Mandibular Condensing Osteitis (CO): Case Series with Literature Review

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ABSTRACT

Introduction and Background: The current study aimed to report institutional case series as well as to update Saudi community prevalence statistics for condensing osteitis and its management. In the same population, differential diagnosis with other similar patterns such as idiopathic sclerosis (IS) and hypercementosis (HC) was compared.

Materials and Methods: A retrospective cohort analysis of patients diagnosed with condensing osteitis between 2016 and 2023 at Taibah University was performed. Data on clinical, radiological, pathological, and Odontogenic causes have been collected. Patient demographic information was also examined, and a literature review was carried out to identify comparable cases.

Results: 45 adult female patients with mean age of 26.4±8.2 were diagnosed with condensing osteitis and this was confirmed by clinical, radiological, and pathological examinations. Related remaining roots to the lesion could be extracted normally in all cases. This condition requires no further treatment, and patient observation during routine follow-up is advised.

Conclusions: We could conclude that condensing osteitis is not uncommon among adult female dental patients in Saudi Arabia, and clinical documentation of its characteristics is required. Future research is needed to identify hidden causes and for genetic predictions.

Keywords: ***condensing; osteitis; mandible; female***

INTRODUCTION

A localized area of bone sclerosis known as condensing osteitis (CO) develops in response to a prolonged low-grade irritation caused by a chronic inflammatory process[1]. The prevalence of condensing osteitis and idiopathic osteosclerosis (IO) in the jaws across Saudi Arabian subpopulations was examined in a research that found (5.9%) of the study participants had CO[2].

Vital teeth with pulpitis, periapical inflammation, or occlusal trauma might develop condensing osteitis[3]. CO is not clinically linked with obvious symptoms; the lesion is typically identified during routine radiographic examination[4]. According to Holly et al, the lower first molar is often the site of CO detection in the mandible, followed by the lower second molar[5].

The radiographic image of CO shows a homogeneous spherical or triangular dense radiopaque mass towards the apex of the tooth with well-defined edges that merge with the surrounding bone in a hazy manner. Furthermore, the lesion manifests as lamina dura loss and periodontal ligament space enlargement. CO contains no radiolucent component[1].

Histologically, condensing osteitis widely defined as sclerosing events that affect local spots due to a chronic low-grade inflammation that

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may involves fibrous connective tissue, which replaces normal bone marrow that may lead to abnormal hardening of affected tissues. This is occasionally accompanied by inflammatory cell infiltration, de novo bone formation, and bone sequestrum with or without odontogenic etiology. Due to the presence of dense trabeculae within a limited area of bone marrow, CO often resembles compact bone. Dominant osteoblasts activity is commonly seen in CO, which results in bone apposition. However, CO is believed to includes both normal and impaired bone remodeling that includes inflammatory cell infiltration[6].

Other diseases similar to CO include Periapical cementoosseous dysplasia, Cementoblastoma, Osteoma, and Complex odontoma and these are the most frequent radiopaque lesion in the jaw, with a general population frequency of 4-7%[7]. Diagnosis of condensing osteitis is based on the clinical, radiographic, and histopathological examinations of the lesion[8]. Management of the lesion involves the removal of the underlying odontogenic infection, usually through endodontic treatment or extraction[5].

The prevalence of CO has been evaluated in several studies worldwide. Table 1 summarizes the findings of five studies done in different countries on the prevalence of CO. In Jeddah, Saudi Arabia, Al-habib reported the prevalence of CO to be 5.9%. The prevalence was consistent with the other reported studies, which ranged from 3% to 8%[2]. Yeh et al. reported a higher prevalence of CO in older ages in Taipei, Taiwan, contrary to Al-habib, in which CO was more prevalent in younger aged individuals[1,2]. Both studies reported a higher occurrence rate of the lesion in females compared to males[1,2].

In the current study, we observed an increase in the frequency of CO patients in our clinics, which makes extraction more difficult and surgical exodontia more common. According to our analysis of the literature, there is a scarcity of CO research in Saudi Arabia, particularly in the Al-Madinah Al-Munawwarah region[8,9]. Exploring CO in this region of Saudi Arabia will add to the present literature for its clinical value while also shedding light on features of CO such as shape, size, location, and distribution pattern.

MATERIALS AND METHODS

Data collection

Between December 2016 and June 2023, 56 Saudi female patients presented to Taibah university dental hospital to treat multiple carious and missing teeth and were diagnosed to have Condensing osteitis lesions. All patients were physically fit on general examination with no significant medical history. No facial asymmetry or regional lymph node abnormality were found upon extra-oral examination. Intraoral examination showed poor oral hygiene with several carious teeth and a history of extraction in all of them (Figure 1). Upon palpating the area of CO, no swelling or tenderness was present. All patients reported no symptoms. There were no sensory or motor deficits. Other parts of the oral mucosa were clinically normal.

Figure 1. Intra-oral photograph of lower arch reveals multiple carious teeth and remaining roots of tooth 37 associated with condensing osteitits.

Clinical characteristics of the collected cases

Over the last seven years, 45 adult female patients have been identified with condensing osteitis. The average age of the affected cases was 26.4±8.2 years, with the mandibular location predominating (88.9%) and the left side being affected more than the right side (51%). The first mandibular molar was the most involved, accounting for 35.6% of the total, followed by the second mandibular molar (22.2%). Deep caries and remaining roots were highly associated with the lesion discovered. The lesion was found on radiographs and all patients were asymptomatic. After addressing the related, odontogenic-appearing etiology, observation was advised in almost 80% of the cases (Table 2).

Radiographic findings

Orthopantomogram radiographs revealed solitary and multiple unilateral and/or bilateral radiopaque mass with well-defined margins related either to remaining roots of badly decayed teeth or at residual ridges in edentulous regions. Cone-beam computed tomography (CBCT) was taken in all patients and confirmed the provisional diagnosis of condensing osteitis (Figures 2 and 3).

Table 1. Summary of the studies done on the prevalence of CO in different countries

Author	Country	Years	Sample size	CO cases	Females	Males	Mean age	Tooth most frequently involved
Al-Habib.[2]	Saudi Arabia	2013-2019	1000	44 (5.9%)	36 (81.8%)	8 (18.2%)	-	Mandibular 1st molar: 35%
Yeh et al.[1]	Taiwan	2005-2010	1098	75 (5.7%)	55 (73.3%)	30 (26.7%)	49.9 years old.	Mandibular 1st molar: 41 (54.7%)
Miloglu et al.[9]	Turkey	1996-2008	6154	53 (0.81%)	27 (0.9%)	23 (0.7%)	32.8 years old	Molar area: 96.2%
Farhadi et al.[10]	Iran	-	411	32 (7.8%)	15	17	34.59 – 33.73 years old	Second premolar: 59.4%
z.verzak et al.[11]	Zagreb	-	1200	80 (6.6%)	38 (55.07%)	31 (44.93%)	37 years old	Molar region of the mandible: 51

Table 2. Clinical characteristics of the included cases

Study variable	Variable category	Frequency	Percent
Site	Maxilla	5	11.1
	Mandible	40	88.9
Side	Right	22	48.9
	Left	23	51.1
Associated teeth	Anterior region	1	2.2
	First premolar	6	13.3
	Second premolar	9	20
	First molar	16	35.6
	Second molar	10	22.2
	Third molar	3	6.7
Management	Observation	36	80
	Surgical excision	9	20
Associated teeth	Deep caries	21	46.7
	Endodontic	6	13.3
	Residual ridge	2	4.4
	Remaining roots	16	35.6
	Total	45	100.0

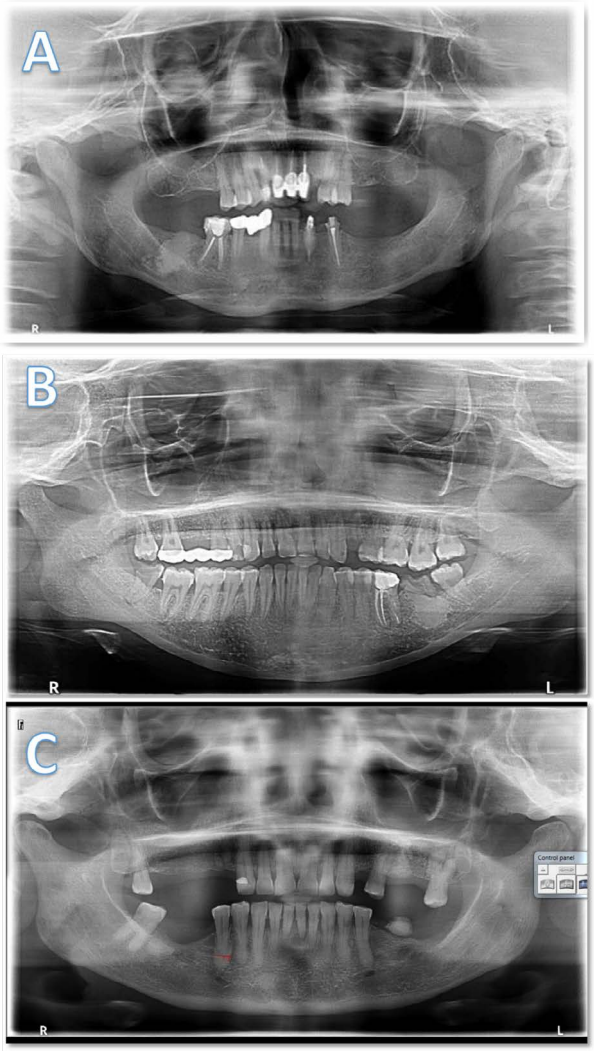

Figure 2. (a) orthopantomograph (OPG) shows unilocular radiopaque lesion at the right mandibular body region (lower right 2nd molar area) which extends from the alveolar ridge of the lower right 2nd molar till the mandibular inferior alveolar canal. (b) OPG shows unilocular radiopaque lesion at the left mandibular body region (lower left 2nd molar area) which extends from the alveolar ridge of the lower left 2nd molar till the mandibular inferior alveolar canal. (c) OPG shows unilocular radiopaque lesion at the right mandibular body region (lower right 2nd molar area) which extends from the alveolar ridge of the lower right 2nd molar till 3mm away from the mandibular inferior alveolar canal.

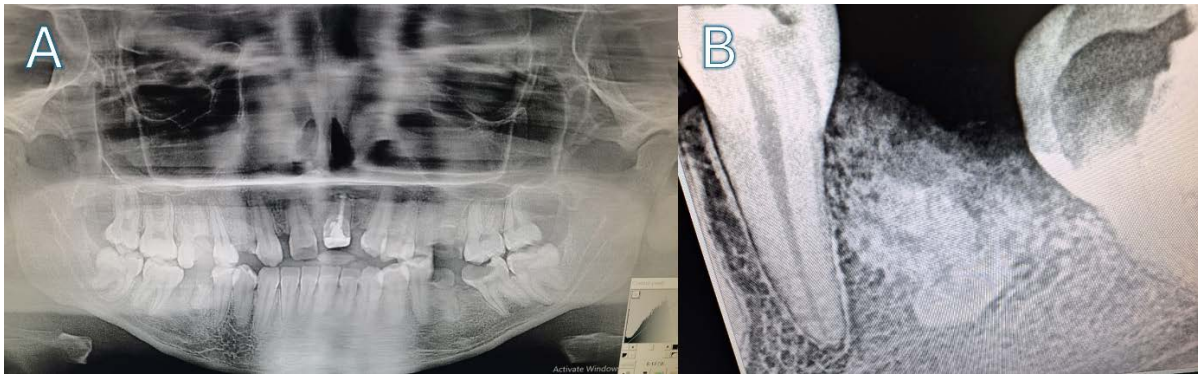

Figure 3. (a) OPG shows unilocular radiopaque lesion at the left mandibular body region (lower left 1st molar area). (b) Her general dentist referred this patient to the Oral Surgery Department, suspecting root remnants. After taking a periapical X-ray, CO was suspected, which was later confirmed through an incisional biopsy of the area.

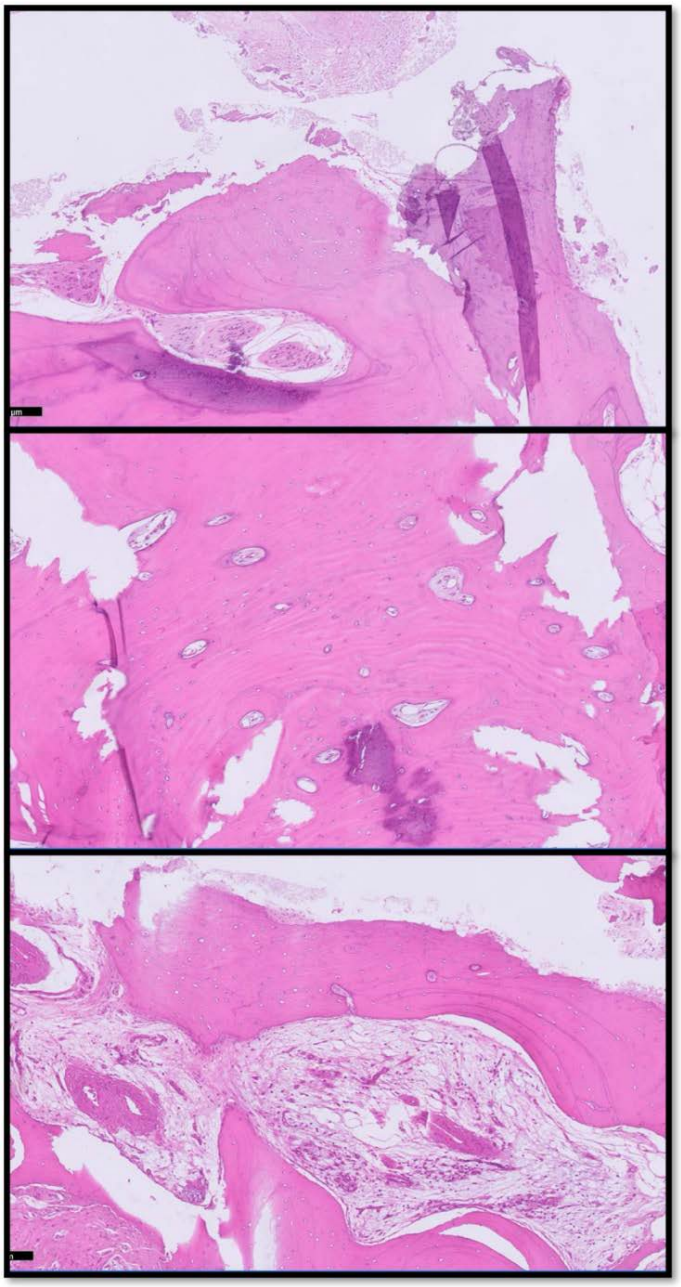

Figure 4. Histopathologic slide photographs demonstrating pieces of necrotic bone and absence of lacunae, non-specific inflamed connective tissue, haemorrhagic areas, bacterial colonization, and necrosis.

Surgical management

The treatment plan involved extractions of the associated remaining roots and replacement with an implant. Restorations of badly decayed teeth were performed and retreatment of endodontically treated teeth were scheduled with cooperation with restorative department. The remaining roots were removed without complications in all cases. A buccal full-thickness envelope flap was reflected to acquire an incisional biopsy from the bone within the lesion margins to aid the final diagnosis. The surgical area was irrigated using normal saline, followed by the placement of a suture for flap closure. Patients were scheduled for an appointment 1 week later for suture removal, and the healing was satisfactory with no complications.

Histopathological examination

The specimens were stored in 10% formalin and sent to the laboratory for histologic evaluation. Histopathological examination showed pieces of necrotic bone and absence of lacunae, non-specific inflamed connective tissue, hemorrhagic areas, bacterial colonization, and necrosis. Higher power view revealed reversal lines in a dense bone trabecula that resembling the compact bone pattern. Features seen in the histopathologic evaluation along with other clinical and radiographic examination led to the definite diagnosis of condensing osteitis (Figure 4).

DISCUSSION

Condensing osteitis (CO) is not an odontogenic tumor but abnormal bony lesion in which inflammation acts as a stimulus to osteoblasts[5,6,12]. Additionally, CO could be regarded as a type of condensing osteomyelitis, and the presence of these radiopaque bone sclerosis is indicative of bone remodeling and bone formation that may be related to the periapical area, interradicular, and edentulous spaces. In another study, Tsvetanov recently called it a pearl shell structure or PSS[3]. Once it is identified, the oral surgeon should take extra precautions when extracting a tooth with CO. The lack of information in the literature about the prevalence of CO in the Saudi population is the main objective and reason to do this study.

The current case acquires more clinical relevance because it is worth noting that CO could frequently occur in conjunction with other sclerotic mandibular lesions in the same patient who may have hypercementosis (HC) or idiopathic sclerotic (IS) areas and may be solitary or multiple[2,13,14]. Another study in the same region found that 9.8% of the current female sample population had HC, which is greater than the percentage reported by others in different locations[13].

CO differs from idiopathic sclerotic lesion in that IS is not related to pathologic abnormalities of the tooth pulp, inflammation, or neoplastic process and mostly detected by chance on radiography. Radiographic similarity require differentiation with other florid osseous dysplasia, focal cemento-osseous dysplasia, periapical cemental dysplasia and other dysplastic bone diseases of the craniofacial complex that are more common in people of African origin[7]. However, current research literatures indicates that condensing osteitis is more common among Asian populations[13,14].

CO has an incidence rate between 4% and 7%, and it more frequently affects women. The literature showed that women-to-men ratio is about 1.5:1 and 2:1, with an occurrence rate of 81.8% in women and 18.2% in men[12,15]. In near region to Al-Madinah Al-Munawwarah specifically in Jeddah, a study found that 5.9% of patients had CO[2]. Some studies deviate from gender discrepancy in disease occurrence[15].

A review of the literature revealed the proven female predominance in both CO and IS. Mostly found in young age female with irritating odontogenic predisposing factors Therefore, additional hormonal, genetic, or environmental analysis may be helpful in determining the hidden causes of these bone active lesions there factors could affect its distribution[13.14.16]. In another Taiwanese population, the occurrence of CO was 5.7%, but the characteristics of their result differed because they were more commonly in female patients in their 60s and associated with different dental conditions such as caries, periodontal diseases, crowns, and extracted area. However, in Saudi regions it is also associated with or without obvious dental problems and occurred in young adult females[1].

There are multiple reports on the mandibular predilection of condensing osteitis[17]. The major reason for the high mandibular incidence of the disease is the presence of superimposed anatomical structures. There could be blood supply and anatomical variations of bones in the mandible region. Highly prevalent caries and fillings in mandibles justify the high risk for pulpitis and necrosis development[18]. Al-Habib found the mandibular incidence of CO to be 53.23%, with teeth in the lower right mandible being more susceptible to get affected with CO[2]. Teeth 45, 46, and 36 were significantly affected repeatedly, with an incidence of 19.35%, 20.97%, and 16.13%, respectively[19]. The size of the CO lesion ranges from 1 to 22 mm. The shapes observed were spherical (32%), erratic (64%), and U-shape (4%)[20].

The persistence of virulent microbiota in residual necrotic pulp attributed to ill-suited endodontic therapy, infection reaction, clement chronic irritation after the root canal, and chronic pulpitis inflammation are the major contributing factors toward CO[21]. As reported above, teeth with neglected caries, enliven pulpy formations, and deep filings are plausible for CO development. In such cases, pulpitis (chronic) forges leading to periapical osteogenesis as a reaction. The vulnerability of these teeth is attributed to dental implants[21]. A similar case was reported by Holly et al., where a 23-year-old asymptomatic woman with caries-destroyed tooth 36 was diagnosed with condensing osteitis[5].

Apart from these, documented cases showed that occlusal trauma in teeth could also sometimes induce bony formations, and hence, the pulp inflammation should not be only etiologically linked to condensing osteitis to avoid misdiagnosis[22]. The asymptomatic nature of condensing osteitis makes it detectable only under radiographs. However, the significant distinction of condensing osteitis over other idiopathic osteosclerosis and periapical lesions is bone formation instead of annihilation, which results in the radiopaque lesion observed by Ustad et al[23].

On some occasions, radiolucent lesions are easily detectable by dental clinicians compared to radiopaque lesions. The reason could be the low occurrence rate of tooth radiopacities. The presence of root parts, foreign agents, exostoses, or affected teeth condition, may aid in the CO diagnosis. Previous extraction records and the residual line of the root segment distinguish the affected region. The shape analysis of diseased teeth confirms the diagnosis. However, the complete condition is confirmed by histopathological examination[23].

According to Green et al., the normality of the apical area is evident as an integrated ligament of the periodontal region and the thin alveolar bone layer surrounded by cancellous bone with fatty marrow. On the other hand, CO struck regions have inflammation or connective tissue development with the broadening of the cavity by lamellar bony formations replacing cancellous bone and marrow[6]. Alqahtani reported a similar scenario where, through radiograph, a homogeneously dense mass at tooth 45 was identified. The radiographic results also showed widened periodontal ligaments cavity and lamina dura loss at tooth 45. The three-dimensional CBCT depicted a reduction of buccal bone in the affected area[24].

Also, Lindeboom et al. investigated the significance of implant placement time. They deduced that the immediate implant placement in infected cavities were highly likely to fail compared to delayed placed implants[25]. Thus, the guided bone regeneration (GBR) and implant placement time remain debatable among dental experts because the infection and membrane exposure risk for immediate implant after GBR remains inevitable[26].

The efficiency and safety of dental implantation in areas of hyperdense lesions were evaluated in a narrative review. Results revealed that in 84.2% of the cases described, replacement with dental implants was successful without any complications in various hyperdense jaw lesions including CO. However, the results are controversial, this is due to the lack of a unified implantation protocol and a follow-up period. The lack of clinical guidelines regarding the implantation in areas of hyperdense lesions can be attributed to how rare these lesions are encountered, problems in diagnosis, problems in implant insertion, and operative and postoperative complications[27].

The biopsy is the final step in the treatment process to elucidate the histopathological etiology of the ailment[28]. The histopathological findings in the Alqahtani study demonstrated the odontoma attributed to atypia-free packed bone lamellae. The epithelial segments were absent, and there was no evidence of malignancy in the biopsy[24]. The suggested treatment for CO is usually extraction of the destroyed tooth, as carried out in the present and above-elaborated cases[29]. However, the above-described case differs from the present case in the GBR scenario where after tooth 45 extraction, there existed an ambiguity on when GBR would be suitable to perform. Moreover, the delayed implant was performed after six months[24].

Even if no surgical intervention is necessary, additional follow-up is important to ensure that the lesion has not become larger over time. Others, however, believe that endodontic treatment and surgical apicectomy with lesion excision are used to treat periapical CO is preferable option as pathologies such as root resorption, tooth impaction, and tooth displacement were induced by CO in some cases[3].

When reviewing the literature, three cases of CO were reported from different regions in Saudi Arabia. All three cases had female patients with ages ranging from 30 to 50 years old. Two of the three cases had the lesion in the mandible[24,16], while Ustad f et al. reported CO lesion related to a maxillary molar[24]. The present case in addition to the previous cases and studies on the prevalence of CO could suggest that CO lesions are not uncommon in the Saudi population.

CONCLUSIONS

Condensing osteitis is the asymptomatic abnormal bony fragmentation diagnosed by radiograph aggravated by root canal, caries, trauma, extraction, and infections. CO mainly affects the lower mandible due to anatomical complications, occlusal pressure, and high caries presence. A biopsy is conducted to analyze the pathological condition of the affected area. In the present case, the treatment includes dental extraction. Due to the number of cases presented in the literature in addition to the case presented here we can conclude that CO is not uncommon among adult female patients in Saudi Arabia. Further studies to examine the success and survival rate of dental implants in patients with CO are recommended.

Authorship Contribution: All authors share equal effort contribution towards (1) substantial contributions to conception and design, acquisition, analysis and interpretation of data; (2) drafting the article and revising it critically for important intellectual content; and (3) final approval of the manuscript version to be published. Yes.

Ethical Approval: Taibah University Research Ethical Committee examined and granted clearance for this study. The World Medical Declaration of Helsinki's guiding principles were followed in the conduct of this investigation. After reviewing the treatment strategy and surgical management with the patient, informed consent was obtained.

Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not publicly available due to data protection guidelines according to the ethics approval.

Potential Conflict of Interest: None

Competing Interest: None

Acceptance Date: 21-06-2024

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