abstract

Mandibular fractures in children are most common in the first decade of life, with a male predominance. The condyles are fractured first, then the symphysis/parasymphysis, and finally the mandible's body. Depending on the severity of the injury, a mandibular symphysis/parasymphysis fracture might be mildly displaced or substantially displaced. The presence of development centres in the mandible, as well as the smaller size of the jaws and numerous tooth buds present in them, can make treatment more difficult in paediatric patients. For most undisplaced paediatric mandibular fractures, a conservative management plan of closed reduction with functional treatments is the therapy of choice. The present case report describes successful conservative management of paediatric mandibular symphyseal fracture treated with open cap splint.

Keywords: MacLennan Splint, Symphysis fracture, trauma, antibiotics

Introduction

Dental trauma in children is a serious and life-threatening dental public health concern. [9] The paediatric mandible is dynamic, changing on a regular basis as a result of growth and development. The child mandible's traumatic injury necessitates an understanding of the fundamental differences between the paediatric and adult mandibles. [10] Trauma in primary teeth can result in pain and affect the development of the permanent dentition. The most common effect on the permanent successors are defects in mineralization or tooth morphology, changes in coloration and enamel defects. [9] The most typical causes of fracture in children were fall (64%), traffic incidents (22%), and sports related accidents (9%). [3] The paediatric group accounts for fewer than 15% of all facial fractures. In paediatric trauma patients, mandibular fractures are the most prevalent face skeletal injury (56 percent), with dento alveolar fractures being the most common (60 percent). [2] The angle, condyle and the sub condylar region contribute approximately 80% of

mandibular fractures in paediatric patients. Around 15-20% of cases have symphysis and parasymphysis fractures. [8] The ratio of girls to boys was 3:5, and the average age was 7+/- 4.4 years. [6].

Because of the resiliency of the mandible and the embedded tooth buds that hold the fracture in youngsters together like "glue," the majority of mandibular fractures are undisplaced. [2,8] Also, the condylar neck which is short and thick tends to resist the fracture therefore the majority of mandible fractures in children are of undisplaced type. [1] The primary dentition has a lower contour height than the permanent dentition, implying that the mandible's vertical height is shorter. [3] The treatment of juvenile fractures differs from the treatment of adult mandible fractures. In paediatric instances, open reduction with rigid fixation is rarely employed. Depending on the severity of the injury, a mandible fracture can result in the loss of both hard and soft tissues. In young children, closed reduction procedures with maxillomandibular fixation can cause a number of issues, including collaboration, compliance, and proper nutritional intake. [3] Due to this reason open cap splint (MacLennan splint) has been implicated according to several literatures, because of its easy to fabricate, simple and more reliable an approach. It also offers other benefits, such as simplicity of application and removal, reduced time consumption, cost-effectiveness, good stability during the healing phase, and low harm to the environment. [3] As a result, unless the fracture segments are substantially displaced, closed reduction is the preferred treatment. [2] The goal of treating these fractures is to return the underlying bone architecture to its pre-injury state as quickly as feasible, in a stable manner, with minimal cosmetic and functional

consequences. The different techniques that are available for managing paediatric mandible fractures: [10]

1. Acrylic splints (MacLennan splint)
2. Circumferential wiring
3. Open reduction
4. Tape muzzles
5. Percutaneous skeletal fixation
6. Resorbable plate
7. Orthodontic resin
8. Modified orthodontic brackets
9. Rubber elastics in combination with orthodontic brackets
10. Ni-Ti Staples.

Case report

A 7-year-old girl, reported to the Department of Paediatric and Preventive Dentistry at Kanti Devi Dental College and Hospital, Mathura with history of trauma in the mandibular anterior region while she was playing, 1 day back. There was no history of loss of consciousness or no history of bleeding from nose(epistaxis), ears or injury to head, convulsions or vomiting. The patient presented to the department with spontaneous pain in the chin area, as well as trouble speaking and chewing. Extra-oral examination revealed swelling and erythema on the lower right side of the chin. (Fig. 1) There was no decrepitation when the temporomandibular joint was examined. Intra oral examination revealed that there was restricted mouth opening with lacerations in the lower symphysis region in between two central and right lateral incisors along with bleeding and slight mobility of the fractured fragments. Derangement of occlusion was evident. (Fig. 2 and 3). The patient was sent for orthopantomogram and mandibular occlusal radiograph which revealed a radiolucent line seen running from the alveolar crest region of central incisors and passing

downward to inferior border of the mandible with minimal displacement of fracture segments. (Fig. 4 and 5). On the basis of mandibular occlusal radiograph and orthopantomogram and clinical examination, we came to the final diagnosis of symphysis fracture of mandible. Informed consent was obtained from parents prior to the beginning of the treatment. Using a cap splint, a treatment strategy was devised to minimise and immobilise the fracture parts (closed or open as per case requirement).

Fabrication of open cap splint and treatment procedure

Alginate impression material was used to make an impression of the maxilla and mandible (Fig. 6) Dental stone was used to make the casts. Fracture site was marked on the mandibular cast and split into two segments using disc wheel bur (i.e., mock surgery was performed). (Fig. 7) The casts were held in reduced positions after the mock surgery, and appropriate occlusion with the opposite maxillary cast was confirmed with the help of sticky wax. 19G stainless steel (SS) orthodontic wire was used for the adaptation of U-shaped wire on buccal and lingual surface to reinforce the splint. (Fig. 8) Occlusal surfaces of all the mandibular teeth and all the undercuts were blocked using modelling wax. Self-curing acrylic was used to make an open cap splint. (Fig. 9) After that, the cap splint was polished and tried in the patient's mouth. After testing the patient's occlusion intraorally with articulating paper, the required adjustment was made. The patient was rinsed with 0.05% sodiummonofluorophosphate+0.03% Triclosan+5%Xylitol (^{Rx} KIDODENT MOUTHWASH) to reduce the bacterial count in the oral cavity. Then the open cap splint was cemented on the teeth using Type I Glass ionomer cement. (Fig. 10)

Antibiotics and analgesics were prescribed for a week for the patient. The following antibiotic and analgesic were given- Amoxicillin (200mg) + Clavulanic Acid (28.5mg) ^{Rx} Augmentin DUO oral suspension 228mg/5ml may be taken twice in 24 hrs and ibuprofen(100mg) + paracetamol (162.5mg) for children aged 7 to 12, ^{Rx} Ibugesic Plus Oral Suspension 100mg/10ml should be taken three times in 24 hours. Patient was instructed to take soft diet till removal of splint and patient is asked to do proper cleaning of oral cavity and use of mouthwash. Oral hygiene instructions were given which included the supervised soft brushing; oral rinsing after every meal; and oral irrigation with saline using syringe and blunt needle twice daily by parents (Parents were instructed how to employ the oral irrigation procedure). On a regular basis, the patient was followed up.

After four weeks, the splint was removed. The occlusion was found to be stable, no spacing seen between 31 and 41 with no mobility of the fractured fragment was observed. (Fig 11 and 12) Occlusion was satisfactory and mouth opening got increased. The orthopantomogram showed that the lower border of mandible was continuous.

Discussion

Because of the specific characteristics and anatomy of the developing immature face, as well as the potential growth consequences of injured facial tissues, paediatric maxillofacial fractures are uncommon, and their therapy necessitates various considerations. [5,6] Falls from great heights, traffic accidents, sports injuries, and other factors are among the most common causes of facial injuries. Because of anatomic variance and variations in mandibular growth, paediatric patients present a unique challenge to dental surgeons. The treatment of paediatric mandibular fractures is also reliant on the patient's

participation. Children's healing times are also shorter due to the well-vascularized tissue. (Kaban, 1990; Mohan et al., 2012). As a result, the therapy required in paediatric patients is determined by the patient's age, compliance, and tooth growth stage. Haug and Foss classify Condyle, alveolus, body, symphysis, parasymphysis, angle, ramus, and coronoid are the different parts of the mandibular fracture. (Haug and Foss, 2000). Because of the presence of permanent tooth buds, interdental wiring is difficult to establish in young patients. The treatment modality of fractures in the pediatric mandible depends on the patients age and stage of tooth development. [6,9]

Soft diet, analgesics, and antibacterial prophylaxis can be used to treat minimally displaced fractures. However, in very young children healing might be prolonged because of insufficient cooperation in following post operative instructions. Fabrication of a splint and cementing it to the arch can be employed to overcome these obstacles in these circumstances. [5]

Circumferential wiring with acrylic splints is a final therapeutic option for Para symphyseal fractures that are minimally to moderately displaced. Intermaxillary, lingual, labiolingual, and a cap type that covers the tooth arch are all examples of acrylic cap splints. [5]

Intermaxillary fixation, cap splints, micro plates, or resorbable plates can be employed in severely displaced fractures. Miniplates should be used with caution to avoid injury to permanent tooth buds and the need for a second surgery to remove them in developing patients. [4]

The following are some suggestions for treating children's mandibular fractures:

0 - 2 years: Splints of the MacLennan type are used to treat edentulous issues.

2 to 4 years: If Eyelet wiring can be employed if the deciduous teeth are well-formed. Splint for the cap.

5 to 8 years: MacLennan cap splint

9 to 11 years; Lower border splints, arch bars, plating, or Tran osseous wiring.

Cap splints are recommended for a variety of reasons, including the fact that they cover both the lingual and buccal cortical plates and securely hold the cortex of mandible.

Other advantages include:

- Occlusion is open
- Function is not impaired
- Smaller adjustments or grinding can be done during the insertion process.
- Functional stresses increase remodeling [11]

Prevention

It is critical to underline the importance of taking preventative steps. Coaches, administrators, educators, and parents who are in charge of children should all be educated. Because the prevalence and severity of sports-related injuries are inversely related to skill level and age, children should be encouraged to adopt good habits from a young age. Seat restraints, traditional seat belts, safety helmets, mouth guards, and other items can help avoid injuries in youngsters. [11]

Conclusion

Pediatric mandibular fractures can be treated in a variety of ways that are both conservative and result in acceptable results in a shorter amount of time. The magnitude of the trauma, physical and medical history, stage of mandibular development, and financial situation of the patient all play a role in determining the treatment technique. The most common type of mandibular fracture in children is in the condylar region, followed by parasymphysis, symphysis, and angle. The fracture is

usually only slightly displaced, and it can be treated conservatively in the vast majority of patients. Cap splints for paediatric mandibular symphysis/parasymphysis with regard to occlusion guided fracture reduction, maximum stability during the healing period, ease of application and removal, reduced operation time, minimal trauma to adjacent anatomic structures, wide age group safe usage, ease of oral hygiene maintenance, and comfort for young patients.

Informed consent statement:

The patient parents signed informed consents, and kept in the records of departmental hospital.

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Legend Figures



Fig. 1: Patient Front view showing presence of lacerations at lower right chin region.



Fig. 2: Intra oral view showing lacerations at anterior rt. labial vestibular region in between 41 and 83.



Fig. 3: Intra oral view showing disarrangement of occlusion.



Fig. 4: Mandibular occlusal radiograph showing radiolucent line running from alveolar crest of central incisors and communicating to the lower border of the mandible at symphysis region.



Fig. 5: Orthopantomogram radiograph.



Fig. 6: Patient's alginate impression.



Fig. 7: Splitting of cast using straight handpiece and disc wheel bur.



Fig. 8: Fabrication of wire splint using 19-gauge wire.



Fig.9: Open cap splint (MacLennan splint) fabricated using self-cure acrylic resin.



Fig.10: Cap splint cementation using type 1 GIC.



Fig.11: 1 month post op. mandibular occlusal radiograph showing satisfactory.



Fig.12: 1 month post op. OPG.