LESIONS OF THE MANDIBLE - A PATTERN BASED APPROACH TO DIAGNOSIS BY OPG

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ABSTRACT

The present study of 95 orthopentograms focused on importance of OPG as a first line of investigation in the diagnosis of mandibular lesions and establish its role beyond doubt in some the conditions due to its pathognomonic appearance. It also narrows down the list of differential diagnosis.

INTRODUCTION

Mandibular lesions cause a variety of problems ranging from swelling, tooth mobility, displacement of adjacent teeth, mild sensitivity, root deformation of developing permanent teeth and potential to expand the bone causing fractures. Some of these mandibular lesions are silent in their progression and pose a challenge in early diagnosis for clinicians. Radiographic characteristics such as location, margin, density, relation to tooth, along with clinical notes is the first step in interpreting mandibular pathologies. Orthopentogram is a simple, accurate and cost effective technique commonly employed for diagnosing dental and maxillofacial lesions. We retrospectively evaluated spectrum of mandibular lesions from a database of groundwork diagnostic OPGs.

METHODS

We reviewed a total of 2690 orthopentograms of patients with tooth ache and/or swelling, referred to the radiologist for the preliminary diagnosis. All osteolytic lesions more than 10 mm. and having characteristics of root abscess were included for evaluation. OPG taken for orthodontic work up, showing dental abscess less than 10 mm and OPG of patients with Gingival and T.M. joint pathologies were excluded.

RESULTS

In our study, we found 0.35% (95/2690) of patients were having a spectrum of mandibular lesions. The frequency of appearance of mandibular lesions on OPG was buccal-neoplasm>dentigerous-cysts>dental-cyst>neoplastic=traumatic-bone-cyst= osteomyelitis >kerato-cyst. The most frequent sites of these lesions were 80/103(77.6%) molars, 14/103(13.6%) incisors, and 9/103(8.7%) angle of mandibles. No lesions were found on condyles.

CONCLUSION

The present study proves that OPG is a first line of investigation when any mandibular pathology whether dental origin or otherwise is suspected because few of the pathologies like dentigerous cyst, dental cyst, multiple myeloma, contagious spread of known malignancy has characteristic radiological appearances, therefore it not only pin points some of the pathologies precisely & certainly narrows the differential diagnosis in remaining conditions, therefore it should be applied as first line of investigation in all cases of suspected mandibular pathologies.

KEYWORDS

Mandibular lesions, Orthopentogram, Pattern based approach.

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INTRODUCTION: Tooth mobility or jaw fractures are some of the serious problems that arise as a consequence of mandibular lesions. Mandibular lesions are either cystic or solid in appearance and can be either malignant or benign. Even benign odontogenic cysts may too cause serious problems. (1)

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Radiological imaging by orthopentograms (OPG) play an important role in the early diagnosis and treatment planning of a wide range of dental and maxillofacial diseases and conditions. On OPG imaging, mandibular lesions appear as either radiolucent or radio dense or mixed pattern lesions. (2)(3) Both focal and diffuse types have also been described. (4) Some lesions such as dentigerous cyst and dental cyst have a pathognomonic appearance. It is very useful in grading malignancies due to its ability to pick contagious spread. The above information motivated us to retrospectively evaluate the radiological spectrum of mandibular lesions from a database of groundwork diagnostic OPGs.

METHODS: The present study was conducted at Bharati Vidyapeeth's Deemed University Hospital and Dhwanikiran Diagnostic Centre, Sangli, during the years July 2013 to August 2015. Ethical committee approved the study proposal. We reviewed a total of 2690 orthopentograms of patients with tooth ache and/or swelling, referred to the radiologist for the preliminary diagnosis. All osteolytic lesions more than 10 mm. and having characteristics of root abscess were included for evaluation. OPG taken for orthodontic work up, showing dental abscess less than 10 mm and OPG of patients with Gingival and T.M. joint pathologies were excluded. All these radiographs were taken using Meditronics-Panorex OPG machine Fujji cr-capsula/dry pix 7000 (figure-1). A singe radiologist reviewed the mandibular lesions on OPG to obtain uniform data. When analyzing the OPGs, clinician's opinion was considered for cases with any disagreement.

DESCRIPTION OF MANDIBULAR LESIONS ON OPG IMAGING: Dentigerous cysts appear as well-defined, unilocular, well-corticated, lucent lesions that are associated with the crowns of impacted or unerupted teeth and usually presents between 30 and 40 years of age. The diagnosis of a follicular cyst should be made when the distance between the crown and the dental sac is superior to 3 mm.[(2)]

Osteomyelitis: Acute suppurative osteomyelitis usually demonstrates no imaging findings in the early stages, whereas chronic lesions display a variety of bone reactions, including radiolucent and radiopaque areas. Low-grade infections can cause sclerosing osteomyelitis, in which bone is deposited along the osseous cortex and trabeculae **[(5)]**.

Solitary Bone Cyst: It is a well-defined unilocular pseudocyst with typical scalloped margin between the roots of normal appearing teeth.[(3)] The majority of Traumatic bone cyst are located in the mandibular body between the canine and the third molar[(6)] and is thought to be the result of a trauma which gives rise to intramedullary haemorrhage.

Dental Cyst: Usually reveal caries tooth and there is chronic history of toothache. It has fairly well defined margins without significant sclerosis.

Keratocystic Odontogenic Tumour (KCOT): Typically seen as a solitary, lucent, unilocular lesion with smooth, corticated borders [(2)] along the length of either the body or ramus of the mandible.

Benign Neoplasm: Invasive mandibular lesions are ill defined mottled translucencies with trabecular bone visible with in mandibular bone or erosion, ill punched out excavating lesion believed to be caused by pressure of tumour rather than infiltration.[(7)]

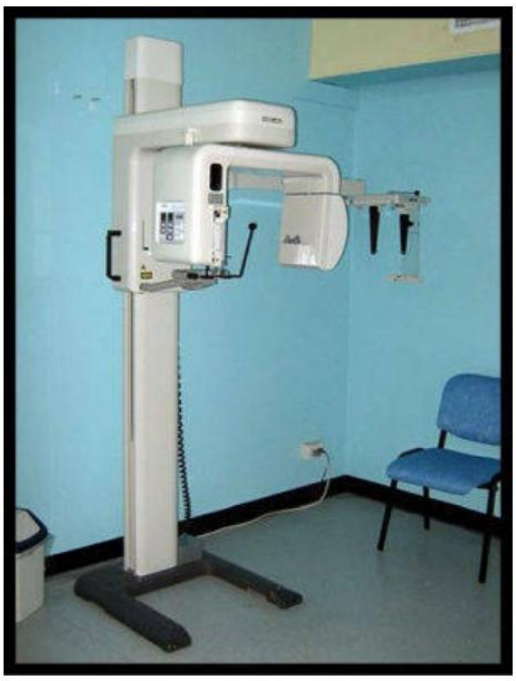
Malignant Neoplasm: Malignant lesions are characterized by lytic osseous changes of varying size, which may be demarcated and expansile or exhibit ill-defined borders. Multiple myeloma is another characteristic appearance of mandible as indicated by multiple punched out lesions.

STATISTICAL ANALYSIS: Data was extracted from the reports of OPGs. Data was entered, mined and cleaned in spread sheet and tabulated using pivotal tables (Microsoft Excel 2007). Continuous data was presented as Mean±SD and categorical as actual numbers and percentages.

RESULTS: A total of 2690 orthopentograms were studied among them, 1675 OPGs were taken for orthodontic work up, 680 OPG showing dental abscess less than 10 mm and 240 Gingival and T.M. joint pathologies. All these OPGs were not considered for analysis. Only 95/2690(0.35%) OPG were included into final analysis. There were 62/95 Males and 33/95 females. A total of 103 lesions were found from these 95 OPGs. Of these mandibular lesions, 36/95(35%) of lesions were contagious spread of buccal neoplasm (Fig-3), 28/95(27.2%) dentigerous cyst (Fig-1), 25/95(24.3%) were dental cysts (Fig-1), 3/95(2.9%) neoplastic lesions (Fig-6,7), 4/95(3.9%) traumatic bone cyst (Fig-1), 4/95(3.9%) osteomyelitis (Fig-2) and 3/95(2.9%) Odontogenic kerato cyst (Fig-5). Evaluation of panoramic radiographs reveals that the most frequent sites of these lesions were 80/103(77.6%) molars, 14/103(13.6%) incisors, and 9/103(8.7%) angle of mandibles. No lesions were found on condyles. False positive diagnosis were zero whereas 3 reports were false negative. The details of the lesions were given in table-1.

Lesions	Incisors	Right Molar	Left Molar	Total Molars	Angle	Condyle	n	%	Male/ Female/ Total
Buccal neoplasm	6	14	16	30	0	0	36	35.0	25/10/35
Dentigerous cyst	3	10	12	22	3	0	28	27.2	15/13/28
Dental cyst	3	9	10	19	3	0	25	24.3	12/13/25
Neoplastic lesions	0	2	1	3	0	0	3	2.9	2/1/3
Traumatic bone cyst	2	1	1	2	0	0	4	3.9	2/1/3
Keratocyst	0	1	1	2	1	0	3	2.9	1/0/1
Osteomyelitis	0	1	1	2	2	0	4	3.9	2/1/3
Total	**14**	**38**	**42**	**80**	**9**	**0**	**103**	**100**	**62/33/95**
Site of lesion (%)	14/103 (13.6)	38/103 (36.9)	42/103 (40.8)	80/103 (77.6)	9/103 (8.7)	0	-	-	-
*Numerical discrepancy among patients and lesions is because of lesion manifesting at multiple sites. Dental cyst is of inflammatory origin- Keratocyst is seen at three sites.									

Table 1: Radiological appearances of mandibular lesions (n=95)



OPG Machine

DISCUSSION: Mandibular lesions are having varying degrees of destructive potential ranging from tooth loss to fractures. These lesions have a variety of cystic or solid appearances on clinical examination. We strongly feel that all the dental procedures should be performed after acquiring investigative radiograph because there are high chances of missing lesion characteristics, as most of the structures of the teeth and the oral cavity are hidden from the treating dentist. Diagnostic radiographs assist in revealing these hidden pathologies. OPG is a baseline investigation modality of choice in mandibular pathology. It is a simple radiographic procedure, which does not require preparation of the patient. It is an outpatient, non-invasive procedure without medication. Additionally, OPG evaluation of jaw lesions includes information about location, density, margin, relation to tooth, along with knowledge of clinical data, this information helps in narrowing differential diagnosis.[8]

Mandibular lesions have both benign and malignant origins. Common benign cystic lesions include periapical (radicular) cysts, follicular (dentigerous) cysts, and odontogenic keratocysts. Benign solid tumours represent a broad spectrum of lesions such as ameloblastomas, odontomas, ossifying fibromas, and periapical cemental dysplasia. Malignant tumours include squamous cell carcinomas, osteosarcomas, and metastatic tumours.

In our study we observed mandibular lesion frequencies and found that the order of appearance as buccal-neoplasm>dentigerouscysts>dentalcyst>neoplastic=traumatic-bone-cyst=osteomyelitis>kerato cyst.

An orthopantomogram diagnosis of buccal neoplasm of mandible is fairly accurate predictor of bony involvement except for central arch lesions and is mainly used for staging of malignancy. Metastasis in the mandible is four times more common than maxilla and approximately 30% of jaw metastases originate from an occult primary lesion.

Dentigerous cyst and dental cyst have a pathognomonic appearance on OPG. A dentigerous cyst encloses the crown of an unerupted tooth, attaching to the neck of the tooth, and grows by expansion of its follicle. Overall prevalence of dentigerous cysts varies between 11.4-44%. In Selvamani study it was 20.3% and Jones study 18.1 %.[9][10] However the above-mentioned studies were based on histopathology and not radiology.

Keratocyst is often associated with an impacted tooth, mimicking a dentigerous cyst. Occasionally a septate KCOT is in distinction from ameloblastoma. Multiple KCOTs is associated with Gorlin-Goltz syndrome. It is usually seen in young males between 2nd-3rd decades. An important feature of this odontogenic keratocyst is its tendency to grow in a predominantly anteroposterior direction while causing minimal cortical expansion.

Scholl et al also suggested that some of the non-odontogenic lesions that mimic odontogenic lesions such as traumatic bone cyst. [2] Scalloping of the border is a prominent indicator of traumatic bone cyst (TBC); however this feature is suggestive, but not diagnostic, of TBC, because several other odontogenic lesions have scalloped borders. Compete et al. reported scalloping pattern in 68% of TBCs occurring between and away from teeth. [11]

Carefulness has to be executed in assessing the frequencies of mandibular lesions observed in our study because of sample sizes. Similar radiographic appearance of mandibular lesions and short of oral cavity examination notes from the consultant dentist during data analysis, which could have impaired the diagnosis accuracy of this retrospective study. Another important point of consideration is, many lesions of the mandibular lesions might have progressed through all three stages with the initial radiological presentation from homogenous radiolucent to mixed to radiopaque, the diagnostic value of OPG becomes limited. Although imaging will not always provide a specific diagnosis, it would help in narrowing the differential diagnosis; thereby help in guiding patient's treatment. [3]

CONCLUSION: We studied a spectrum of mandibular lesions using OPG database and found out 0.35 %(95/2690) of mandibular lesions. OPG is convenient technique to expose patient jaws on a single film. It should be applied as a first investigation of choice in suspected mandibular pathologies. because few of the pathologies like dentigerous cyst, dental cyst, multiple myeloma, contagious spread of known malignancy has characteristic radiological appearances, therefore it not only pin points some of the pathologies precisely & certainly narrows the differential diagnosis in remaining conditions, therefore it should be applied as first line of investigation in all cases of suspected mandibular pathologies. With the help of clinical history & histopathological report the clinician/dentist can arrive at definitive diagnosis.

FOLLOWING ARE FINDNGS SEEN IN RADIOGRAPHS:

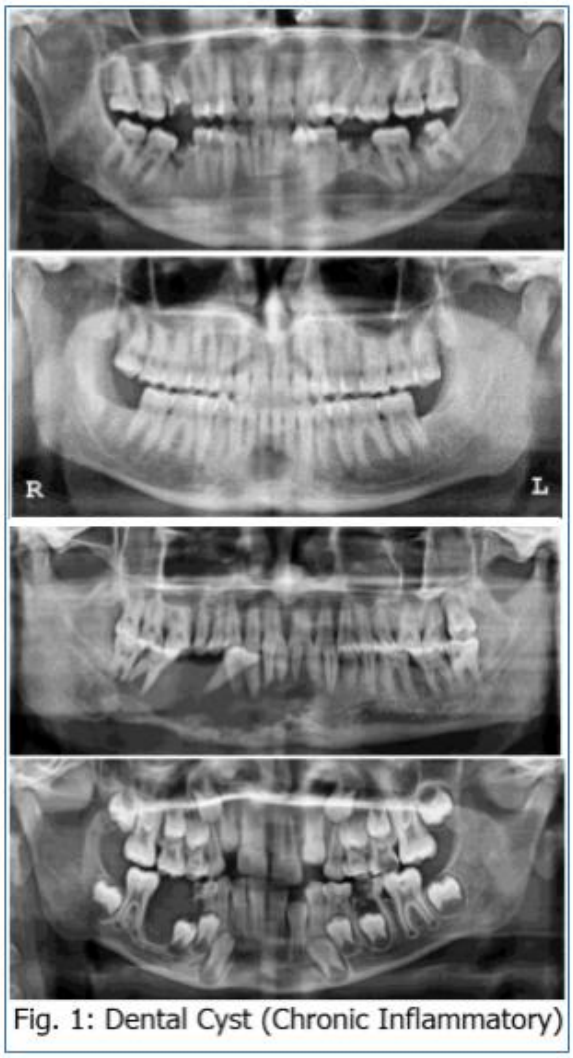


Fig. 1: Dental Cyst (Chronic Inflammatory)

Fig. 1: Dental Cyst: All the OPG are of different patients showing well-defined osteolytic lesion without sclerosis.

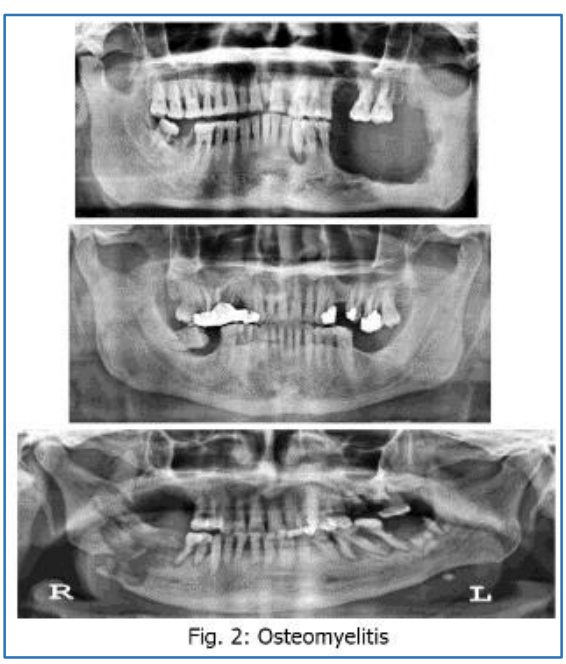


Fig. 2: Osteomyelitis

Fig. 2: Osteomyelitis: All the OPG are of different patients showing osteolysis with loss of tooth and sclerosis showing chronic inflammatory process.

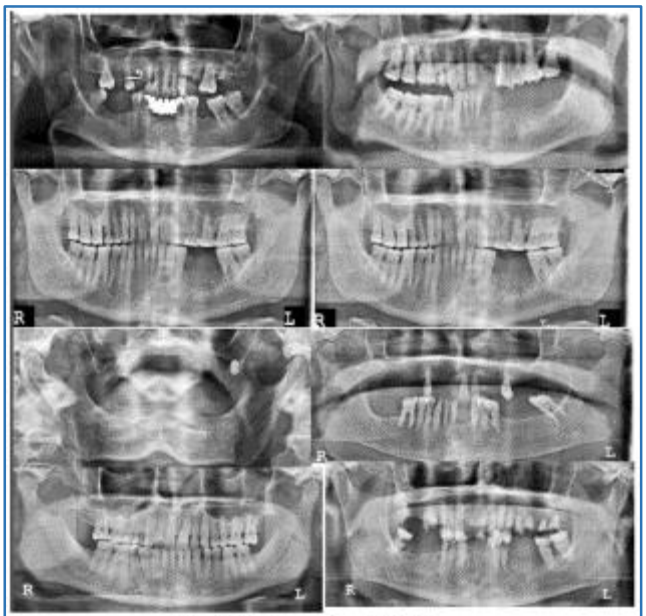


Fig. 3: Spread of Malignancy

Fig. 3: Spread of Malignancy: All the OPG are of different patients who had buccal or gingival lesions with changes in adjacent bones like erosion or alveolar process with minimal sclerosis.

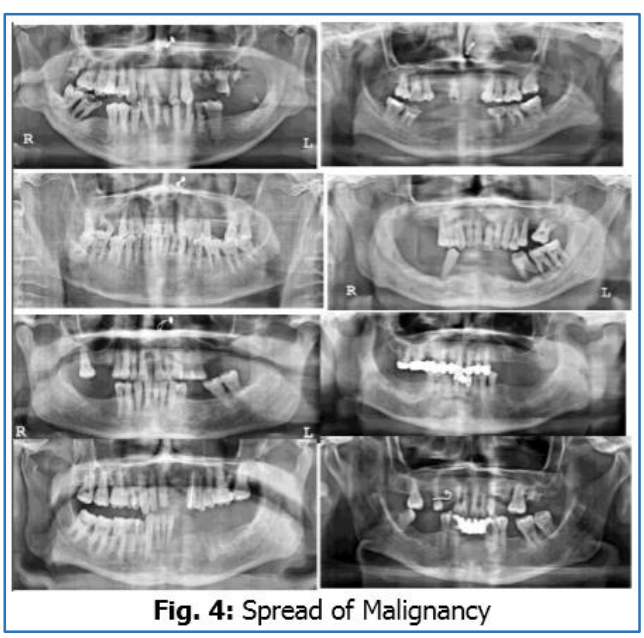


Fig. 4: Spread of Malignancy

Fig. 4: Spread of Malignancy: All the OPG are of different patients who had buccal or gingival lesions with changes in adjacent bones like erosion or alveolar process with minimal sclerosis.

Fig. 5: Kariocysts

Fig. 5: Keratocysts: Multilocular well-defined radiolucent lesion with thin, sclerotic borders, cortical scalloping and resorption of teeth roots.

Fig. 6: Metastasis

Fig. 6: Metastasis: All the OPG are of different patients showing Osteolytic lesions with supportive systemic evidences these differentiates metastasis from multiple myeloma.

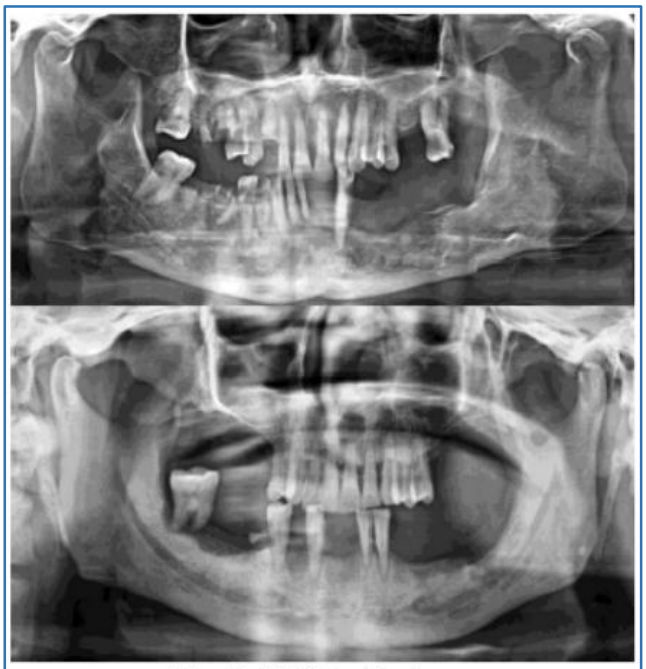


Fig. 7: Multiple Myeloma

Fig. 7: Multiple Myeloma: All the OPG are of different patients showing Osteolytic lesions with supportive systemic evidences these differentiates metastasis from multiple myeloma.

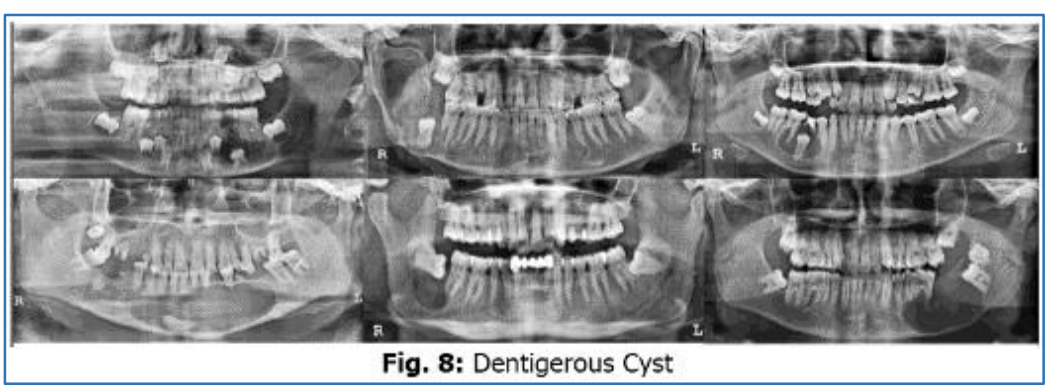


Fig. 8: Dentigerous Cyst

Fig. 8: Dentigerous Cyst: All the OPG are of different patients showing well-defined osteolytic lesion with crowns of unerupted tooth–this is characteristic of dentigerous cyst.

REFERENCES:

1. Slootweg PJ. Lesions of the jaws. Histopathology. 2009 Mar; 54(4): 401-18.
2. Scholl RJ, Kellett HM, Neumann DP, Lurie AG. Cysts and cystic lesions of the mandible: clinical and radiologic-histopathologic review. Radiographics : a review publication of the Radiological Society of North America, Inc. 1999 Sep-Oct; 19(5): 1107-24.
3. Dunfee BL, Sakai O, Pistey R, Gohel A. Radiologic and pathologic characteristics of benign and malignant lesions of the mandible. Radiographics : a review publication of the Radiological Society of North America, Inc. 2006 Nov-Dec; 26(6): 1751-68. Van Merkesteyn J, Groot R, Bras J, McCarroll R, Bakker D. Diffuse sclerosing osteomyelitis of the mandible: a new concept of its etiology. Oral surgery, oral medicine, oral pathology. 1990; 70(4): 414-9.
4. Van Merkesteyn J, Groot R, Bras J, McCarroll R, Bakker D. Diffuse sclerosing osteomyelitis of the mandible: a new concept of its etiology. Oral surgery, oral medicine, oral pathology. 1990; 70(4): 414-9.
5. Unger E, Moldofsky P, Gatenby R, Hartz W, Broder G. Diagnosis of osteomyelitis by MR imaging. American Journal of Roentgenology. 1988; 150(3): 605-10.

6. Xanthinaki AA, Choupis KI, Tosios K, Pagkalos VA, Papanikolaou SI. Traumatic bone cyst of the mandible of possible iatrogenic origin: a case report and brief review of the literature. Head & Face Medicine. 2006; 2: 40.
7. Chandra S, Gupta P, Patel J, Jhala J, Dhebar M. Mandibular invasion in oral cancers. European archives of oto-rhino-laryngology. 2000; 257(6): 343-6.
8. Neyaz Z, Gadodia A, Gamanagatti S, Mukhopadhyay S. Radiographical approach to jaw lesions. Singapore medical journal. 2008 Feb; 49(2): 165-76; quiz 77. Selvamani M, Donoghue M, Basandi PS. Analysis of 153 cases of odontogenic cysts in a South Indian sample population: a retrospective study over a decade. Brazilian oral research. 2012; 26(4): 330-4.
9. Selvamani M, Donoghue M, Basandi PS. Analysis of 153 cases of odontogenic cysts in a South Indian sample population: a retrospective study over a decade. Brazilian oral research. 2012; 26(4): 330-4.
10. Jones AV, Craig GT, Franklin CD. Range and demographics of odontogenic cysts diagnosed in a UK population over a 30-year period. Journal of oral pathology & medicine : official publication of the International Association of Oral Pathologists and the American Academy of Oral Pathology. 2006 Sep; 35(8): 500-7.
11. Kuttenberger JJ, Farmand M, Stoss H. Recurrence of a solitary bone cyst of the mandibular condyle in a bone graft. A case report. Oral surgery, oral medicine, and oral pathology. 1992 Nov; 74(5): 550-6.