

Open acrylic cap splint-assisted management of bilateral condylar and symphysis fractures in a 3-year-old child: A case report

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Abstract

Pediatric mandibular fractures are relatively uncommon and require specialized management because of developing dentition, active craniofacial growth, and limited patient cooperation. Conservative treatment modalities are preferred whenever possible to minimize damage to growth centres and developing tooth buds. This case report describes the management of a 3-year-old male child who sustained a mandibular symphysis fracture associated with bilateral condylar fractures and a dentoalveolar injury following a fall from a terrace. Clinical examination revealed facial swelling, pain, restricted mouth opening, mandibular mobility, occlusal discrepancy, and mobility of teeth 51 and 52. Radiographic evaluation using posteroanterior mandibular radiography and cone beam computed tomography confirmed the diagnosis. Treatment was performed under general anesthesia using an open acrylic cap splint retained with circum-mandibular wiring and supported by orthodontic brackets with elastics. Follow-up demonstrated satisfactory healing, restoration of occlusion, improved function, and uneventful recovery. The present case highlights the effectiveness of open acrylic cap splint therapy as a minimally invasive and growth-preserving treatment option for complex mandibular fractures in young children.

Keywords: Pediatric mandibular fracture, bilateral condylar fracture, symphysis fracture, open acrylic cap splint, circum-mandibular wiring, conservative management

Introduction

Pediatric mandibular fractures are relatively uncommon and account for a small proportion of maxillofacial injuries. However, among pediatric facial fractures, mandibular fractures represent the most frequently encountered injuries. [1] The management of mandibular fractures in children is considerably different from that in adults because of the presence of active growth centers, developing tooth buds, increased bone elasticity, and the dynamic nature of craniofacial growth. [1, 2]

Condylar and symphysis fractures are among the most common mandibular fracture patterns observed in pediatric patients. [1, 3] Falls from height, road traffic accidents, and sports-related injuries constitute the major etiological factors responsible for these injuries. [1] Because pediatric bone demonstrates greater elasticity and remodeling potential, many fractures are minimally displaced and can be managed successfully using conservative treatment approaches. [1, 4]

The primary objectives of treatment include restoration of pre-traumatic occlusion, preservation of mandibular growth, protection of developing dentition, and maintenance of function. Open reduction and internal fixation may

adversely affect developing tooth buds and facial growth centers; therefore, conservative techniques such as acrylic cap splints and circum-mandibular wiring are often preferred. [1, 5]

Open acrylic cap splints provide stable fracture immobilization, maintain functional occlusion, and minimize surgical morbidity while preserving growth potential. [1, 6] The present case report describes the successful management of a mandibular symphysis fracture associated with bilateral condylar fractures and dentoalveolar injury in a 3-year-old child using an open acrylic cap splint secured with circum-mandibular wiring and adjunctive elastic stabilization.

Clinical Findings

Extraoral examination revealed facial swelling and tenderness over the mandibular region (Fig. 1). Restricted mouth opening measuring approximately 21 mm was observed. Intraoral examination demonstrated occlusal discrepancy and abnormal mobility of the mandible (Fig. 2). Mobility of primary maxillary incisors 51 and 52 was also present. The patient experienced discomfort during mandibular movements and mastication.



Fig 1: Preoperative extraoral profile



Fig 2: Preoperative intraoral view showing occlusal discrepancy

Diagnostic Assessment

Radiographic Findings

Posteroanterior mandibular radiography and cone beam computed tomography (CBCT) were performed for evaluation of the injury.

Radiographic examination revealed a mandibular symphysis

fracture, bilateral condylar fractures (Fig. 3), and a dentoalveolar fracture involving teeth 51 and 52. CBCT provided detailed visualization of fracture extent and displacement, aiding definitive diagnosis and treatment planning.



Fig 3: Preoperative CBCT showing mandibular symphysis fracture and bilateral condylar fractures

Therapeutic Intervention

Treatment Procedure

Maxillary and mandibular impressions were obtained, and dental casts were prepared. An open acrylic cap splint incorporating orthodontic brackets was fabricated on the

mandibular cast (Fig. 4). The splint was designed to provide adequate stabilization while maintaining functional occlusion, similar to the conservative approach described by Shah *et al.* ^[1]

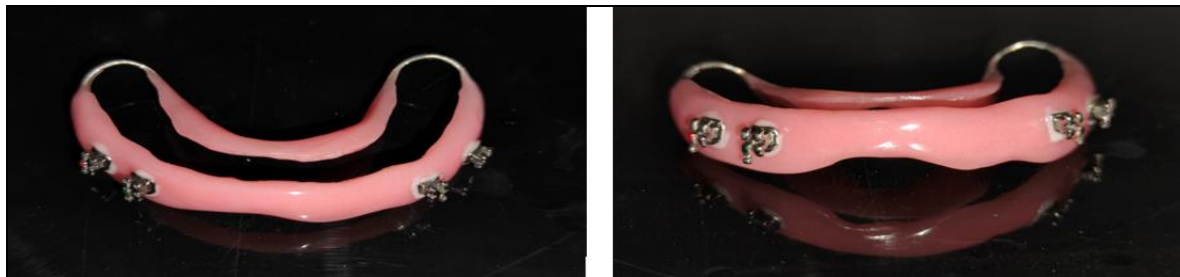


Fig 4: Fabricated open acrylic cap splint with incorporated orthodontic brackets

The procedure was performed under general anesthesia. Fracture segments were carefully reduced and proper occlusal relationship was established. The open acrylic cap splint was then adapted intraorally and secured using circum-mandibular wiring. Orthodontic brackets were

bonded in the maxillary arch, and elastics were subsequently engaged to facilitate occlusal guidance, improve splint retention, and enhance fracture stabilization during healing (Fig. 5).



Fig 5: Placement of open acrylic cap splint and circum-mandibular wiring and elastic stabilization using bonded brackets

Postoperative instructions included maintenance of oral hygiene, adherence to a soft diet, and avoidance of physical activity that could compromise fracture healing. Immediate

postoperative radiographic assessment confirmed satisfactory reduction and stabilization of the fracture segments (Fig. 6).



Fig. 6: Immediate postoperative PA mandible radiograph

Follow-up and Outcomes

Clinical follow-up demonstrated satisfactory healing and progressive improvement in mandibular function (Fig. 7). Occlusion remained stable throughout the healing period. The patient exhibited improved mouth opening, reduced discomfort, and restoration of normal mastication. The acrylic Cap

Splint was removed after approximately five weeks, and follow-up intraoral examination demonstrated stable occlusion and satisfactory healing (Fig. 8). Post-removal clinical and radiographic examination confirmed satisfactory fracture healing and maintenance of functional occlusion. Follow-up PA mandibular radiography demonstrated satisfactory bony healing (Fig. 9).



Fig 7: Follow-up extraoral profile



Fig 8: Follow-up intraoral view and splint removal



Fig 9: Post-treatment PA mandible demonstrating satisfactory healing

Discussion

Pediatric mandibular fractures are uncommon when compared with adults, owing to the increased elasticity of facial bones, the protective effect of adipose tissue, and the relatively retruded facial skeleton in young children. Nevertheless, when fractures do occur, the mandible is the most frequently affected facial bone.^{1,2} The management of mandibular fractures in pediatric patients remains challenging because of the presence of developing tooth buds, active growth centers, limited patient cooperation, and the potential for long-term disturbances in facial growth and occlusal development.^{1,4}

The pattern of injury observed in the present case consisted of a mandibular symphysis fracture associated with bilateral condylar fractures and dentoalveolar trauma. This fracture combination is commonly explained by force transmission following direct trauma to the chin. Impact at the symphyseal region generates compressive forces anteriorly while simultaneously transmitting forces posteriorly toward the condylar neck, resulting in unilateral or bilateral condylar fractures.² Such injuries require careful management because the condyle serves as an important growth center for mandibular development.

Treatment planning in pediatric mandibular fractures differs considerably from that in adults. Although open reduction and internal fixation can provide rigid stabilization, its use in young children remains controversial because of the risk of injury to developing tooth buds, interference with mandibular growth, infection, hardware-related complications, and the possible need for secondary surgery for plate removal.^{4,7} Consequently, conservative treatment approaches are generally preferred whenever satisfactory reduction and stabilization can be achieved.^{1,8}

Shah *et al.*¹ reported successful management of a pediatric parasymphysis fracture associated with a subcondylar fracture using a MacLennan splint, circum-mandibular wiring, bonded brackets, and elastics. The authors emphasized that conservative treatment facilitates fracture healing while preserving mandibular growth and minimizing morbidity. Similar principles guided the treatment approach in the present case.

Open acrylic cap splints have gained widespread acceptance in the management of pediatric mandibular fractures because they provide adequate stabilization without compromising developing structures. The splint acts by maintaining fracture reduction, preserving occlusal relationships, and distributing functional forces evenly across the dental arch.^{1,5} Furthermore, acrylic splints are easy to fabricate, cost-effective, minimally invasive, and can be customized according to the patient's dentition and fracture pattern. These advantages make them particularly useful in very young children where conventional fixation techniques may not be feasible.

Circum-mandibular wiring serves as an effective method for securing acrylic splints in pediatric patients. Due to the reduced crown height of primary teeth and the ongoing physiologic root resorption associated with deciduous dentition, conventional intermaxillary fixation often lacks adequate retention.^{1,6} Circum-mandibular wiring provides stable fixation without interfering with developing tooth buds and avoids the need for transosseous hardware placement. In the present case, satisfactory stabilization was achieved using circum-mandibular wiring combined with an open acrylic cap splint.

An additional modification employed in this case was the bonding of orthodontic brackets in the maxillary arch and incorporation of brackets within the acrylic splint for elastic

stabilization. Similar to the technique described by Shah *et al.*¹, elastics were utilized to guide occlusion and enhance fracture stability during healing. This approach allowed maintenance of proper occlusal relationships while minimizing patient discomfort and preserving mandibular function.

Another important consideration in pediatric fracture management is the remarkable healing capacity of children. Increased vascularity, enhanced osteogenic potential, and active remodeling processes contribute to rapid fracture healing and functional recovery.^{1,8} These biological advantages often permit successful outcomes with conservative treatment modalities that may be inadequate in adult patients. In the present case, satisfactory healing was observed clinically and radiographically within five weeks, with restoration of normal occlusion and mandibular function.

Condylar fractures in children deserve special consideration because of their association with mandibular growth disturbances, facial asymmetry, temporomandibular joint dysfunction, and malocclusion. However, several authors have demonstrated that pediatric condyles possess substantial remodeling capacity, particularly when managed conservatively and when functional rehabilitation is achieved early.^{4,8} For this reason, bilateral condylar fractures in the present case were managed conservatively while ensuring proper stabilization of the associated symphyseal fracture.

Long-term follow-up remains essential in all pediatric mandibular fractures. Although immediate outcomes may be favorable, potential complications such as growth disturbances, ankylosis, malocclusion, delayed eruption, or damage to developing permanent tooth buds may become evident only during subsequent growth phases.^{1,4} Regular monitoring of mandibular growth, temporomandibular joint function, and eruption of permanent dentition is therefore recommended.

The favorable clinical and radiographic outcomes observed in the present case support the growing body of evidence advocating conservative management of pediatric mandibular fractures. Open acrylic cap splints secured with circum-mandibular wiring, supplemented by elastic-guided occlusal stabilization, provide an effective, minimally invasive, and growth-preserving treatment modality for complex mandibular fractures in young children.

Clinical Significance

- Pediatric mandibular fractures require growth-preserving treatment approaches.
- Open acrylic cap splints provide stable and minimally invasive fracture fixation.
- Circum-mandibular wiring enhances splint retention and stability.
- Conservative treatment minimizes risk to developing tooth buds and facial growth centers.
- Early diagnosis and intervention promote favorable healing and functional outcomes.

Conclusion

Pediatric mandibular fractures require a treatment approach that balances fracture stabilization with preservation of craniofacial growth and developing dentition. Conservative management using an open acrylic cap splint and circum-mandibular wiring offers a predictable, minimally invasive,

and growth-preserving treatment option for young children with mandibular fractures.¹

In the present case, successful healing of a mandibular symphysis fracture associated with bilateral condylar fractures was achieved with restoration of functional occlusion, satisfactory mandibular function, and absence of postoperative complications. The favorable outcome supports previous reports advocating splint-assisted conservative management as an effective treatment modality for pediatric mandibular fractures.^{1,6} Long-term follow-up remains essential to monitor mandibular growth, temporomandibular joint function, and eruption of the developing permanent dentition.

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