CASE REPORT

Jurnal Radiologi Dentomaksilofasial Indonesia December 2022, Vol. 6, No. 3: 113-8
P-ISSN.2685-0249 | E-ISSN.2686-1321

http://jurnal.pdgi.or.id/index.php/jrdi/index

Assessment of parasymphysis and ramus fractures in pediatric patients using panoramic radiographs and CBCT: a case report

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ABSTRACT

Objectives: This case report aims to identify fractures that occur through panoramic radiographs and evaluated by CBCT after being given treatment.

Case Report: A 12-year-old male patient came with his older brother to the emergency room (ER) RSKGM/Bandung Dental Hospital due to the trauma of a fall by an iron football goalpost while playing soccer which caused the patient to fall onto the grass field. The patient was experiencing continuous bleeding. Systemic and allergic history was denied. Extraoral examination showed bruising with no facial asymmetry. Intraoral examination revealed a vertical gap between teeth 42 and 43, the jaw within the site was mobile, and active bleeding especially from lingual lacerations. After consulting with Dental Surgery Specialist, the emergency room doctor gave interdental wiring. After 2 months post wiring, a CBCT photo evaluation was carried out.

Conclusion: The mandibular fracture in this case report was well identified by clinical examination and supported by panoramic radiography. After that the patient was given treatment and evaluated through CBCT. CBCT provides a clearer and better picture.

Keywords: *Fracture, parasymphysis, ramus, panoramic, cone-beam computed tomography*
Cite this article: Romdlon MA, Ramadhan FR, Epsilawati L, Kusumawardhany DF. *Assessment of parasymphysis and ramus fractures in pediatric patients using panoramic radiographs and CBCT: a case report.* Jurnal Radiologi Dentomaksilofasial Indonesia 2022;6(3)113-8. https://doi.org/10.32793/jrdi.v6i3.930

INTRODUCTION

A fracture is a break or discontinuity of a bone, tooth or hard body structure.[1] Fractures are the main result of trauma. Maxillofacial trauma is a complex injury involving facial bone injuries, soft tissue injuries, and dentoalveolar injuries.[2] Articles describing mandibular fractures have been found since 1650 BC in the Edwin Smith Papyrus.[3] Getting a precise epidemiological picture of facial trauma globally in the world is very difficult, because it depends on variations in geography, demography, economy and even occupation (civil or military). In developing countries, there is an increase in facial injuries, this is due to an increase in imports of new and used vehicles, an increase in the movement of vehicles on the road, the movement of people from rural to urban areas, poor road conditions, driving under the influence of alcohol, people's non-compliance with traffic regulations, such as the use of seat belts and helmets. Other factors that occur due to assault (fights), sports, industrial accidents or trauma at work due to falls.[3]

The incidence of facial fractures of the mandible in America is second only to nasal fractures. A study conducted by Morris et al in 2015 explained that of 4143 mandibular fractures in 2828 patients managed, 27% occurred in the angle, 21.3% in the symphysis, 18.4% in the condyle and sub condyle and 16.8% in the mandible.[4] Observations made in Taiwan on the incidence of fractures in the mandible also rank high.[5] According to Yadav et al. (2012) there are some parts of the mandible that do have weaknesses, making it easier for fractures to occur, namely in areas that have lost teeth, condyle neck, symphysis, and angle.[6] Fractures in children are less common than in adults.[7] These things are related to children's activities that result in falls, traffic accidents, and exceptions may occur.[8]

The high incidence of fractures in the face, makes a dentist must assess what imaging should be used according to the indications we can plan treatment appropriately. The use of panoramic radiographs is an alternative (first choice) for dentists to find patients with fractures in the facial area. A better supporting modality can be used CBCT to get a clearer image. This case report aims to identify fractures that occur through panoramic radiographs and evaluated by CBCT after being given treatment.

CASE REPORT

A 12-year-old male patient came with his older brother to the emergency room (ER) RSKGM/ Bandung Dental Hospital due to the trauma of a fall

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Received on: October 2022
Revised on: November 2022
Accepted on: December 2022

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by an iron football goalpost while playing soccer which caused the patient to fall onto the grass field. The patient was experiencing continuous bleeding. Systemic and allergic history was denied. Extraoral examination showed bruising with no facial asymmetry. Intraoral examination revealed a vertical gap between teeth 42 and 43, the jaw within the site was mobile, and active bleeding especially from lingual lacerations (Fig. 1). Hecting was performed and the bleeding stopped. A radiological examination in Universitas Padjadjaran Dental Hospital was referred. The panoramic radiograph (Fig. 2) shows an oblique radiolucent line between the alveolar bone of teeth 42 and 43 complete to the inferior cortical border of the mandible. The other line on the left mandibular ramus is visible but not clear. CBCT examination was performed to confirm the fracture findings.

The results of CBCT showed that the fracture line of the mandibular parasymphysis (Fig. 3) and the oblique fracture line of the ramus (Fig. 4) were non-complete. After the radiograph was taken, the patient returned to the ER. After consulting with Dental Surgery Specialist, the emergency room doctor gave interdental wiring (Fig. 5). After 2 months post wiring, a CBCT photo evaluation was carried out. The CBCT result (Fig. 6) showed the patient's occlusion was achieved. Furthermore, the patient was advised to consult an oral surgeon at another hospital in accordance with the patient's health insurance requirements.

DISCUSSION

Fractures in the parasymphysis area are more common because the bone in this area is thin as a result of the long canine root. The position of the region that appears more prominent also affects the incidence of symphysis and parasymphysis fractures. This is in line with a study conducted by Kaur in 2019, which explained that the most cases of fractures were found in the mandible in the parasymphysis region.[9] The incidence of fractures in the mandibular ramus area is indeed smaller than fractures in the parasymphysis, this is in accordance with a study conducted by Putri in 2015 in Riau who obtained data on ramus fractures that occurred 1.7% and Habibi in 2016 in Banjarmasin who obtained data that ramus fractures occurred only 1.4%. Both studies described the incidence of fractures based on their anatomy.[10,11] The low incidence of fractures in the ramus as a result of the anatomy that protects the area, for example, being in the back, protected by more soft tissue, strong

Figure 1. Extraoral examination (left picture), and intraoral examination (right picture)

Figure 2. Panoramic radiograph showed a line in right parasymphysis and left ramus (yellow arrow)

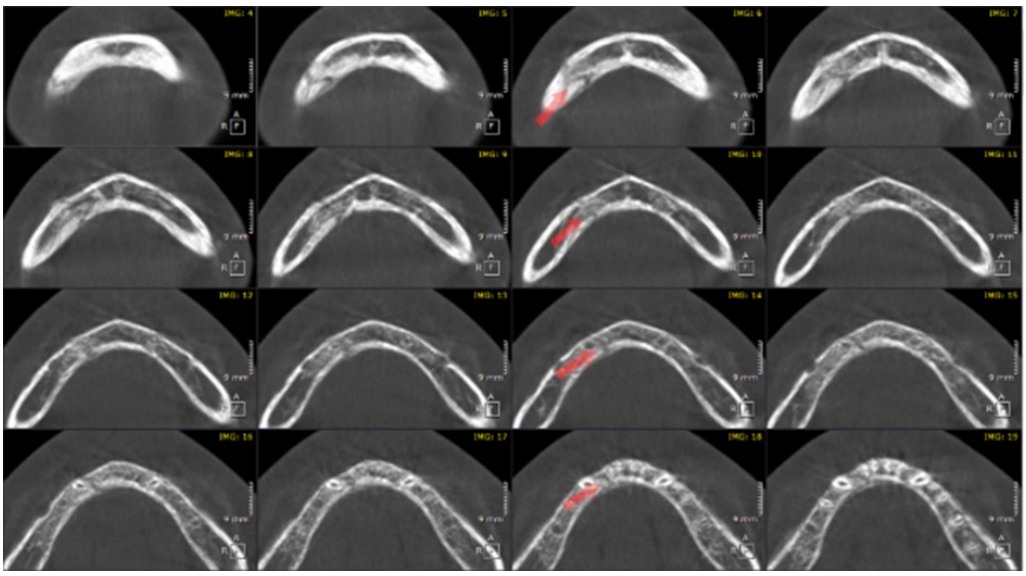

Figure 3. Reformatted CBCT image of the parasymphysis fracture in axial slicing view

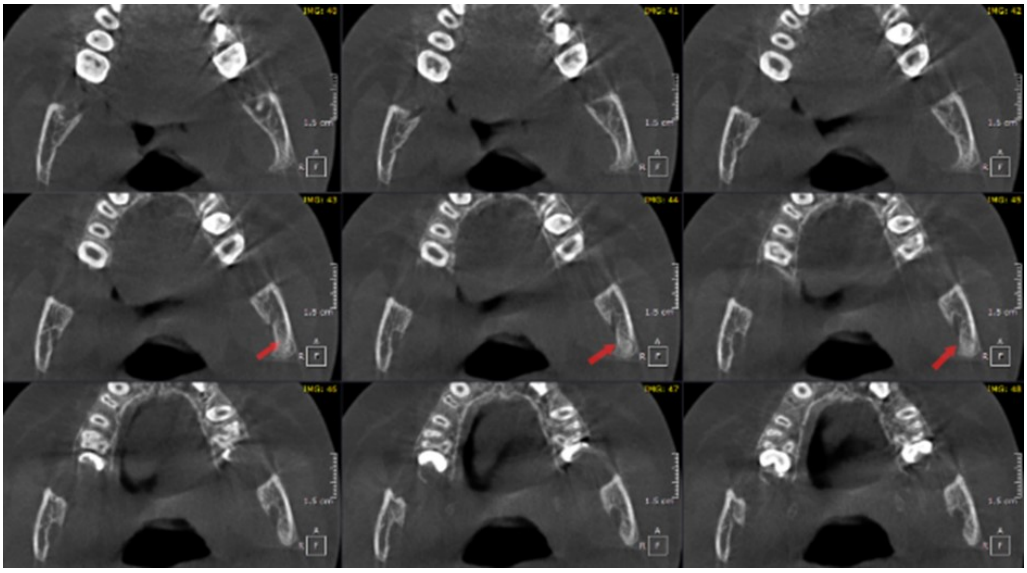

Figure 4. Reformatted CBCT image of the ramus fracture in axial view

Figure 5. Interdental wiring treatment of teeth #42-45

Jurnal Radiologi Dentomaksilofasial Indonesia 2022; 6(3); 113-8 | DOI: 10.32793/jrdi.v6i3.930

muscles in the ramus area resulting in fractures that occur in this area do not allow the bone fragments to undergo large displacement. Because the mandibular body does not have this lateral muscular insertion and most of the muscular insertions are medial, from the chin to the mandible's angle, the muscle does not contain the fracture, favoring larger movement of the bone fragments.[12]

Signs and symptoms of fracture of the mandible can be seen clinically or not at all, so radiographs are needed to confirm the diagnosis. We can do a clinical examination with Bimanual Palpation (by grasping the suspected fracture line and moving the mandible supero-inferior and or antero-posteriorly) and Compression Test (applying pressure on the suspected fracture area, causing tenderness, usually in symphysis fractures) with an undisplaced mandible).[13] Clinically we can see from the patient's occlusion that can change to malocclusion (no contact is found in the upper or lower jaw) after the traumatic event. Soft tissue (gingival and involved oral mucosa (laceration) can also be a sign of the fracture site. According to Yadav there are several things that are signs of fracture in the symphysis and parasymphysis area. Fractures in this area are usually associated with condyle fractures. Ecchymosis appears on the Floor of mouth Cracks that occur are usually subtle and may not be visible when the occlusion is normal. There is tenderness, posterior crossbite in symphysis fractures. Posterior open bite or unilateral open bite in parasymphysis fractures. Possibility of paresthesia of the lower lip as a mental nerve injury. Theory that has been suggested by Yadav, is in line with this reported case.[6] The theory is also in agreement with the signs of a ramus fracture. Fractures that occur in the ramus are usually caused by direct trauma to that side of the face. Usually we can see the presence of swelling and ecchymosis both extra-oral or intra-oral, the patient also feels pain when pressed in the ramus and trismus area so that it is difficult to open the mouth.

The fractures of mandible area are classified based on the following criteria from anatomical locations, site of injury, condition of the bone fragments at the fracture site, according to the direction of the fracture and favorability for treatment, according to severity of fracture, presence or absence of teeth in the jaws, clinical and radiological findings. According to the anatomical location, the fracture in this case is classified as a parasymphysis fracture and a ramus fracture, according to the site of injury, the fracture in this case is a direct fracture (if the pressure received directly damages the region resulting in a fracture in that area). If based on the condition of the bone fragments at the fracture site, it is a simple fracture (a fracture that does not result in fragment displacement, the fracture fragment is not exposed and the mucosa and skin area around the area still looks good). If classified based on the direction of the fracture and favorability for treatment, this case is included in the vertical favorable fracture (fracture seen from the occlusal, the fracture line extends from the buccal oblique to the lingual). Based on the classification of presence or absence of teeth in the jaws, this case is classified as Class I (when the teeth remain in the fracture line). Based on clinical and radiological findings, it refers to the AO classification which sees fractures based on radiological findings, clinical examination and soft tissue involvement FLOSA. F refers to the number of fractures, in this case it is included in the F2 category (multiple fractures). L refers to the fracture site, in this case the canine, alveolar process and ramus area (L2, L8). O refers to the occlusion, in this case it belongs to the category O0 (no malocclusion). S refers to soft tissue involvement, in this case S1 (open intraorally). A refers to the associated fracture, in this case it is included in the category A0 (None)[6.13]

Younger patients generally have the potential for better and faster bone remodeling than adult patients. Management of fractures in children differs from adults because of anatomic variation, rapidity of healing, degree of patient co-operation and the potential for changes in mandibular growth. The principle of treatment is control of infection, tooth in the line of fracture, reduction of

Figure 6. CBCT evaluation in one month after post-wiring treatment

fractures, immobilization of the fragments.[14-16] The main goal of treatment is to re-establish the patient's preinjury dental occlusion. Fractures that are nondisplaced and exhibit no occlusal changes may be amenable to nonsurgical management, but the majority of mandible fractures will require stabilization for adequate healing and to restore pretraumatic maxillomandibular orientation. Various treatment strategies have been stated and vary widely depending on the fracture site and surgeon's preference. The patient's demographics, comorbidities, dentition, and fracture characterization will all influence the choice of fixation by the treating surgeon.[17] Open reduction, internal fixation is generally the treatment of choice for symphyseal and para symphyseal fractures, although closed treatment is still an accepted alternative for select patients with simple nondisplaced fractures. In pediatric, fractures are approached differently due to the stage of mixed dentition, the elasticity of the craniofacial skeleton and the potential for remodeling of the bone and fracture site with growth. The high elasticity of the cortical bone accounts for why pediatric mandible fractures are unicortical and minimally displaced.[18] The patient in the present case was treated with closed reduction using interdental wiring. The advantage of closed reduction over open reduction is its cost-effectiveness, lesser surgical trauma to the patient and reduced risk of any iatrogenic trauma to other anatomical structures. Furthermore, the rate of associated complications is less in cases of closed reduction compared to open reduction.[19]

The decision to image a mandibular injury can be justified if a fracture is suspected. Radiologic assessment of mandibular fractures is one of the most important things because it will show the presence or absence of a fracture, show the location and orientation of the fragments, show the involvement of important structures around it or not, and also show the presence of foreign bodies that may be buried in the soft tissue and see the healing process of the treatment given. In general, the signs of a fracture on the radiograph are the presence of one or two well-defined radiolucent lines, changes in the normal shape of the structure, loss of continuity of the outer border or even an increase in the radiopacity of a structure.[20]

It is important for a fracture to be identified quickly. X-ray evaluation of a mandibular fracture follows a set mandibular series, which involves three views: a posteroanterior (PA), oblique and lateral view. Panoramic X-rays is a supplemented view and images the entire mandible in a one-dimensional plane. They subsequently are the most informative radiograph and are move sensitive in detecting a mandibular fracture in comparison to other X-ray views. The limitation of this modality is prone to artefact. Several x-ray views are obtained at different projections to identify all visible fracture lines and the displacement.[21] In this case, Panoramic was the first choice of technique. The results show a great visibility in detecting parasymphisis fracture but failed to recognize other fractures. CBCT is the next option technique that used to assess other finding and evaluating the trauma in this case. Particularly, CBCT has proved satisfactorily recognize mandibular fracture. In addition, the benefit of a 3D reconstructed view allows excellent detail in evaluating fracture. However, an adequate image quality must be evaluated at the first place before detecting fracture.[22]

CONCLUSION

The mandibular fracture in this case report was well identified by clinical examination and supported by panoramic radiography. After that the patient was given treatment and evaluated through CBCT. CBCT provides a clearer and better picture.

FOOTNOTES

All authors have no potential conflict of interest to declare for this article. Informed consent was obtained from the patient for being included in this case report.

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