

# Prefabricated Acrylic Cap Splint: A Minimally Invasive and Conservative Intervention for Paediatric Mandibular Fractures: A Case Report

NISHIMA<sup>1</sup>, ANIL GUPTA<sup>2</sup>, SHALINI GARG<sup>3</sup>, VISHAL SHARMA<sup>4</sup>, SUGANDHA SHARMA<sup>5</sup>

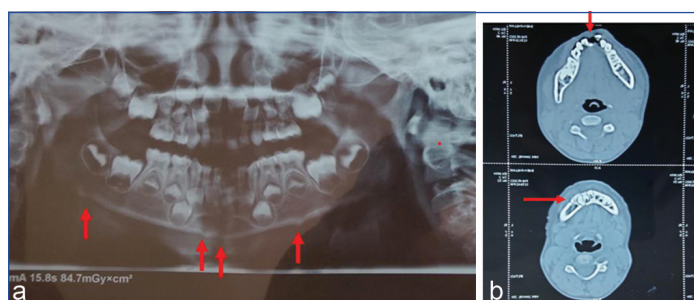
## ABSTRACT

Dental traumatic injuries in paediatric patients result in a painful experience for both the parents and the child. Although children may exhibit similar fracture patterns as seen in adult traumatic injuries, there are various factors to consider when treating fractures in paediatric patients, which pose challenges for paediatric dentists. There are numerous treatment options available for managing maxillofacial fractures, such as open reduction, closed reduction, immobilisation with open or closed cap splint, with or without circummandibular wiring, and the use of mini plates, among others. In this present case report, a five-year-old child presented with multiple step deformities in the mandible. Since the patient had deciduous dentition, the main concerns were the high possibility of disruption to the periosteal envelope, which could affect the growth of the mandibular processes, and damage to developing permanent tooth buds. These were key considerations when planning the appropriate treatment. Taking into account these potential complications associated with other invasive procedures, a minimally invasive conservative management approach was chosen for the child, which proved to be highly successful and cost-effective. Undisplaced fractures in paediatric patients should always be treated or stabilised using the closed reduction method.

**Keywords:** Closed reduction, Dental trauma, Undisplaced fracture

## CASE REPORT

A five-year-old female patient presented to the paediatric and preventive department with a chief complaint of pain and swelling in the lower right facial region for the past two days following a fall from a terrace. The incident occurred on the 5<sup>th</sup> of February 2022. The patient was initially taken to a local hospital due to excessive bleeding, pain, and swelling and received treatment for these symptoms. The pain started suddenly, was moderate in nature, and persisted throughout the day. Pain relief was achieved with medication. Sutures were applied to the chin laceration. One tooth (tooth no. 71) was lost in the lower front tooth region. A Computed Tomography (CT) scan was performed on the same day, revealing a right body fracture along with a parasymphysis mandibular fracture [Table/Fig-1a,b]. There was no history of loss of consciousness or vomiting, and no significant medical history was reported. This was the patient's first dental visit, and there was no known history of deleterious habits.



**[Table/Fig-1a,b]:** Pretreatment OPG and CT scan.

During the extraoral clinical examination, a diffuse, tender, hard swelling measuring 4x4 cm was observed in the right lower facial region. The swelling extended anteroposteriorly from the right parasymphysis to the right body of the mandible, and superoinferiorly from the right zygomatic arch to the inferior border

of the mandible. A dressing was present in the chin region, and the patient had a restricted mouth opening of approximately 8-10 mm, along with disrupted occlusion. Intraoral examination revealed the presence of deciduous dentition. Palpation revealed tenderness and step deformity along the mandibular lower border in the parasymphysis and symphysis region. Tooth number 71 was avulsed, and tooth number 81 showed grade-2 mobility. An oblique fracture line was observed between the right lateral incisor and right canine, extending to the lower border of the mandible. This type of fracture would have presented difficulties and complications if treated with other methods.

A provisional diagnosis of soft tissue laceration along with mandibular fracture was made. Additionally, malocclusion resulting from dental trauma was ruled out. Differential diagnoses such as mandibular contusion, mandibular dislocation, and isolated dental trauma were also considered. Preoperative Orthopantomogram (OPG) confirmed step deformities in the right body, symphysis, and parasymphysis regions, as well as the left body of the mandible [Table/Fig-1a,b]. Based on this, a final diagnosis of step deformity at the symphysis, parasymphysis region, and body of the mandible, with suspected fracture, along with soft tissue laceration and Ellis class IX fracture with respect to teeth 54 and 85, was made. Various treatment options were discussed, including closed reduction under General Anaesthesia (GA) as suggested by the oral surgery department, Intermaxillary Fixation (IMF), open reduction of fractures, circummandibular wiring, and, most importantly, minimally invasive conservative management using an acrylic cap splint.

The treatment plan involved detailed discussions with the parents, and stabilisation with an acrylic cap splint was finalised after obtaining written informed consent. Tooth extraction was performed for tooth 81, and decayed teeth (teeth 54 and 85) were restored. The patient was advised to rinse the mouth with a

0.2% chlorhexidine solution and apply topical Betadine ointment over the sutured site on the chin. Suture removal was scheduled for one week later.

Maxillary and mandibular alginate impressions were taken under local anaesthesia, and diagnostic casts were made. Wax blackout was performed, and the extension of the cap splint was marked. Finally, the cap splint was fabricated using acrylic material [Table/Fig-2]. Additionally, tooth 81, which had grade-II mobility, was extracted. The mandibular symphysis and parasymphysis fracture were immobilised with the acrylic cap splint, which was secured in the correct position using luting Glass Ionomer Cement (GIC) [Table/Fig-3].



[Table/Fig-2a,b]: Fabrication of acrylic cap splint.



[Table/Fig-3]: Acrylic cap splint.

A postoperative OPG was taken with the acrylic cap splint in place. The patient was followed-up once every week to monitor the healing process and address any issues. The acrylic cap splint was removed during the third week. The fractured site showed complete healing with no signs of mobility, and the patient achieved stable occlusion postoperatively [Table/Fig-4].



[Table/Fig-4]: Follow-up OPG.

Preoperatively, the patient had a mouth opening of 10 mm, which improved to 30 mm by the third postoperative week. During monthly follow-ups for three months, the patient exhibited excellent occlusion and good chewing capacity [Table/Fig-5].

## DISCUSSION

Traumatic dental injuries in paediatric patients have an incidence rate of 4-6% out of the total maxillofacial injuries that occur. Children below five years of age have an incidence rate of  $\leq 0.6-1.2\%$ , suggesting that paediatric facial trauma is less common in this age group [1]. The ideal approach to managing traumatic dental injuries or maxillofacial fractures varies between adults and children. In

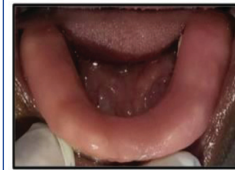
## PREOP



MAXILLARY VIEW

MANDIBULAR VIEW

FRONTAL VIEW



Fabrication of acrylic splint was done.



2 weeks follow-up

## POSTOP



[Table/Fig-5]: Preoperative pictures showing decayed teeth w.r.t. 54 and 85; avulsed 71 and mobile 81., 2 weeks follow-up with fabricated cap splint and post-operative picture showing restored teeth with proper occlusion achieved.

paediatric patients, immobilisation and stabilisation are the best and least invasive approaches to treat undisplaced fractures and restore deranged occlusion [2].

For minimally displaced or undisplaced fractures, treatment options include observational follow-up of the fractured site or closed reduction. Severely displaced fractures may require open reduction and rigid internal fixation. However, the use of plates and screws for internal fixation is not possible when permanent tooth buds are present within the affected jawbone [3]. Therefore, this case report presents the successful management of a five-year-old girl with mandibular symphysis, parasymphysis, body, and angle greenstick fractures [2] using a minimally invasive approach, namely an acrylic cap splint. Fractured alveolar processes in the maxilla and mandible require reduction, immobilisation, and stabilisation for 2-4 weeks for proper treatment. Arch bars are not suitable for children due to the size of teeth in mixed dentition and the presence of newly erupted permanent teeth with immature roots [3].

More than half of paediatric dental fractures occur in the mandibular region. These fractures are treated with various goals in mind, including restoration of occlusion, restoration of function, and most importantly, restoration of normal growth and development of the mandible, as well as the developing permanent teeth [4]. Treatment options for mandibular fractures include closed reduction with intermaxillary fixation, open reduction with intraosseous wires, and the use of miniplates and screws for internal rigid fixation. Other treatments include tape muzzles, circumferential wiring, acrylic splints, percutaneous skeletal fixation, nickel titanium staples, orthodontic resin, modified orthodontic brackets, and rubber elastics in combination with orthodontic brackets [5].

Nowadays, mandibular fractures are treated using recent advancements, namely vacuum-formed splints [6,7]. Saskianti T et al., reported a case with a right parasymphyseal fracture, which was treated using a modified acrylic closed cap splint. They used a 19-gauge orthodontic wire on the buccal and lingual surfaces to reinforce the splint [8]. Dolas A et al., reported a case of a nine-year-old boy with an unfavourable parasymphyseal fracture on the right side of the mandible. It was initially treated with arch bar stabilisation, which was unsuccessful. Then, it was stabilised with a vacuum-formed splint, and healing was observed as early as four weeks [9].



| Author                  | Place of the study/Year            | Clinical findings  | Treatment given   |
|-------------------------|------------------------------------|--|---|
| Kocabay C et al., [13]  | Turkey, 2007 August                | Clinical and radiological examination showed a vertical fracture line between lower incisors associated with medially dislocated left mandibular dentoalveolar structure.  | Conservative management was given.  |
| Aizenbud D et al., [14] | Israel 2009 December               | Pain, swelling, trismus, derangement of occlusion, sublingual haematoma, step deformity, deviation, loss of sensation due to nerve damage, bleeding, ecchymosis, Temporomandibular Joint (TMJ) problems, tenderness, movement restriction, open bite and crepitus.               | Closed reduction was done.  |
| John B et al., [11]     | Trichengode, India. Dentistry 2010 | Clinical examination revealed bruise on the chin, open mouth appearance with profuse bleeding from the oral cavity and derangement of occlusion. Step deformity with tenderness and mobility was elicited along the lower border of the mandible on the left-side canine region. | Closed reduction was given.   |
| Venugopal P et al., [5] | Kochi, Kerala 2022                 | Intraoral examination revealed labial ecchymosis in the mandibular anterior region and a step deformity between the distal aspect of 72 and 82.  | The displaced dentoalveolar segment was repositioned with finger pressure, and a modified closed cap splint was cemented to the reduced fractured jaw.  |
| Sharma A et al., [10]   | Ambala, Haryana, 2019              | On an intraoral examination, lacerated wound with respect to 72 73 and 82 83 regions was noted, and on palpation, step deformity was felt with respect to the same region. Malocclusion was present and sublingual haematoma was also noted.                                     | Close reduction was done.   |
| Telgi CR et al., [12]   | Uttar Pradesh, India, March 2021   | Two cases reported with mandibular body and parasymphiseal fracture, respectively.   | Cap splint is a promising fixation technique in terms of occlusion guided-fracture reduction, maximum stability during healing period, ease of application and removal, reduced operation time, minimal trauma for adjacent anatomic structures, ease of maintenance of oral hygiene, and comfort for young patients. Cap splint is a promising fixation technique in terms of occlusion guided-fracture reduction, maximum stability during healing period, ease of application and removal, reduced operation time, minimal trauma for adjacent anatomic structures, ease of maintenance of oral hygiene, and comfort for young patients. Cap splint is a promising fixation technique in terms of occlusion guided-fracture reduction, maximum stability during healing period, ease of application and removal, reduced operation time, minimal trauma for adjacent anatomic structures, ease of maintenance of oral hygiene, and comfort for young patients. Cap splint was given. |
| Sharma S et al., [15]   | Lucknow, Uttar Pradesh, India 2020 | Seven-year-old male patient who had a history of trauma because of falling from a tractor while playing, two days back from reporting. He had multiple mandibular fractures with extensive soft tissue laceration.   | Conservative approaches like acrylic splint or closed reduction with IMF.   |

**[Table/Fig-6]:** Review of clinical findings and treatment plan of previous similar cases [5,10,15].

In the present case, an acrylic cap splint was used to treat the fracture, which not only improves the occlusal morphology and helps maintain occlusion but also stabilises the fractured segment. Other advantages of acrylic cap splints include improved patient comfort, reduced bonding time, reduced chairside time, less laboratory time, non-invasiveness, protection of injured teeth, elimination of custom wire bending, ease of access to oral hygiene, and enhanced patient compliance, as discussed in previous studies [Table/Fig-6] [5,10-15]. The present case demonstrated the successful achievement of stable occlusion with a minimally invasive immobilisation procedure.

## CONCLUSION(S)

The best possible treatment for paediatric mandibular fractures in a young child, whether in primary dentition or mixed dentition, is the stabilisation of undisplaced fractures with minimal and conservative management, such as a prefabricated acrylic cap splint. Therefore, it is crucial to consider all the pros and cons of various treatment modalities in a young paediatric patient with dental trauma before finalising a treatment strategy. A multidisciplinary approach is highly recommended.

## REFERENCES

- [1] Kumar N, Richa, Gauba K. Modified closed cap splint: Conservative method for minimally displaced pediatric mandibular fracture. *The Saudi Dent J*. 2018;30(1):85-88.
- [2] Kumar N, Kumar A, Syreen S, Singh S. Circummandibular wiring: A treatment approach toward management of mandibular fracture in children. *Int J Clin Dent Res*. 2017;1(1):37.
- [3] Saoji S, Agrawal S, Bhojar A, Shrivastava S, Mishra A, Bhusari BK, et al. Management of mandibular fracture in pediatric patient with cap splint: A case report. *International Journal of Dental Clinics*. 2015;7(3):33-34.
- [4] Swayampakula H, Colvenkar S, Kalmath B, Vanapalli J, Zaheer MA. Management of pediatric mandibular fracture with acrylic cap splint. *Cureus*. 2023;15(1):e33324.
- [5] Venugopal P, Reshma Raj VP, Kumaran P, Xavier AM. Custom splint: A conservative approach to pediatric mandibular dentoalveolar trauma. *Scientific Dental Journal*. 2022;6(3):146.
- [6] Himaja S, Shreya C, Bhuvaneshwari K, Jayasri V, Mohammed AZ. Management of pediatric mandibular fracture with acrylic cap splint. *Cureus*. 2023;15(1):e33324.
- [7] Sangeetha KM, Surendra P, Roshan NM, Reddy VS, Chaur RG, Srinivasa SB. Management of dentoalveolar fracture with multiple avulsions: A case report with three years follow-up. *International Journal of Case Reports and Images*. 2014;5(12):835-38.
- [8] Saskianti T, Marwah A, Tedjosongko U, Dewi AM, Maulani B, Rahmawati L. Modified closed cap splint for symphysis/parasymphysis mandibular fracture management: A case report. *Journal of International Dental and Medical Research*. 2022;15(3):1320-25.
- [9] Dolas A, Shigli A, Ninawe N, Kalaskar R. Management of mandibular fracture in pediatric patient using vacuum-formed splint: A case report. *Dental Journal of Advance Studies*. 2017;5(03):112-15.
- [10] Sharma A, Patidar DC, Gandhi G, Soodan KS, Patidar D. Mandibular fracture in children: A new approach for management and review of literature. *International journal of Clinical Pediatric Dentistry*. 2019;12(4):356-59.
- [11] John B, John RR, Stalin A, Elango I. Management of mandibular body fractures in pediatric patients: A case report with review of literature. *Contemp Clin Dent*. 2010;1(4):291-96.
- [12] Telgi CR, Singh MM, Rajpal S, Ali MG, Priya N, Akhtar S. CAP splint: An armour to safeguard developing dentition in paediatric mandibular fractures- A case series. *IP Indian Journal of Orthodontics and Dentofacial Research*. 2021;7:77-81. Doi: 10.18231/ijodr.2021.013.
- [13] Kocabay C, Ataç MS, Öner B, Güngör N. The conservative treatment of pediatric mandibular fracture with prefabricated surgical splint: A case report. *Dental Traumatology*. 2007;23(4):247-50.

- [14] Aizenbud D, Hazan-Molina H, Emodi O, Rachmiel A. The management of mandibular body fractures in young children. *Dental Traumatology*. 2009;25(6):565-70.
- [15] Sharma S, Mohammad S, Kanna S, Gupta R, Kharmawlong RW. Comminuted mandibular fractures in a pediatric patient: A case report with review. *The TraumaXilla*. 2020;2(1-3):36-39.

**PARTICULARS OF CONTRIBUTORS:**

1. Postgraduate Student, Department of Paediatric and Preventive Dentistry, SGT Dental College, SGT University, Gurugram, Haryana, India.
2. Professor and Head, Department of Paediatric and Preventive Dentistry, SGT Dental College, SGT University, Gurugram, Haryana, India.
3. Professor, Department of Paediatric and Preventive Dentistry, SGT Dental College, SGT University, Gurugram, Haryana, India.
4. Senior Lecturer, Department of Paediatric and Preventive Dentistry, SGT Dental College, SGT University, Gurugram, Haryana, India.
5. Postgraduate Student, Department of Paediatric and Preventive Dentistry, SGT Dental College, SGT University, Gurugram, Haryana, India.

**NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:**

Nishima,  
W156, FF, Uppal Southend, Sector 49, Gurugram-122018, Haryana, India.  
E-mail: nishima.raheja23@gmail.com

**PLAGIARISM CHECKING METHODS:** [Jain H et al.]

- Plagiarism X-checker: Apr 14, 2023
- Manual Googling: May 09, 2023
- iThenticate Software: May 26, 2023 (15%)

**ETYMOLOGY:** Author Origin**EMENDATIONS:** 6**AUTHOR DECLARATION:**

- Financial or Other Competing Interests: None
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. Yes

Date of Submission: **Apr 11, 2023**Date of Peer Review: **May 05, 2023**Date of Acceptance: **Jun 01, 2023**Date of Publishing: **Sep 01, 2023**