

Physical Therapy as first therapy to mandibular fracture in a pediatric patient

Fisioterapia para fratura mandibular em paciente pediátrico como primeira terapia

Fisioterapia como primera terapia de la fractura mandibular en un paciente pediátrico

Received: 12/27/2021 | Reviewed: 01/01/2022 | Accept: 01/05/2022 | Published: 01/09/2022

Maísa Pereira-Silva

ORCID: <https://orcid.org/0000-0003-2483-8695>
São Paulo State University, Brazil
E-mail: maisa.silva@unesp.br

Nataira Regina Momesso

ORCID: <https://orcid.org/0000-0002-5537-2448>
São Paulo State University, Brazil
E-mail: nataira.momesso@unesp.br

Ana Carolina Zucon Bacelar

ORCID: <https://orcid.org/0000-0003-2088-8417>
São Paulo State University, Brazil
E-mail: ana.bacelar@unesp.br

Izabella Sol

ORCID: <https://orcid.org/0000-0003-2384-9819>
São Paulo State University, Brazil
E-mail: izabella.sol@unesp.br

Láís Kawamata de Jesus

ORCID: <https://orcid.org/0000-0002-0459-5860>
São Paulo State University, Brazil
E-mail: lais.kawamata@unesp.br

André Luiz da Silva Fabris

ORCID: <https://orcid.org/0000-0002-1777-2125>
São Paulo State University, Brazil
E-mail: andre.fabris@hotmail.com

Ana Paula Farnezi Bassi

ORCID: <https://orcid.org/0000-0002-0031-4953>
São Paulo State University, Brazil
E-mail: ana.bassi@unesp.br

Leonardo Perez Faverani

ORCID: <https://orcid.org/0000-0003-2249-3048>
São Paulo State University, Brazil
E-mail: leonardo.faverani@unesp.br

Alessandra Marcondes Aranega

ORCID: <https://orcid.org/0000-0001-5856-7972>
São Paulo State University, Brazil
E-mail: alessandra.aranega@unesp.br

Idelmo Rangel Garcia-Júnior

ORCID: <https://orcid.org/0000-0001-8892-781X>
São Paulo State University, Brazil
E-mail: idelmo.rangel@unesp.br

Oswaldo Magro-Filho

ORCID: <https://orcid.org/0000-0002-9821-2479>
São Paulo State University, Brazil
E-mail: osvaldo.magro@unesp.br

Francisley Ávila Souza

ORCID: <https://orcid.org/0000-0002-1427-071X>
São Paulo State University, Brazil
E-mail: francisley.avila@unesp.br

Abstract

Mandibular fractures are the most common in children, however with a low incidence because of child anatomy. Among the sites, the condyle is one the most fracture site, being a dilemma to surgeons about your management. The treatment to condyle fracture can be a surgical approach or conservative management. Conservative treatment presents the IMF, appliances, soft diet, and physiotherapy as an option, and these treatments can be applied isolated or associated. Physical Therapy has been a few reported in the literature as isolated therapy, reported as complementing the surgical approach, or after orthodontic/appliances therapy. Promote early mandibular mobility is important to restore function and prevent future complications such as ankylosis. Instruments to perform physiotherapy are

expensive and not accessible to the entire population. Therefore, the present study presents a case of a pediatric patient with condyle fracture treated with a soft diet and physiotherapy with wooden spatula.

Keywords: Physical therapy; Mandibular condyle; Closed fracture reduction; Child.

Resumo

As fraturas mandibulares são as mais comuns em crianças, porém com baixa incidência devido à anatomia de pacientes pediátricos. Dentre os sítios, o côndilo é um dos sítios mais acometidos, sendo um dilema para o cirurgião quanto a conduta. O tratamento da fratura condilar pode ser uma abordagem cirúrgica ou conduta conservadora. O tratamento conservador apresenta o IMF, aparelhos ortodônticos, dieta leve e fisioterapia como opção, podendo esses tratamentos ser aplicados isolados ou associados. A fisioterapia tem sido pouco relatada na literatura como terapia isolada, sendo utilizada como complementação da abordagem cirúrgica, ou após terapia ortodôntica / aparelhos. A terapia para promover a mobilidade mandibular precoce é importante para restabelecer a função e evitar complicações futuras como anquilose. Instrumentais para realizar a fisioterapia são comercializados, entretanto o alto custo faz com que estes não sejam acessíveis a toda população. Portanto, o presente estudo apresenta um caso de paciente pediátrico com fratura de côndilo tratado com dieta leve e uma fisioterapia com materiais alternativos.

Palavras-chave: Fisioterapia; Côndilo mandibular; Redução fechada; Criança.

Resumen

Las fracturas mandibulares son las más frecuentes en los niños, sin embargo, su incidencia es baja debido a la anatomía del niño. Entre los sitios, el cóndilo es uno de los que presenta más fracturas, lo que representa un dilema para los cirujanos sobre su manejo. El tratamiento de la fractura del cóndilo puede ser un abordaje quirúrgico o un tratamiento conservador. El tratamiento conservador presenta como opción la IMF, la aparatología, la dieta blanda y la fisioterapia, pudiendo aplicarse estos tratamientos de forma aislada o asociada. La fisioterapia ha sido informada en la literatura como terapia aislada, como complemento del abordaje quirúrgico o después de la terapia de ortodoncia / aparatos. Promover la movilidad mandibular temprana es importante para restaurar la función y prevenir complicaciones futuras como la anquilosis. Los instrumentos para realizar fisioterapia son costosos y no accesibles para toda la población. Por tanto, el presente estudio presenta el caso de un paciente pediátrico con fractura de cóndilo tratado con dieta blanda y fisioterapia con espátula de madera.

Palabras clave: Fisioterapia; Cóndilo mandibular; Reducción cerrada; Niño.

1. Introduction

Mandibular fractures are the most common in children, occurring due to several factors, including traffic accidents, falls, sports accidents, and physical aggression (Wainwright et al., 2019). But the incidence is low due to a larger craniofacial with proportion, increased parental supervision in a younger population, high elasticity of pediatric bone, thicker adipose layer tissue covering them, a high cancellous to cortical bone ratio, and flexible suture lines (Kaban, 1993; Crean et al., 2000; Zimmermann et al., 2005; Youssef et al., 2018; Bansal, 2021). Condylar fractures are the most affected mandibular site however low occurrence of mandibular fractures makes the decision about the approach controversial (Ghosh, 2018; Du, 2021). The different anatomy, the presence of mixed or deciduous dentition, and growth sites are principal factors to be analyzed and make the decision to approach more difficult (Bansal, 2021).

Condylar fractures treatments in pediatric patients can be surgical and even conservative. Among the surgical approaches there is the management of reduction and open fixation. Conservative therapies can guide a liquid diet, splints, traction with Kirschner wire, maxillo-mandibular block, guided occlusion with rubber bands and braces, and physiotherapy, which can be isolated or associated therapies (Kim, 2015; Li, 2020; Vesnaver, 2021).

Physical therapy associated with others has shown favorable results and is well-defended in the literature. Physiotherapy alone in condylar fractures treatment of pediatric patients is little reported. Therefore, the objective of this paper is to present a case of mandibular fracture in a pediatric patient, conducted only with physical therapy.

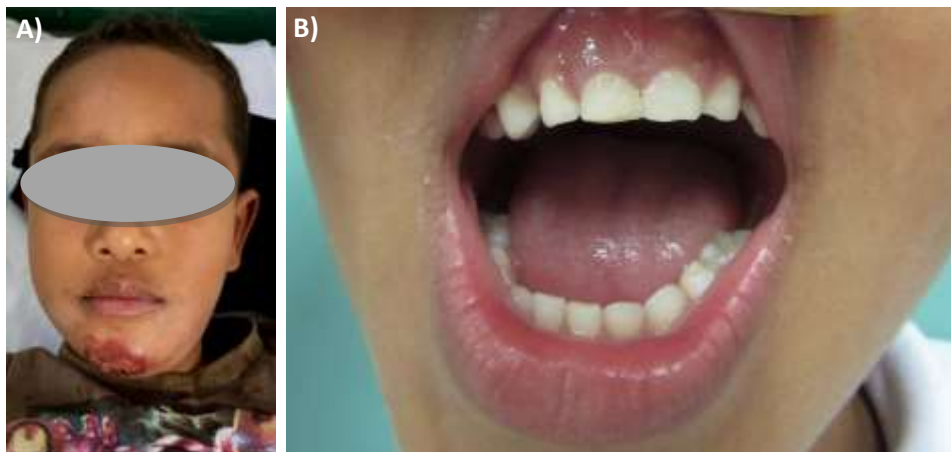
2. Methodology

The present paper consists in a case report of a pediatric patient evaluated in Santa Casa Hospital of Araçatuba, with mandibular fracture conducted only with physical therapy presenting satisfactory results. This study applied the methodology described in Pereira (2018) and a Free and Clarified Term Consent.

3. Case Report

A 5-year-old male was referred to the oral and maxillofacial surgery Service, of Santa Casa Hospital of Araçatuba (Araçatuba, Brazil) after fell from his bicycle. The initial examination found the normal occlusion with a moderate restriction of mouth opening, sustained an abrasion over the chin that had been evaluated and sutured in the emergency room; crown fractures of upper central incisors. The extraoral assessment presented pain in the preauricular region and deviation to the right side in the mouth opening. The patient presented primary dentition with no significant malocclusion. (Figure 1)

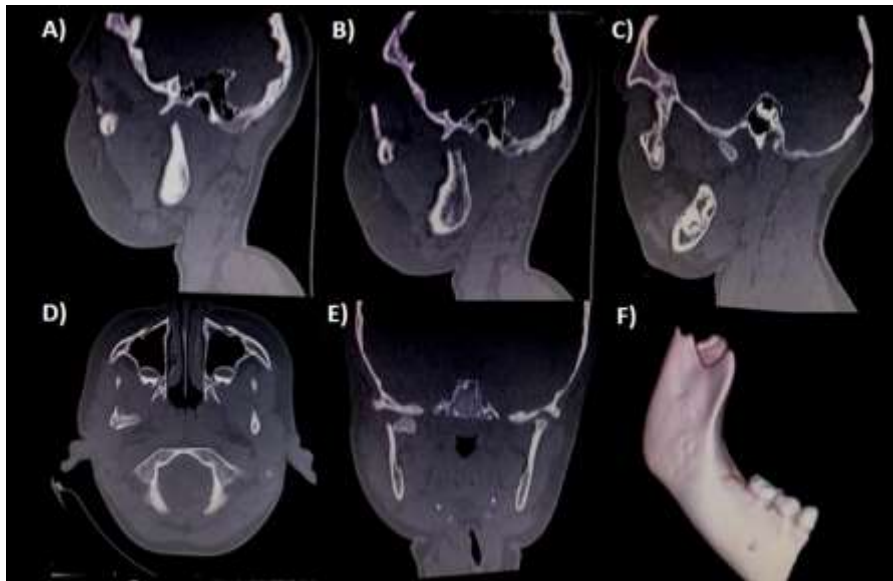
Figure 1. A) Abrasion over the chin that had been evaluated and sutured. B) Crown fractures of upper central incisors and deviation to the right side in the mouth opening.



Source: Own authorship.

Three-dimensional computed tomography (CT) revealed displaced condylar neck fracture on the right side and mandibular height decrease. However, the patient was too young to use intermaxillary fixation. (Figure 2)

Figure 2. A-C) CT Sagittal Slices presenting condylar fracture D) CT Axial Slice presenting condylar fracture and medial displacement. E) CT Coronal Slice presenting condylar fracture and medial displacement. F) 3D CT imaging.



Source: Own authorship.

Hence, we recommended conservative treatment rather than surgical treatment. At discharge prescribed him a soft diet and recommended functional exercise. The protocol applied was three sessions/day for three months. At each session, he had to open his mouth for 60 seconds then close it. They had to do this three times (Bandy, 1994). Performed the open mouth with wooden spatulas (2mm) and each week was increased one wooden spatula until 22° spatula (44mm). Complementing the exercises of the open mouth, the patient performed the movements to protrusion and lateral movement. The deviation to the right side in the mouth opening is maintaining. (Figure 3)

Figure 3. Follow up and physiotherapy with wooden spatulas.



Source: Own authorship.

The patient was followed up in our outpatient clinic every week. Follow-up examinations were carried out including physical and radiographic assessment at four months, and none anquilosis sign was observed. (Figure 4)

Figure 4. A) *Panoramic radiography.* B) *Condyle fracture detail in panoramic radiography.*



Source: Own authorship.

4. Discussion

The conservative management of the mandibular condyle fracture is one of the options for the treatment and it can be used individually or complement the surgical treatment to restore the mandible function (Steed et al. 2016; Cooney, 2020). Soft diet, physiotherapy, intermaxillary fixation (IMF) (Thoren, 2001; Cooney, 2020), and functional appliances are options for these treatments (Staderini, 2020). Some surgeons believe that IMF does not present a benefit to children's condylar fracture. The management with IMF is complicated by poor patient compliance, difficulty in applying IMF, and, in the case of mixed dentition, lack of sufficient support (Boffano, 2012; Zhao, 2014; Cassi 2017; Cooney, 2020). Likewise, the therapy with functional appliances depend on compliance, self-motivation, parental and peer influence, quality of life impairment and adaptability, wear time, forgetfulness, and interference with daily activities to obtain a good results (El-huni, 2019).

The treatment's limitations with IMF and functional appliances by poor compliance lead to physiotherapy as the option. Physical therapy promotes early mandible mobilization, improves vascular circulation adjacent to the fracture site, and thus accelerates regeneration or remodeling of the fractured condyle (Boffano, 2012). The Therabite®, which is a tool that helps in mouth opening exercises to trauma, radiotherapy, postoperative of mandibular surgeries, but this tool is not available to all patients. Some surgeons use the wooden spatulas, which perform the Therabite® movement as an option to the trismus exercises and obtain the same results and an available treatment option (Lee, 2018). In addition to the mouth opening exercises, the lateral and protrusion movements are important to restore the mandibular movements and were performed and included in our case and protocol promoting good results.

In the mouth opening exercises in cases of important displacement, we have the remodeling of TMJ. Besides the range motion and the condyle remodeling, an author confirmed that anteriorly displaced discs may return to their normal position following closed treatment in cases that condyle do not present an important displacement (Liu et al., 2019). The success results of physiotherapy in radiotherapy, postoperative mandibular surgeries, and condyle fractures restoring range motion and TMJ function depend on the frequency, self-discipline, clearly-set (Lee, 2018; Melchers et al. 2009), and in present case parents and family support to perform the exercises at home. The authors believe that the parents are a tool in the success of the therapy, to complete all the other factors as the frequency exercises, and help the child understand the importance.

The main complication in the failure of these treatments in condyle fracture is the ankylosis in postoperative. Physiotherapy helps restore the integrity of TMJ function and normalize functional movements, avoiding neuromuscular adaptation. The early mobilization does not prevent the fibrous union of the fractured fragments and helps the patients restore the pre-traumatic range of motion. The follow-up is necessary with radiographic control and CT to the early failure diagnosis (Cassi, 2017). In the control needs attention about complications as immobility for insufficient postoperative mandible exercises (Thoren, 2001), asymmetries, and occlusion that can occur in postoperative, being conservative ou surgical approach, and know the moment to forward to the orthodontist (Melchers et al. 2009). Patients can be treated without orthodontics during the first year after trauma, and maintain a good occlusion therefore pediatric patient follow-up is important (Staderini, 2020). The patient of the present case continues without needing appliances, and in follow-up without complications.

5. Final Considerations

Therefore the physiotherapy can be the treatment at the first moment after a condyle fracture, but the team should be careful in follow-up to know the moment that present malocclusion and the orthodontic treatment could be necessary. Guide parents and their support is important to instruct their children in therapy and to be successful. The authors consider this therapy good management, but researches and a recent systematic review need to be performed to strengthen our approach.

References

- Anehosur, V., Kulkarni, K., Shetty, S., & Kumar, N. (2019). Clinical outcomes of endoscopic vs retromandibular approach for the treatment of condylar fractures-a randomized clinical trial. *Oral surgery, oral medicine, oral pathology and oral radiology*, 128(5), 479–484. <https://doi.org/10.1016/j.oooo.2018.12.007>
- Bandy, W. D., Irion, J. M., & Briggler, M. (1997). The effect of time and frequency of static stretching on flexibility of the hamstring muscles. *Physical therapy*, 77(10), 1090–1096. <https://doi.org/10.1093/ptj/77.10.1090>
- Bansal, A., Yadav, P., Bhutia, O., Roychoudhury, A., & Bhalla, A. S. (2021). Comparison of outcome of open reduction and internal fixation versus closed treatment in pediatric mandible fractures-a retrospective study. *Journal of cranio-maxillo-facial surgery : official publication of the European Association for Cranio-Maxillo-Facial Surgery*, 49(3), 196–205. <https://doi.org/10.1016/j.jcms.2020.12.013>
- Boffano, P., Rocca, F., Schellino, E., Baietto, F., Galesio, C., & Berrone, S. (2012). Conservative treatment of unilateral displaced condylar fractures in children with mixed dentition. *The Journal of craniofacial surgery*, 23(5), e376–e378. <https://doi.org/10.1097/SCS.0b013e31825755d3>
- Cassi, D., Magnifico, M., Di Blasio, C., Gandolfini, M., & Di Blasio, A. (2017). Functional Treatment of a Child with Extracapsular Mandibular Fracture. *Case reports in dentistry*, 2017, 9760789. <https://doi.org/10.1155/2017/9760789>
- Cooney, M., O'Connell, J. E., Vesey, J. A., & Van Eeden, S. (2020). Non-surgical management of paediatric and adolescent mandibular condyles: A retrospective review of 49 consecutive cases treated at a tertiary referral centre. *Journal of cranio-maxillo-facial surgery : official publication of the European Association for Cranio-Maxillo-Facial Surgery*, 48(7), 666–671. <https://doi.org/10.1016/j.jcms.2020.05.006>
- Crean, S. T., Sivarajasingam, V., & Fardy, M. J. (2000). Conservative approach in the management of mandibular fractures in the early dentition phase. A case report and review of the literature. *International journal of paediatric dentistry*, 10(3), 229–233. <https://doi.org/10.1046/j.1365-263x.2000.00196.x>
- Du, C., Xu, B., Zhu, Y., & Zhu, M. (2021). Radiographic evaluation in three dimensions of condylar fractures with closed treatment in children and adolescents. *Journal of cranio-maxillo-facial surgery : official publication of the European Association for Cranio-Maxillo-Facial Surgery*, 49(9), 830–836. <https://doi.org/10.1016/j.jcms.2021.04.002>
- El-Huni, A., Colonio Salazar, F. B., Sharma, P. K., & Fleming, P. S. (2019). Understanding factors influencing compliance with removable functional appliances: A qualitative study. *American journal of orthodontics and dentofacial orthopedics : official publication of the American Association of Orthodontists, its constituent societies, and the American Board of Orthodontics*, 155(2), 173–181. <https://doi.org/10.1016/j.ajodo.2018.06.011>
- Ghosh, R., Gopalkrishnan, K., & Anand, J. (2018). Pediatric Facial Fractures: A 10-year Study. *Journal of maxillofacial and oral surgery*, 17(2), 158–163. <https://doi.org/10.1007/s12663-016-0965-8>
- Kaban L. B. (1993). Diagnosis and treatment of fractures of the facial bones in children 1943-1993. *Journal of oral and maxillofacial surgery : official journal of the American Association of Oral and Maxillofacial Surgeons*, 51(7), 722–729. [https://doi.org/10.1016/s0278-2391\(10\)80409-4](https://doi.org/10.1016/s0278-2391(10)80409-4)
- Kim, J. H., & Nam, D. H. (2015). Closed reduction of displaced or dislocated mandibular condyle fractures in children using threaded Kirschner wire and external rubber traction. *International journal of oral and maxillofacial surgery*, 44(10), 1255–1259. <https://doi.org/10.1016/j.ijom.2015.06.004>
- Lee, R., Yeo, S. T., Rogers, S. N., Caress, A. L., Molassiotis, A., Ryder, D., Sanghera, P., Lunt, C., Scott, B., Keeley, P., Edwards, R. T., & Slevin, N. (2018). Randomised feasibility study to compare the use of Therabite® with wooden spatulas to relieve and prevent trismus in patients with cancer of the head and neck. *The British journal of oral & maxillofacial surgery*, 56(4), 283–291. <https://doi.org/10.1016/j.bjoms.2018.02.012>

- Li, M. X., Xing, X., Li, Z. B., & Li, Z. (2021). Classification and treatment strategies for condylar fractures in children. *The British journal of oral & maxillofacial surgery*, 59(7), 776–782. <https://doi.org/10.1016/j.bjoms.2020.09.016>
- Liu, M., Zhao, Y., He, Y., An, J., Lei, J., & Zhang, Y. (2020). Outcomes of anterior disc displacement and condylar remodelling for sagittal fracture of the mandibular condyle in children after closed treatment. *International journal of oral and maxillofacial surgery*, 49(1), 82–89. <https://doi.org/10.1016/j.ijom.2019.03.901>
- Melchers, L. J., Van Weert, E., Beurskens, C. H., Reintsema, H., Slagter, A. P., Roodenburg, J. L., & Dijkstra, P. U. (2009). Exercise adherence in patients with trismus due to head and neck oncology: a qualitative study into the use of the Therabite. *International journal of oral and maxillofacial surgery*, 38(9), 947–954. <https://doi.org/10.1016/j.ijom.2009.04.003>
- Pereira, A. S., Shitsuka, D. M., Parreira, F. J. & Shitsuka, R. (2018). Metodologia da pesquisa científica. UFSM.
- Staderini, E., Patini, R., Tepedino, M., Gasparini, G., Zimbalatti, M. A., Marradi, F., & Gallenzi, P. (2020). Radiographic Assessment of Pediatric Condylar Fractures after Conservative Treatment with Functional Appliances-A Systematic Review. *International journal of environmental research and public health*, 17(24), 9204. <https://doi.org/10.3390/ijerph17249204>
- Steed, M. B., & Schadel, C. M. (2017). Management of Pediatric and Adolescent Condylar Fractures. *Atlas of the oral and maxillofacial surgery clinics of North America*, 25(1), 75–83. <https://doi.org/10.1016/j.cxom.2016.10.005>
- Thorén, H., Hallikainen, D., Iizuka, T., & Lindqvist, C. (2001). 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 : official journal of the American Association of Oral and Maxillofacial Surgeons*, 59(7), 768–774. <https://doi.org/10.1053/joms.2001.23369>
- Vesnaver A. (2020). Dislocated pediatric condyle fractures - should conservative treatment always be the rule?. *Journal of cranio-maxillo-facial surgery: official publication of the European Association for Cranio-Maxillo-Facial Surgery*, 48(10), 933–941. <https://doi.org/10.1016/j.jcms.2020.08.001>
- Wainwright, D. J., Moffitt, J. K., Bartz-Kurycki, M., Wainwright, D. J., Anderson, K., Demian, N., Teichgraber, J. F., & Greives, M. R. (2019). The Trends of Pediatric Facial Fractures Due to Violence in a Level One Trauma Population. *The Journal of craniofacial surgery*, 30(7), 1970–1973. <https://doi.org/10.1097/SCS.00000000000005613>
- Youssef, P., Povolotskiy, R., Mukherjee, T. J., Kandinov, A., & Paskhover, B. (2018). Pediatric facial injuries: Hitting close to home. *Journal of cranio-maxillo-facial surgery: official publication of the European Association for Cranio-Maxillo-Facial Surgery*, 46(9), 1539–1543. <https://doi.org/10.1016/j.jcms.2018.05.054>
- Zhao, Y. M., Yang, J., Bai, R. C., Ge, L. H., & Zhang, Y. (2014). A retrospective study of using removable occlusal splint in the treatment of condylar fracture in children. *Journal of cranio-maxillo-facial surgery: official publication of the European Association for Cranio-Maxillo-Facial Surgery*, 42(7), 1078–1082. <https://doi.org/10.1016/j.jcms.2012.07.010>
- Zimmermann, C. E., Troulis, M. J., & Kaban, L. B. (2005). Pediatric facial fractures: recent advances in prevention, diagnosis and management. *International journal of oral and maxillofacial surgery*, 34(8), 823–833. <https://doi.org/10.1016/j.ijom.2005.06.015>