

MANAGEMENT OF PEDIATRIC CONDYLE FRACTURE WITH MYOFUNCTIONAL APPLIANCES – A CONSERVATIVE APPROACH

ABSTRACT

In pediatrics, condylar fracture is the commonest traumatic pathology of maxillofacial region. Owing to higher vascularity, bony fragments fuse very fast within few hours if ignored or improperly managed, this may lead to severe complications to the patient both aesthetically and functionally. The current case reports give an insight to the clinical outcomes of conservative treatment in two patients with the usage of myofunctional appliance in patients with condylar fractures. Both the patients were followed up for one year and complete recovery was evaluated by clinical and radiographic methods.

Keywords: Condylar fracture, myofunctional appliance, trauma, pediatric.

1. INTRODUCTION (ARIAL, BOLD, 11 FONT, LEFT ALIGNED, CAPS)

Pediatric mandibular condylar fractures are the commonest of all the facial skeletal injuries occurring with a frequency of 30–40% followed by parasymphiseal (27%), body (9%) and angle (8%).¹⁻³

Mandibular condyles in children are highly vascular, smaller in size, firm within thin cortical plate. On the basis of fracture at anatomical level, they are categorized as intracapsular fracture involving the condylar head, and extracapsular involving the condylar neck or the subcondylar region.⁴ Owing to the difference in the anatomy of condyle, duration of healing, patient compliance and potential for interference in the growth of mandible the treatment modality is different for pediatric and adolescent patients.

These can be managed with two different approaches.

1. First, surgical open-reduction-and-internal-fixation (ORIF) which is indicated when ,
 - (i) Fracture involves lateral aspect of the condyle accompanying with reduction of mandibular height.
 - (ii) In which the cranial fragment dislocates laterally out of the glenoid fossa.
2. Second, non-surgical closed-functional-therapeutic-regimen (CTR) is indicated in fractures without displacement of fragments or when the displacement involves the medial parts of the condyle without shortening of the condylar height.⁵⁻⁹

Researchers state that, condylar fracture management in children is controversial as it may affect the patient functionally as well as aesthetically.¹⁰⁻¹⁵ Complications include facial asymmetry, or Temporo-Mandibular-Joint-Dysfunction (TMJD) on both the injured and non-injured side with decreased mandibular function activity, reduced mouth opening, chronic pain, and loss of ramal height and in few cases class II malocclusion with anterior open-bite.¹⁶⁻²⁰ Hence, its management requires special considerations, in order to restore the condyle to its original size.

In the current case reports, surgical as well as conservative approach in the form of a functional appliance was given to the patients who showed positive outcomes.

Functional therapy is normally recommended in pediatric patients as it allows early mobilization, increased bone remodeling process therefore approximating condylar growth and satisfactory condylar function. It also aids in early stabilization and rehabilitation.

Myofunctional appliances are prefabricated according to the patient's needs based on appropriate size. Owing to its soft and flexible property & ease to wear with good adaption to patient's mouth it can be easily removed at patient's willingness. It stimulates and re-educate muscles, ligaments and bone, leading to the remodeling of soft and hard tissue structures near TMJ which helps in achieving proper height of ramus thereby preventing ankylosis. It relaxes the muscles for the uplift-ment of the fractured part of the condyle, prevents shortening of the ramus on the fractured segment thereby preventing facial asymmetry.

2. PRESENTATION OF CASES: CASE 1

A 12-year-old male patient reported to the Department of OMFS with the chief complaint of reduced mouth opening after sustaining trauma on right side of the jaw while playing. Patient was examined thoroughly extra-orally and intra-orally. His medical and family history was non-contributory to the case and was vitally stable. On extra-oral inspection, swelling was present along right side of face, with peri-orbital ecchymosis & sub-conjunctival hemorrhage with the right eye, CLW was present over right symphysis region and abrasion along right malar region. On extra-oral palpation, there was tenderness along right symphysis and left preauricular region, step deformity was noted along right symphysis region. TMJ examination, revealed left condyle was not palpable and there was deviation on mouth opening to left side with restricted mandibular movements. On intraoral inspection, there was inter-fragmental mobility between 41 and 42 and deranged occlusion was present on left side. (Figure 1: A, B, C)

Based on case-history and clinical examination, a provisional diagnosis of right parasymphysis and left condylar fracture of mandible was made.

In radiographic investigations, a 3D-CT Face and an Ortho-Pantamo-Gram (Figure 1: D, E F) was advised which revealed a displaced fracture of the right side parasymphysis region of the mandible extending from alveolar process obliquely to inferior border of mandible between 41 and 42, and also a medially displaced intra-capsular fracture of the left condylar neck of the mandible. Despite the largely affected area, the vertical dimension was preserved and the cranial piece of the fracture was not widely dislocated from the caudal one, probably due to the integrity of the periosteal layer.

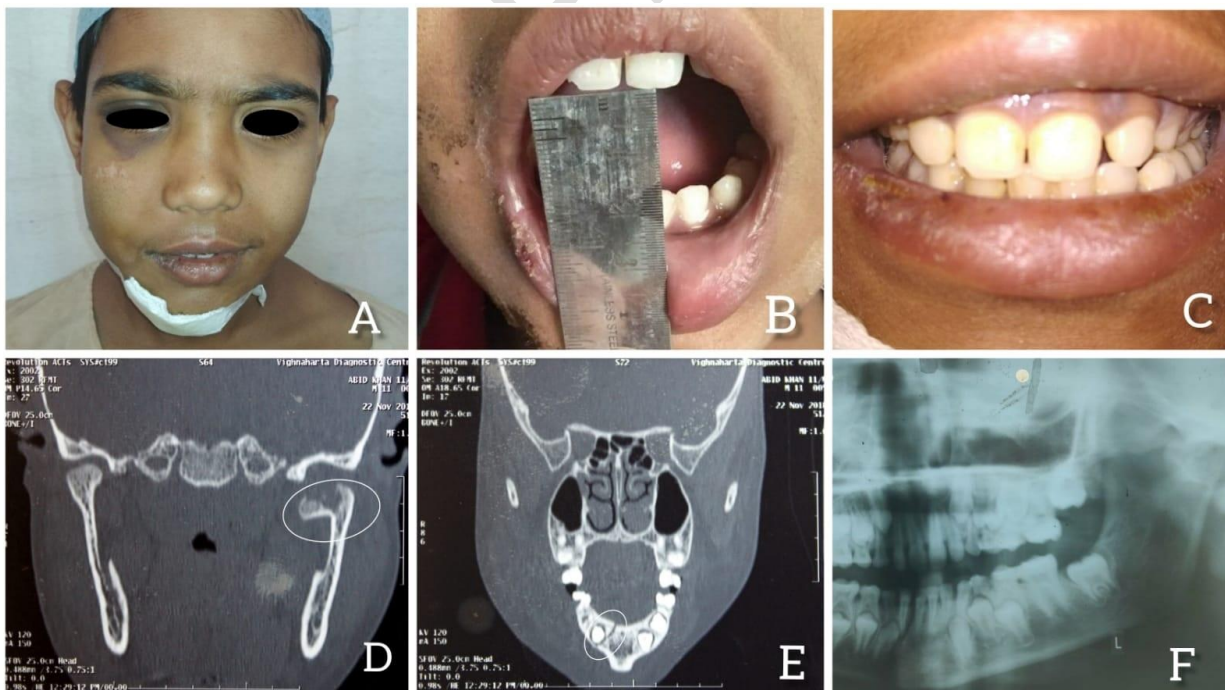


FIGURE 1: Case-Report 1, A, B, C - Pre-operative Clinical Photographs; D, E, F - Pre-Operative Radiographs.

Treatment planning was done to perform ORIF for the right parasymphysis fracture through the existing lacerated wound over the chin under LA with sedation. Further, the left side condylar neck intra-capsular fracture was planned to be treated using a modified functional exercise regimen approach by giving patient a customized removable functional type of appliance (2-4 weeks) to allow the fibrous callus formation, maintain the vertical dimension and guide the occlusion in the correct manner over the deranged side. The customized removable appliance was designed in such a way that it is retained completely in both the arches via adam's clasps and C-clasps. A provision was made to incorporate hooks over the C-clasps at the maxillary and mandibular retention plates to allow placement of Class II elastics. (Figure 3) Patient was advised to follow a strict mouth opening-and-closing exercises for 6 months with the help of elastics and functional removable appliance during the entire day; the appliance to be removed during feeding and while sleeping at night. Patient follow-up was done at every week for one month, 3rd month, 6th month and after 1-year. Immediate post-operative, mid-treatment and 1 year-post-treatment radiographs were obtained to check for healing of the Condylar fracture, mouth opening, occlusion and deviation. (Figure 4)

CASE 2

A 12-year old boy reported to the Department of OMFS with the chief complaint of pain along lower jaw region and swelling over face following RTA. Patient complained of difficult mastication due to the reduced mouth opening and swelling. His medical and family history was non-contributory to the case. All his vital signs and parameters were within normal limits.

Extra-orally, patients' relatives gave history of bleeding from right ear with sutured CLW over the symphysis region and swelling was present bilaterally crossing the midline in lower one- third of the face. On extraoral palpation, tenderness was present along symphysis and right and left preauricular region, step-deformity was palpated along lower border of mandible in symphysis region.

Intraorally, there was gingival tear and inter-fragmental mobility between 41 and 31, Ellis class 3 # was present in 12 and deranged occlusion bilaterally with anterior open-bite. (Figure 2: A, B, C)

Based on case-history and clinical examination, provisional diagnosis given was symphysis and bilateral condylar fracture of mandible.

On radiographic investigations, 3D-CT Face (Figure 2: D, E, F) was done which revealed displaced mid-symphysis fracture of the mandible, the fracture line extended between 31 and 41 from superior to inferior border of mandible and also bilaterally medially-displaced intra-capsular condylar neck fractures of the mandible.

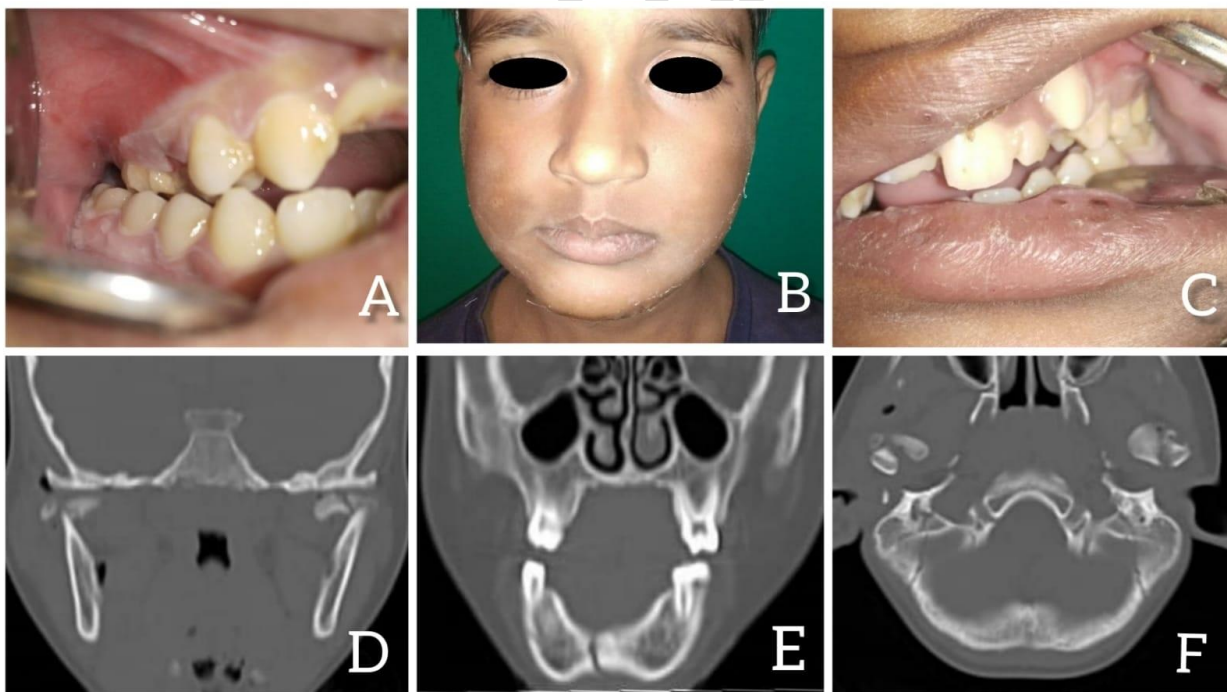


FIGURE 2: Case-Report 2, A, B, C - Pre-operative Clinical Photographs; D, E, F - Pre-operative Radiographs.

Treatment planning was done to perform ORIF for the mid-symphysis fracture through the existing lacerated wound over the chin under general anaesthesia. Further, the right and left side condylar neck intra-capsular fractures were planned to be treated using the same modified functional exercise regimen approach as discussed earlier for Case Report 1; by giving the patient a customized removable functional type of appliance. (Figure 3) Follow-up was done after 6 months which showed proper remodelling of condylar heads and clinically bilateral molar relationships. (Figure 4) Thereby, we concluded that early physiotherapy with myofunctional appliance for condylar fracture seems to be a good treatment option in cases of condylar fracture in pediatric patients.



FIGURE 3: Patient Specific Modified Removable Appliance in-mouth and in-fabrication.

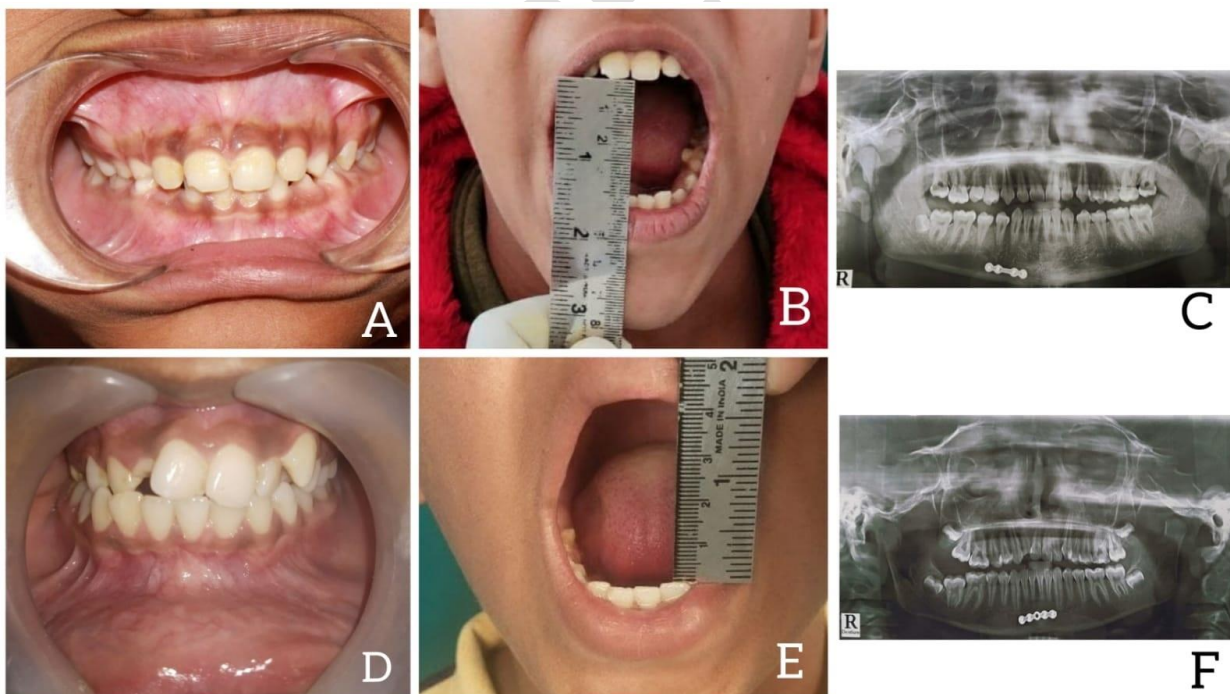


FIGURE 4: Follow-Up After 3-Years, A, B, C - Case-Report 1 (A,B - Clinical Photographs, C - OPG); D, E, F - Case-Report 2 (D,E - Clinical Photographs, F - OPG).

3. DISCUSSION

In pediatric patients, fractured bony fragments get fused partially within 72 hours and it becomes difficult to reduce them after 7 days. Hence, in order to prevent various complications such as restriction of mandibular movements, ankylosis, open-bite, malocclusion and facial asymmetry which may occur in delayed or inappropriately done treatment, immediate intervention is needed.²¹⁻²⁴

In order to avoid the significant injury to the successor or to the developing tooth buds, conservative approach has shown positive outcome. These conservative approaches include analgesics, dietary modifications, physiotherapy, intermaxillary fixation (IMF) and functional appliances such as activator.²⁵⁻²⁷

In pediatric patients, conservative approach is recommended for almost all cases of intra-capsular and extra-capsular condylar fractures. Functional appliances guide corrects occlusion and proper distribution of forces amongst craniofacial structures.

Foremost, the primary goal of this of this approach is the triggering bone reconstruction, equalizing intra-articular functional structures and therefore retaining functional activity of TMJ. This is achieved through prompt restoration of occlusion which thereafter normalizes the joint and muscle function.

The main advantages of these myofunctional appliances are it can be easily removed and are bearable however it requires patient's cooperation. Researchers have reported good results in patients who used an intraoral myofunctional appliance for prolonged period (4-9 months) without using IMF.^{28,29} In another study done at pediatric Dental Clinic of Tokushima University Hospital, Japan by using an activator for a short term (3-5 weeks) without any adjuvant physiotherapy amongst 8 patients with a regular follow-up for 1-year showed fruitful results.³⁰

Also in Retrospective Case-Study done at Department Of OMFS, AIIMS, New Delhi, India concluded that Closed-Treatment for Pediatric Mandibular Condylar Fracture (PMCF) is effective due to high Osteogenic capacity leading to 'Restitutive Remodeling' in fractured condyles.³⁰

In traumatic injuries, careful observation and long term follow-ups are required both clinically as well as radiographically. In our first case, ORIF was done for right parasymphysis fracture and in second case for symphyseal fracture, whereas in order to maintain the functional integrity for intra-capsular condylar neck fractures in both the cases, custom-made myofunctional appliance was given to wear for 24-hours except while eating. In both of our cases, custom-made myofunctional appliance was given for 6-8 weeks along with special mouth-opening exercises were instructed to these patients.

Follow-up was done regularly clinically as well as radiographically, initially every week then after 3-months for about 1-year which showed good bone remodeling process, approximate condylar height and proper occlusion as positive results. Patient's were further assessed for facial asymmetry, ankylosis, maximal mouth-opening pre-treatment and after the removal of the appliances, TMJD as pain, clicking sounds, range of movements and malocclusion.

4. CONCLUSION

Management of condylar fractures are controversial in children. Non-invasive management of condylar fractures is recommended for proper functioning. In our cases, conservative treatment of condylar fractures showed satisfactory clinical outcomes at 1-year of follow-up with the use of myofunctional appliance.

CONSENT

All authors declare that 'written informed consent was obtained from the patient (or other approved parties) for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editorial office/Chief Editor/Editorial Board members of this journal.

ETHICAL APPROVAL

All authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

REFERENCES

1. B. R. Chrcanovic, B. Freire-Maia, L. N. Souza, V. O. Ara'ujo, and M. Abreu, "Facial fractures: a 1-year retrospective study in a hospital in belo Horizonte," *Brazilian Oral Research*, vol. 18, no. 4, pp. 322–328, 2004.
2. B. R. Chrcanovic, M. H. Abreu, B. Freire-Maia, and L. N. Souza, "Facial fractures in children and adolescents: a retrospective study of 3 years in a hospital in Belo Horizonte, Brazil," *Dental Traumatology*, vol. 26, no. 3, pp. 262–270, 2010.
3. B. R. Chrcanovic, L. N. Souza, B. Freire-Maia, and M. H. Abreu, "Facial fractures in the elderly: a retrospective study in a hospital in Belo Horizonte, Brazil," *Journal of Trauma*, vol. 69, no. 6, pp. E73–E78, 2010.
4. N. Zachariades, M. Meztis, C. Mourouzis, D. Papadakis, and A. Spanou, "Fractures of the mandibular condyle: a review of 466 cases. Literature review, reflections on treatment and proposals," *Journal of Cranio-Maxillofacial Surgery*, vol. 34, no. 7, pp. 421–432, 2006.
5. B. R. Chrcanovic, "Open versus closed reduction: diacapitular fractures of the mandibular condyle," *Oral and Maxillofacial Surgery*, vol. 16, no. 3, pp. 257–265, 2012.
6. P. Boffano, P. Corre, and S. Righi, "The role of intra-articular surgery in the management of mandibular condylar head fractures," *Atlas of The Oral And Maxillofacial Surgery Clinics*, vol. 25, no. 1, pp. 25–34, 2017.
7. M. D. Pereira, A. Marques, M. Ishizuka, S. M. Keira, E. Brenda, and A. B. Wolosker, "Surgical treatment of the fractured and dislocated condylar process of the mandible," *Journal of Cranio-Maxillo-Facial Surgery*, vol. 23, no. 6, pp. 369–376, 1995.
8. Y. Wu, X. Long, W. Fang et al., "Management of paediatric mandibular condylar fractures with screw-based semi-rigid intermaxillary fixation," *International Journal of Oral and Maxillofacial Surgery*, vol. 41, no. 1, pp. 55–60, 2012.
9. Y.-M. Zhao, J. Yang, R.-C. Bai, L.-H. Ge, and Y. Zhang, "A retrospective study of using removable occlusal splint in the treatment of condylar fracture in children," *Journal of Cranio-Maxillofacial Surgery*, vol. 42, no. 7, pp. 1078–1082, 2014.
10. Choi J, Oh N, Kim IK. A follow-up study of condyle fracture in children *Int J Oral Maxillofac Surg* 2005;34:851Y858
11. Gu'ven O, Keskin A. Remodelling following condylar fractures in children. *J Craniomaxillofac Surg* 2001;29:232Y237
12. Strobl H, Emshoff R, Rothler G. Conservative treatment of unilateral condylar fractures in children: a long-term clinical and radiologic follow-up of 55 patients. *Int J Oral Maxillofac Surg* 1999;28:95Y98
13. Hovinga J, Boering G, Stegenga B. Long-term results of nonsurgical management of condylar fractures in children. *Int J Oral Maxillofac Surg* 1999;28:429Y440
14. Deleyiannis FW, Vecchione L, Martin B, et al. Open reduction and internal fixation of dislocated condylar fractures in children: long-term clinical and radiologic outcomes. *Ann Plast Surg* 2006;57:495Y501
15. Lekven N, Neppelberg E, Tornes K. Long-term follow-up of mandibular condylar fractures in children. *J Oral Maxillofac Surg* 2011;69:2853Y2859.
16. B. R. Chrcanovic, "Factors influencing the incidence of maxillofacial fractures," *Oral and Maxillofacial Surgery*, vol. 16, no. 1, pp. 3–17, 2012.
17. M. Zandi, A. Khayati, A. Lamei, and H. Zarei, "Maxillofacial injuries in western Iran: a prospective study," *Oral and Maxillofacial Surgery*, vol. 15, no. 4, pp. 201–209, 2011.
18. P. Boffano, F. Rocca, E. Zavattero et al., "European Maxillofacial Trauma (EURMAT) in children: A multicenter and prospective study," *Oral Surgery, Oral Medicine, Oral Pathology and Oral Radiology*, vol. 119, no. 5, pp. 499–504, 2015.
19. A. Di Blasio, D. Cassi, C. Di Blasio, and M. Gandolfini, "Temporomandibular joint dysfunction in moebius syndrome," *European Journal of Paediatric Dentistry*, vol. 14, pp. 295–298, 2013.

20. P. Boffano, F. Rocca, E. Schellino, F. Baietto, C. Gallesio, and S. Berrone, "Conservative treatment of unilateral displaced condylar fractures in children with mixed dentition," *Journal of Craniofacial Surgery*, vol. 23, no. 5, pp. e376–e378, 2012.
21. Defabianis of Tmj fractures in children and adolescents: treatment guidelines, *J Clin Pediatr Dent*, 2003;27:191-199.
22. Donoff RB et al, management of condylar fracture of cervical spine- report of cases, *J Oral Surg*, 1973;31: 131-135.
23. Kaban LB, Mulliken JB, Murray JE. Facial Fractures in children: An analysis of 122 fractures in 109 patients. *Plast Reconstr Surg* 1977; 59/ 15-20.
24. Mulliken JB, Kaban LB, Murray JE. Management of facial fractures in children. *Clin Plast Surg* 1977; 4: 491-502.
25. Y. Wu, X. Long, W. Fang et al., "Management of paediatric mandibular condylar fractures with screw-based semi-rigid intermaxillary fixation," *International Journal of Oral and Maxillofacial Surgery*, vol. 41, no. 1, pp. 55–60, 2012.
26. H. Thörn, D. Hallikainen, T. Iizuka, and C. Lindqvist, "Condylar process fractures in children: a follow-up study of fractures with total dislocation of the condyle from the glenoid fossa," *Journal of Oral and Maxillofacial Surgery*, vol. 59, no. 7, pp. 768–773, 2001.
27. H. Strobl, R. Emshoff, and G. Rothler, "Conservative treatment of unilateral condylar fractures in children: a long-term clinical and radiologic follow-up of 55 patients," *International Journal of Oral and Maxillofacial Surgery*, vol. 28, no. 2, pp. 95–98, 1999.
28. Strobl H, Emshoff R, Rothler G. Conservative treatment of unilateral condylar fractures in children / a long-term clinical and radiologic follow-up of 55 patients. *J Oral Maxillofac Surg* 1999; 28: 95-98.
29. Kahl B, Fischbach R, Gerlach KL Temporomandibular joint morphology in children after treatment of condylar fractures with functional appliance therapy / a follow-up study using computed tomography, *Dentomaxillofac Radiol* 1995; 24 /37-45.
30. Kenji Arita, Clinic outcome of short-term myofunctional therapy for pediatric condylar fracture; a retrospective study, *Osaka Dent Univ* 2012 (April); 14(1) / 63-70.
31. P. Yadav, O. Bhutia, A. Bansal, S. Lakshmanan, A. Roychoudhury- ScienceDirect Does closed treatment of paediatric mandibular condyle fractures result in restitutive remodelling?