CASE REPORT

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Mandibular osteomyelitis on panoramic radiographs: a case series

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ABSTRACT

Objectives: This series of cases aims to see an extension of a lesion using panoramic radiographs to help establish a diagnosis in three cases in the mandible. Osteomyelitis occurs more often in the mandible than in the maxilla because the maxilla has a better blood supply than the mandible, with relatively thinner cortical and fewer medullary cavities.

Case Report: Three female patients presented with nearly identical complaints, including frequent pus discharge, unpleasant odor, and swelling. Only two of the patients had a history of tooth extraction. All three were referred to the university dental hospital (RSGM) for further management. Panoramic radiographs revealed similar findings among the three cases, including mixed radiopaque -radiolucent images with irregular shapes and diffuse borders. In two patients, sequestra were visible in the right and left corpus regions of the mandible. In contrast, the third patient showed a slightly different presentation: a well-defined, irregular radiopaque mass protruding from the top of the alveolar bone, localized at the crest of the ridge. One of the patients had a history of systemic diseases, specifically hypertension which was under control.

Conclusion: In these three cases, a panoramic X-ray examination was the only support for identifying the characteristics of lesion expansion and was considered sufficient as a reference for patient management. However, a definitive diagnosis still requires a histopathological examination.

Keywords: *Mandible, osteomyelitis, panoramic radiograph, sequestrum*
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INTRODUCTION

Osteomyelitis of the jaw is a relatively rare infectious disease caused by systemic conditions such as hematogenous spread, bone disorders, or vascular diseases, as well as local odontogenic or non-odontogenic infections in the oral and maxillofacial region.[1] The term *osteomyelitis* is derived from the ancient Greek words *osteon* (bone) and *muelos* (marrow), referring to an infection of the medullary portion of the bone, affecting the spongiosa, bone marrow, cortex, and periosteum.[2] Infection occurs in calcified bone when fluid accumulation in the medullary cavity or beneath the periosteum compromises the blood supply.

Jaw osteomyelitis can be difficult to treat, particularly in its chronic form, which tends to recur.[3] Early phase of acute osteomyelitis, typically within the first 2 to 3 days, radiographic imaging often appears normal. Initially, the infected bone loses its structural detail and is poorly demarcated. However, after 6 to 7 days, signs such as osteopenia, cortical bone destruction, periosteal reaction, and involucrum formation begin to appear. By the 10th day, sequestra may be visible.

In chronic osteomyelitis, sequestra can be observed on plain radiographs as focal sclerotic lesions with opaque margins. The sequestrum is an avascular segment of bone, and in some cases, an entire long bone may become sequestered. This creates a favorable environment for microbial persistence and can lead to recurrent infections. The involucrum appears as thickened, sclerotic bone surrounding the sequestrum. Cortical destruction may also be evident, along with irregular trabecular patterns and an indistinct bone lumen.[4] Acute osteomyelitis is a hematogenous infection that primarily affects prepubertal children and the elderly. Chronic osteomyelitis has two main origins: it may result from an inadequately treated case of acute osteomyelitis or from the continuous spread of chronic ulcers.[5]

Osteomyelitis of the jaw has typical clinical symptoms of recurrent pain and swelling of the cheek, and trismus, and the presence of pus and/or fistula and/or sequestration is characteristic of the suppurative variant, thus distinguishing it from the non-suppurative variant.[6] Osteomyelitis is classified into chronic or acute suppurative osteomyelitis, chronic, focal, or diffuse sclerosing osteomyelitis, and osteomyelitis of Garre. Chronic diffuse

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sclerosing osteomyelitis mainly occurs in the mandible and is characterized by a long history of pain and recurrent inflammation. Although chronic suppurative osteomyelitis is less common, it usually arises as a complication of tooth extraction and commonly occurs in adults.[7]

The oldest known case of mandibular osteomyelitis occurred in the Pleistocene epoch about 1.6 million years ago and the fossilized jaw of a 12-year-old homo erectus skeleton was found in Kenya.[8] Osteomyelitis in the mandible is more common than in the maxilla due to its dense and poorly vascularized cortical layer and blood vessels originating from the inferior alveolar neurovascular pool. The maxillary bone, on the other hand, is less dense and receives blood vessels from many blood vessels, thus being more resistant to the development of osteomyelitis.[9 10] In the mandible, the most common sites are the symphysis, mandibular corpus, mandibular ramus, and condyle.[11]

The posterior region of the mandible is the most commonly affected area, and oral microorganisms can reach this area through the periodontal ligament or hematogenous spread.[12] Panoramic radiography (Orthopantomography or OPG) is a radiographic technique to produce images of the fascial structures that include the maxillary and mandibular dental arches and supporting structures such as the maxillary antrum, fossa nasalis temporomandibular joint, and hyoid bone in a single film image (White and Pharoah, 2000).[13] Radiographic techniques play an important role in the early diagnosis and follow-up of inflammatory conditions in the jawbone. The importance of radiography and imaging in cases of osteomyelitis of the jaw has been well documented in the literature. Worth and Stoneman stated that imaging of osteomyelitis is done with conventional radiographs.[14] Until now, conventional radiographs are still used to check for alveolar bone loss that occurs due to periodontal disease. Conventional radiographs provide information about the periodontium's status and a permanent bone record throughout the disease.[15] One of them is a panoramic radiograph which was used to look at the bone structure in the three patients who had osteomyelitis.

The purpose of writing this case report is to be more familiar with osteomyelitis when viewed from supporting examinations such as panoramic radiographs and associated with other clinical examinations.

CASE REPORT

This article reports three cases of osteomyelitis findings in the mandible in the form of radiolucent and radiopaque lesions in the posterior of the left and right mandible on panoramic radiographs.

The first case was a 48-year-old female patient who presented with complaints of frequent pus discharge and odor on the left lower gum since ± 1 year ago. Initially ± 1 year ago the patient complained that the left lower back tooth was painful and swollen until it broke and released pus so the patient went to the nearest dental clinic and was given 3 kinds of drugs, namely dexamethasone

Figure 1. Images of extra oral (A), intra oral RA (B) and intra oral RB.(C)

Figure 2. Panoramic radiograph shows lesion and bone sequestration in the periapical region of teeth 35 36

and other drugs that the patient forgot the name. History of lower left back tooth extraction in 2017.

History of swollen gums but no pain ± 2 weeks ago and the patient checked himself to the nearest clinic and was given 1 type of medicine which the patient did not know the name of. There were complaints of visible bone but no complaints of bone fragments coming out of the left lower jaw. Because the complaints of swelling and pus discharge still existed, ± 2 days ago the patient was referred to the RSGM for further treatment Performed preoperative routine clinical examination. Extraoral examination revealed facial symmetry with normal mouth opening. Intraoral examination showed an enlargement of the vestibular mucosa adjacent to tooth 36, measuring approximately 1.0 × 0.7 × 0.5 cm, accompanied by a fistula, hyperemia (+), tenderness on palpation (+), and purulent discharge (+). The residual roots of teeth 35 and 36 exhibited hyperemia (+), with no tenderness on percussion (-) or palpation (-). Residual roots were also noted in teeth 15, 16, and 25, all presenting with hyperemia (+) but without tenderness on percussion (-) or palpation (-). Profunda caries were identified in teeth 24 and 34, with no associated hyperemia (-), percussion tenderness (-), or palpation tenderness (-). The residual root of tooth 46 showed no signs of hyperemia, percussion tenderness, or palpation tenderness (all -). Edentulous ridges were present in the regions of teeth 37 and 47. The presence of calculus was noted (+), and the patient exhibited moderate oral hygiene (Figure 1).

The patient was referred to the radiology department of dentistry for a panoramic radiographic examination. After obtaining the radiograph results, it was found that there were 2 pieces of root residue in teeth 35 and 36, the periodontal ligament space and lamina dura disappeared, and there was a mixed radiopaque radiolucent irregularly shaped diffuse border with enlargement and irregular contours of the mandibular canal. There was a picture of bone sequestration in the corpus region of the mandible sinistra, and sclerosing osteitis appeared in the periapical teeth 35, 36 (Figure 2), Based on the history, clinical findings, and supporting examinations, the case was diagnosed as suspected chronic suppurative osteomyelitis of the left mandible, likely originating from teeth 35 and 36.

Case management includes, sequesterectomy, fistulectomy + tooth extraction 15 16 23 24 34 35 36 46 under general anesthesia, a flap incision is made in the front area of tooth 35 to the posterior then tooth 35 36 is extracted and the sequester tissue is removed with the help of a bone bur accompanied by irrigation with 0.9% NaCl solution. Granulation tissue under the sequester was cleaned until it appeared healthy bone with bleeding. then the intra-oral flap was returned and primary suturing was done with silk 4.0 and extraoral with silk 6.0. The patient was discharged one day later without any complaints and the intra-oral condition of the post-wound suturing area was seen.

A second case, a female patient aged 24 years, came with complaints of pus discharge on the right cheek near the ear. Initially ± 2 years ago the patient complained that the right lower back tooth with cavities often felt pain and swelling, the patient then went to the health center and was

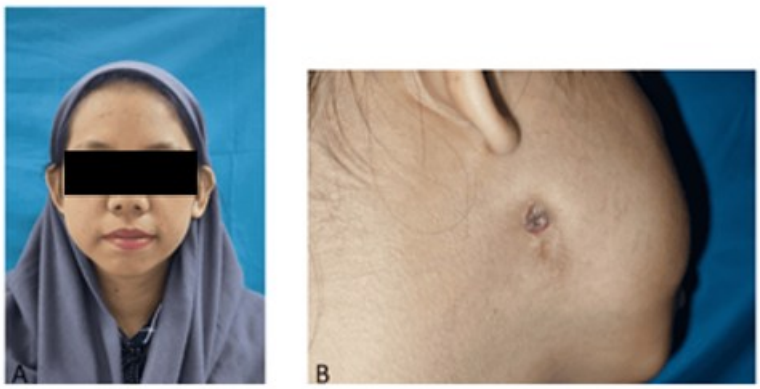

Figure 3. Extraoral image showing a symmetrical face (A), and extraoral cutaneous fistula on the dextra mandible (B)

Figure 4. Intraoral images of edentulous ridge of tooth 46-48 right mandible

Figure 5. Panoramic radiograph showing the extraction socket in the edentulous teeth 47,48, bone sequestration in the corpus mandibular region dextra

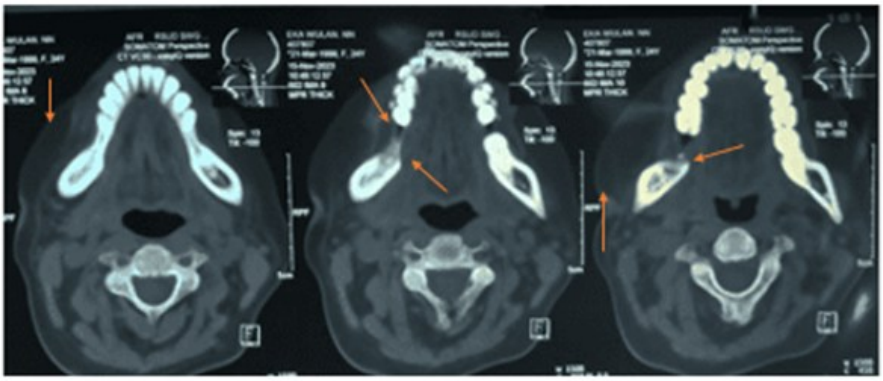

Figure 6. The axial CT scan corresponding to the OPG is shown in Figure 3 with a more detailed picture of osteolysis in the posterior side alveolar bone of the edentulous mandible dextra

given 3 kinds of drugs which the patient forgot the name of, after taking the drug, the patient still felt pain and swelling. The swelling increased and the patient felt that the swelling became reddish with pus discharge. Because there was no change, ± 3 months ago the patient then took the initiative to go to a private clinic and extracted the right lower second molar, after the extraction the swelling decreased but still oozed pus. The patient was then referred to the dental clinic of the oral surgery department at the regional general hospital in October 2023, then a roentgen photo examination was carried out, surgical extraction of the right lower wisdom tooth, fistula closure, and jaw bone reconstruction due to chronic infection.

The swelling decreased, but 2 weeks after surgery, a pimple-like swelling appeared on the right cheek and ± 1 week later pus was released. The patient was then referred to RSGMP Hasanuddin University for further management and routine preoperative clinical examination was performed. On extraoral clinical examination, the patient's face was symmetrical with a normal mouth opening. A fistula was observed in the right preauricular region, measuring approximately 1.0 × 0.7 cm. Intraoral examination revealed edentulous areas in regions 46–48 and 36, the presence of calculus (+), and moderate oral hygiene (Figure 3). The patient was then referred to the dental radiology installation for a panoramic radiographic examination. After obtaining the radiograph results, it was found that there was a more radiopaque extraction socket in the edentulous teeth 47 48, a mixed radiopaque radiolucent irregularly shaped diffuse border with irregular contours of the mandibular canal. Bone sequestration of the dextra mandibular corpus region was seen (Figure 4). In addition to the panoramic radiograph, the patient also had a CT scan and to further confirm the diagnosis, we can see the CT scan reconstruction of the axial section (Figure 5). Based on the history, clinical findings, and supporting examinations, the case was diagnosed as suspected recurrent chronic suppurative osteomyelitis of the right mandible.

For the third case, a 43-year-old female patient presented with complaints of an enlargement in the right lower gum area. About ± 3 years ago the patient felt that there was an enlargement in the right gum area which was getting bigger and bigger, but did not hurt. There was a history of remaining tooth roots in the enlargement area which had never been extracted. There is no history of complaints of discharge from the swelling area.

Because it began to feel disturbing, the patient then checked his condition at the health center in Raja Ampat and was referred to RSUD Sorong City, and immediately referred to RSGMP Hasanuddin University for further treatment. A routine

Figure 7. Panoramic radiograph: the sunray appearance are showed in the red arrow

Figure 8. Panoramic Radiograph View of the edentulous region of tooth 46, showing a radiopaque lesion of the mandible dextra

preoperative clinical examination was performed. On extraoral clinical examination, the patient's face was symmetrical with normal mouth opening. Intraoral examination revealed an enlargement in the region of tooth 46, measuring approximately 2.0 × 2.0 × 1.5 cm, with a hard consistency, no crepitation (-), and no tenderness on palpation (-). The lesion was the same color as the surrounding tissue. Radix gangrene was noted in tooth 48, with no gingival hyperemia (-) or palpation tenderness (-). Moderate calculus was present (+), and the patient exhibited moderate oral hygiene (Figure 7).

The patient was then referred to the dental radiology installation for a panoramic radiographic examination. After obtaining the radiograph results, it appears that in the edentulous region of tooth 46, an irregular radiopaque mass with clear boundaries is found protruding on the crest of the alveolar bone and appears to be bulging, the lesion is localized in the area of the crest of the bone and appears to be separated from the overall trabecular bone, it appears that the radiopaque lesion found in the dextra mandible can support the suspicion of osteomyelitis sclerosis Another possible differential diagnosis is a mixed tumor (radiopaque) such as odontoma or osteoma (Figure 8).

In the third case, the diagnosis was somewhat the diagnosis was somewhat different from the previous two cases where the two cases above were only suspected of chronic suppurative osteomyelitis while the third case was found to have a mixed tumor such as odontoma or osteoma.

DISCUSSION

This case report looks at how osteomyelitis was found in three patients who had undergone panoramic radiographic examination, and shows that the development of osteomyelitis can be different for each individual as well as the causes of osteomyelitis and how osteomyelitis can recur in one of the patients, this diagnosis was obtained from panoramic radiographic findings and supported by clinical examination both extra-oral and intra-oral. One of the patients had slightly different radiographs from the two patients which were osteomyelitis and the other patient had osteomyelitis mixed with odontoma or osteoma.

All three cases were seen in the mandibular area precisely in the posterior area of the mandible dextra and sinistra. All three patients with these lesions were female with an adult age of 21-55 years, this is by some literature mentions that these lesions are more common in adulthood and some studies that obtained prevalence figures based on gender showed that women are more common. Radiographically, all three cases showed bone damage to the posterior mandibular corpus dextra and sinistra. Various classification systems are used

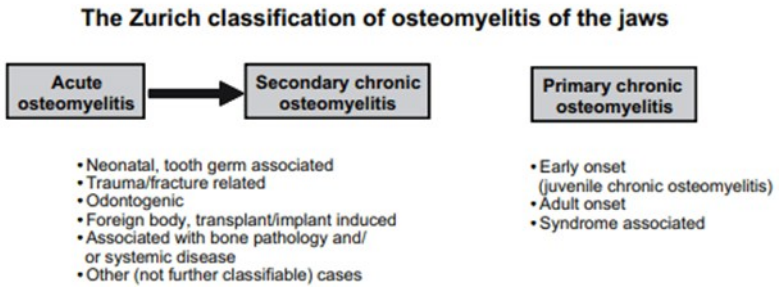

Figure 9. Zurich classification, osteomyelitis of the jaw[2]

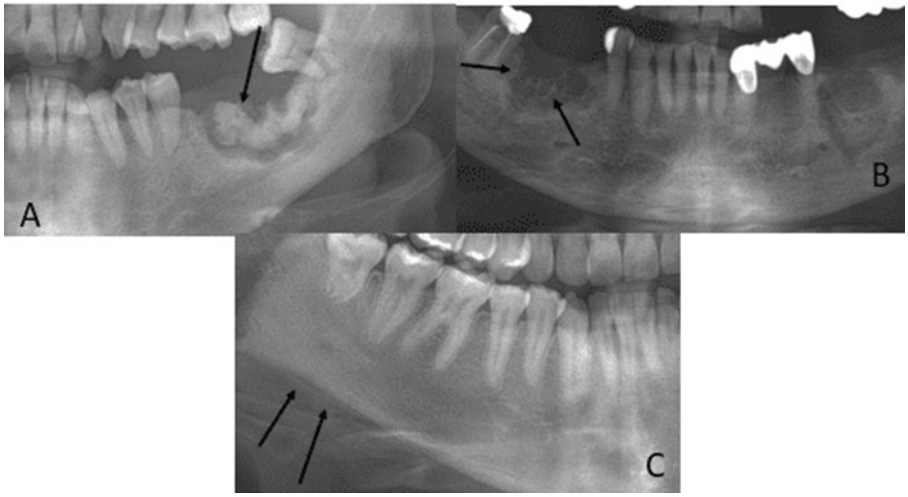

Figure 10. Representative panoramic radiography shows sequestrum (A), retracted socket (B), and formation of new periosteal bone (C)[17]

to describe osteomyelitis of the long bones and jaws. The Zurich classification is currently the most widely used system. It organizes osteomyelitis as acute or chronic, with the latter sub-category being primary (non-suppurative) or secondary (suppurative) (Figure 9).[3,8,14,22]

In the third case, we can see that osteomyelitis can be accompanied by other diseases such as suspected osteomyelitis mixed with odontoma or osteoma, as in other cases it can also be accompanied by osseous dysplasia and other examples of cases found also osteomyelitis mixed with bell palsy which shows the facial asymmetry of the patient.[15,16]

A 54-year-old female patient presented with complaints of pain in the jaw after a tooth extraction 1 month ago. The pain disappeared, and the patient also complained that her face appeared bluish color (bruise) which was getting wider and wider. The patient also felt like her face was not symmetrical right and left. Extraoral examination revealed a bluish color on the right side of the face. In the motor examination of the facial muscles, facial asymmetry was seen when the patient was instructed to raise his eyebrows and when the patient smiled. Intra-oral examination revealed post -extraction socket of tooth 44 with visible bone around socket 44 and extending to tooth 43 region and a little pus was found in the region. On radiographic examination, a picture was similar to a bone sequester in the dextra anterior mandible .[16]

Chronic diffuse sclerosing osteomyelitis/ tendoperiostitis of the mandible is difficult to treat and many different treatment options have been reported in the literature.17 Thus, one of the above cases had recurrent osteomyelitis which took a long time to heal and could depend on the management which involved antibiotic therapy and surgical treatment including tooth extraction, necrosis removal, abscess drainage, or fistula healing. Over the past decade, bisphosphonate therapy appears to be a promising treatment option for mandibular DSO/TP, in addition to conservative treatment.[18,19]

Osteomyelitis is also found in children and adolescents, radiographic examination usually determines the diagnosis of chronic adolescent mandible with typical findings including enlargement and changes in mandibular contour, periosteal reaction, partial destruction of the cancellous cortical border, lytic areas, enlargement of the mandibular nerve canal, and a sclerotic "ground glass appearance" or radiopaque-radiolucent mixed bone pattern.[20]

Chronic osteomyelitis of the jaw can be caused by low-virulence infections such as caries, periodontitis, tooth eruption, and tooth extraction

sites. Clinical symptoms of suppurative chronic osteomyelitis of the mandible include localized pain, malaise, fever, and anorexia.[21] After 10 - 14 days after the onset of suppurative osteomyelitis, the involved teeth begin to experience mobility and are sensitive to percussion, pus oozes around the gingival sulcus or through mucosal and cutaneous fistulas, halitosis is usually found, enlarged bone dimensions due to increased periosteal activity, abscess formation, erythema, soft when palpated. Trismus can sometimes occur.[22,23] As in the three cases above, we can see that two patients had osteomyelitis caused by tooth extraction and one patient had a cutaneous fistula.[21,22,23]

Adequate and rational application of radiology and imaging is directed towards recognizing, describing, and confirming the local source and extent of infection in the maxilla or mandible. Furthermore, it also helps to identify whether it is a soft tissue or hard tissue infection and helps to diagnose the lesion differently from similar lesions, such as osteonecrosis. In other cases, the radiographic changes may be indistinguishable from the more chronic phase of osteomyelitis with increased bone sclerosis and sequestra.[24] The first sign of osteomyelitis is a loss of trabecular bone structure resulting in an area of radiolucency that is commonly associated with an empty tooth socket or diseased tooth. Early radiographic indicators may be expansion of the periodontal ligament space or damage to the lamina dura.[24]

Panoramic radiographs are the only means of diagnosis and prognosis follow-up in osteomyelitis patients, the most common finding on panoramic radiographs is a mixed pattern of osteolysis and sclerosis, and the second most common finding is an osteolytic bone pattern. Sequestra was observed in 143 cases (42.1%), and periosteal new bone was found in 24 cases (7.1%) (Figure 10).[10 12] Computed Tomography (CT) is useful for evaluating chronic osteomyelitis in complex anatomical regions and can clearly show the interhemispheric relationship between the area of infection and important surrounding structures. CT can provide information regarding the presence of sequestrum, cloaca, cortical damage, and thickness of the involucrum. CT is more accurate for viewing sequestrum than plain photographs and MRI. In addition, it can also help guide a neddle biopsy.neddle biopsy and fluid aspiration for microbiologic examination. However, due to the high radiation dose, CT should be used with caution in children.[4]

From the above discussion, we can see clearly and can distinguish what happens to the mandibular bone, sequestrum, socket of former extraction, and new bone formation from the results of panoramic radiography, then in the three cases above we can see the sequester in the mandibular bone dextra and sinistra and the socket of former extraction from all the information that can be obtained on the results of panoramic radiographs of the three patients in this case report and the presence of clinical symptoms accompanying the lesion, the radiodiagnosis of chronic suppurative osteomyelitis or diffuse sclerosing osteomyelitis can be confirmed properly.

CONCLUSION

In these three cases, panoramic radiography was the only tool used to assess the characteristics of lesion expansion and was considered sufficient as a reference for patient management. However, establishing a definitive diagnosis still requires a histopathological examination. That said, in some cases, histopathological examinations are not always performed, and diagnoses may rely solely on clinical evaluations and supporting imaging, such as panoramic radiographs.

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None.

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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