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DIAGNOSTIC AND TREATMENT DILEMMAS OF CEMENTO-OSSEOUS DYSPLASIA: A PICTORIAL REVIEW

SEMENTO-OSSEÖZ DİSPLAZİNİN TANI VE TEDAVİSİNDE İKİLEMLER: GÖRSEL BİR DERLEME

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Abstract

Cemento-osseous dysplasia is one of the benign fibro-osseous lesions that commonly occurs in the jaws or edentulous alveolar processes. Principally, the diagnosis of cemento-osseous dysplasia is based solely on clinical and radiological findings. Biopsy, surgical intervention, or tooth extraction is generally not recommended due to the infection risk. The failure to diagnose cemento-osseous dysplasia may lead to unnecessary and invasive dental treatment procedures in patients. In order to prevent possible complications, this lesion should be diagnosed accurately and differentiated from other similar lesions.

In this review, the clinical and radiological features, histopathological findings, differential diagnosis, treatment and prognosis, complications and preventive strategies of cemento-osseous dysplasia are discussed in a practical and systematic way with a particular emphasis on the importance of the accurate diagnosis in terms of preventing unnecessary iatrogenic dental procedures as well as possible disease-related complications.

Keywords: *Cemento-osseous dysplasia, Classification, Differential diagnosis, Fibro-osseous lesion, Radiological features.*

Özet

Semento-osseöz displazi, genellikle çene kemiklerinde veya dişsiz alveolar kretlerde görülen benign fibro-osseöz lezyonlardan birisidir. Prensip olarak, semento-osseöz displazi tanısı yalnızca klinik ve radyolojik bulgulara dayandırılmaktadır. Enfeksiyon riski nedeniyle biyopsi, cerrahi müdahale veya diş çekimi genellikle önerilmemektedir. Semento-osseöz displazi tanısının konulamaması hastalara gereksiz ve invaziv dental tedavi prosedürlerinin uygulanmasına neden olabilmektedir. Olası komplikasyonların önlenmesi için, bu lezyonların doğru teşhis edilmesi ve diğer benzer lezyonlardan ayırıcı tanısının yapılması gerekmektedir.

Bu makalede; semento-osseöz displazinin klinik ve radyolojik özellikleri, histopatolojik bulguları, ayırıcı tanısı, tedavi ve prognozu, komplikasyonları ve korunma stratejileri, doğru tanının gereksiz iatrojenik dental prosedürlerin yanı sıra hastalıkla ilgili olası komplikasyonların önlenmesindeki önemi özellikle vurgulanarak, pratik ve sistematik bir şekilde tartışılmaktadır.

Anahtar Kelimeler: *Semento-osseöz displazi, Sınıflama, Ayrıcı tanı, Fibro-osseöz lezyon, Radyografik özellikler.*

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OVERVIEW / GENEL BAKIŞ

Cemento-osseous dysplasia (COD) is considered the most common fibro-osseous lesion confined to the tooth-bearing areas of the jaws or edentulous alveolar processes, in which the normal bone structure is replaced by fibrous tissue containing focal mineralised substances that may consist of bone, cementum, or both (1-3). Although the definite aetiology and pathogenesis of the lesion are still unknown, it is thought to be non-neoplastic and possibly derived from reactive or dysplastic changes of the periodontal ligament or medullary bone (3).

"Cemento-osseous dysplasia" has remained a controversial term for many years. In the 2005 classification of the World Health Organization (WHO), this lesion was defined as originating from the periodontal tissue, but the term "cemento" was discarded and the term "osseous dysplasia" was preferred due to the view that cementum and bone are indistinguishable (4,5). However, in the recent classification of the WHO in 2017, the terminology of "cemento-osseous dysplasia" is reverted back to emphasize the odontogenic origin of this lesion arising particularly from the periodontal ligament (5,6). In addition, "familial gigantiform cementoma", which is characterized by multiple multi-quadrant lesions and has a well-defined autosomal dominant inheritance pattern, was mentioned as a variant of florid COD by the WHO in 2005, but was specified as an individual disease in the 2017 classification (4,5).

The diagnosis of COD usually relies on the correlation of demographic information with clinical and radiological features (7). Because patients are usually asymptomatic, the lesion is often discovered on routine dental radiographs with its classical radiological features, and biopsy is not usually indicated because of the infection risk (3,8-11). In most cases the lesion is self-limiting, does not need any intervention, and only requires radiographic follow-up. Therefore, it is important to avoid unnecessary iatrogenic dental procedures such as endodontic treatment or re-treatment, apicectomy, and extraction due to misdiagnosis (9,12,13). In order to achieve this, comprehensive knowledge about the clinical and radiological features of COD as well as the lesions that can be considered in the differential diagnosis is essential (2).

In this review; the clinical and radiological features, histopathological findings, differential diagnosis, treatment and prognosis, complications and preventive strategies of COD are extensively discussed.

CLINICAL AND RADIOGRAPHIC FEATURES

COD shows a strong predilection for middle-aged Asian and African women, especially in the fourth and fifth decades of life (4,6,14,15). The lesions that have self-limiting behaviour and do not show substantial growth are commonly asymptomatic and are noticed incidentally during routine radiographic assessments (15,16). The cases that manifest some discomfort such as pain, discharge, and delayed healing are mostly associated with secondary infections (6,16-18).

COD is localized in the tooth-bearing areas of the jaws in the periapical region of vital tooth/teeth or in edentulous alveolar processes and generally affects the mandible rather than the maxilla (1,7,14-16,18,19).

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COD can be focal or multifocal and three COD subtypes were described in the 2017 WHO classification as periapical, focal, and florid. All three subtypes with similar radiological features are variants of the same pathological process and are distinguished by the location and distribution of the lesions (2,5-7,11).

Periapical COD presents as single or multiple lesions in the apical region of vital mandibular anterior teeth with discernible periodontal ligament spaces (20-22) (Figure 1a). Focal COD appears as a single lesion associated with a particular posterior tooth or in the edentulous alveolar crest after extraction of the involved tooth (Figure 1b). Florid COD is considered as the generalized form of COD and commonly presents as bilateral and symmetric multifocal involvement in the mandible, but may affect all four quadrants (7,11,21) (Figure 1c).

Figure 1. Subtypes of COD **a)** periapical, **b)** focal, and **c)** florid.

The margins of COD lesions are usually well-defined and often present with a radiolucent border surrounded by a band of sclerotic bone of varying width (10,16,19). The sclerotic bone points to reactive bone associated with the slow enlargement rate (2). The shape of the lesion is slightly irregular, roughly ovoid, and centric with respect to the root apex (10,16,19).

The internal characteristics of COD lesions may vary from radiolucent to mixed to radiopaque corresponding to the maturation stages of the lesion, which are classified as early, intermediate, and mature stages (3,21,23). In the early stage with predominant fibrous content, the immature lesion shows a well-

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defined oval to round radiolucent appearance (Figure 2a). It can also be observed radiographically that the COD lesion is separated from the root surface by an intact periodontal ligament space. In the intermediate stage, which is characterized by a combination of fibrous and mineralized tissues, the lesion is manifested by a mixed radiolucent-radiopaque internal structure (Figure 2b). In the mature stages, the lesions cease to enlarge and the characteristic central lobular radiopacities appear enclosed by an irregular zone of relative radiolucent rim of varying width corresponding to the maturation level of the lesion (Figure 2c). Maturation with progressive opacification outward from the centre is important in the radiological diagnosis of COD (2,6,7,14-16).

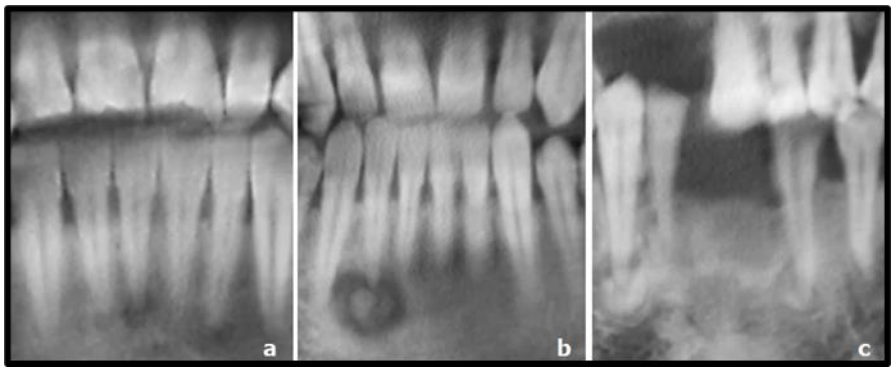

Figure 2. Radiological appearance of the maturation stages of COD **a)** early, **b)** intermediate, and **c)** mature.

The effects of COD on the adjacent teeth and tissues may include loss of lamina dura, a less prominent or widened periodontal ligament space, and occasionally hypercementosis. While uncomplicated or small lesions usually present without tooth displacement or root resorption and with minimal or no cortical expansion, root resorption or tooth displacement may be detected in rare cases. Larger lesions may cause expansion of the jaws and superior displacement of the floor of the maxillary antrum or inferior displacement of the inferior alveolar canal. However, these large lesions are always bordered by a thin and intact outer cortex (2,10,24) (Figure 3&4).

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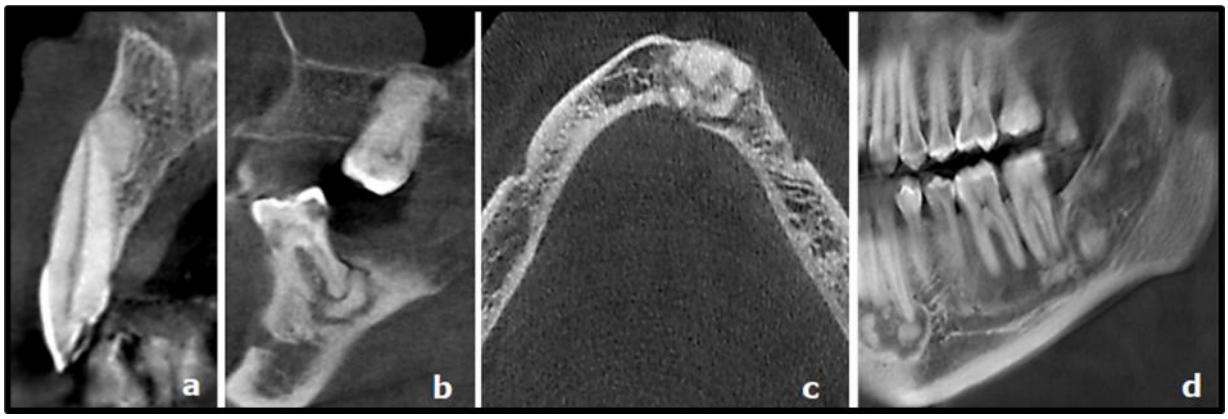

Figure 3. Effects of COD lesions on the adjacent teeth and tissues **a)** root resorption, **b)** hypercementosis and superior displacement of the floor of the maxillary antrum, **c)** cortical expansion and perforation, and **d)** inferior displacement of the inferior alveolar canal.

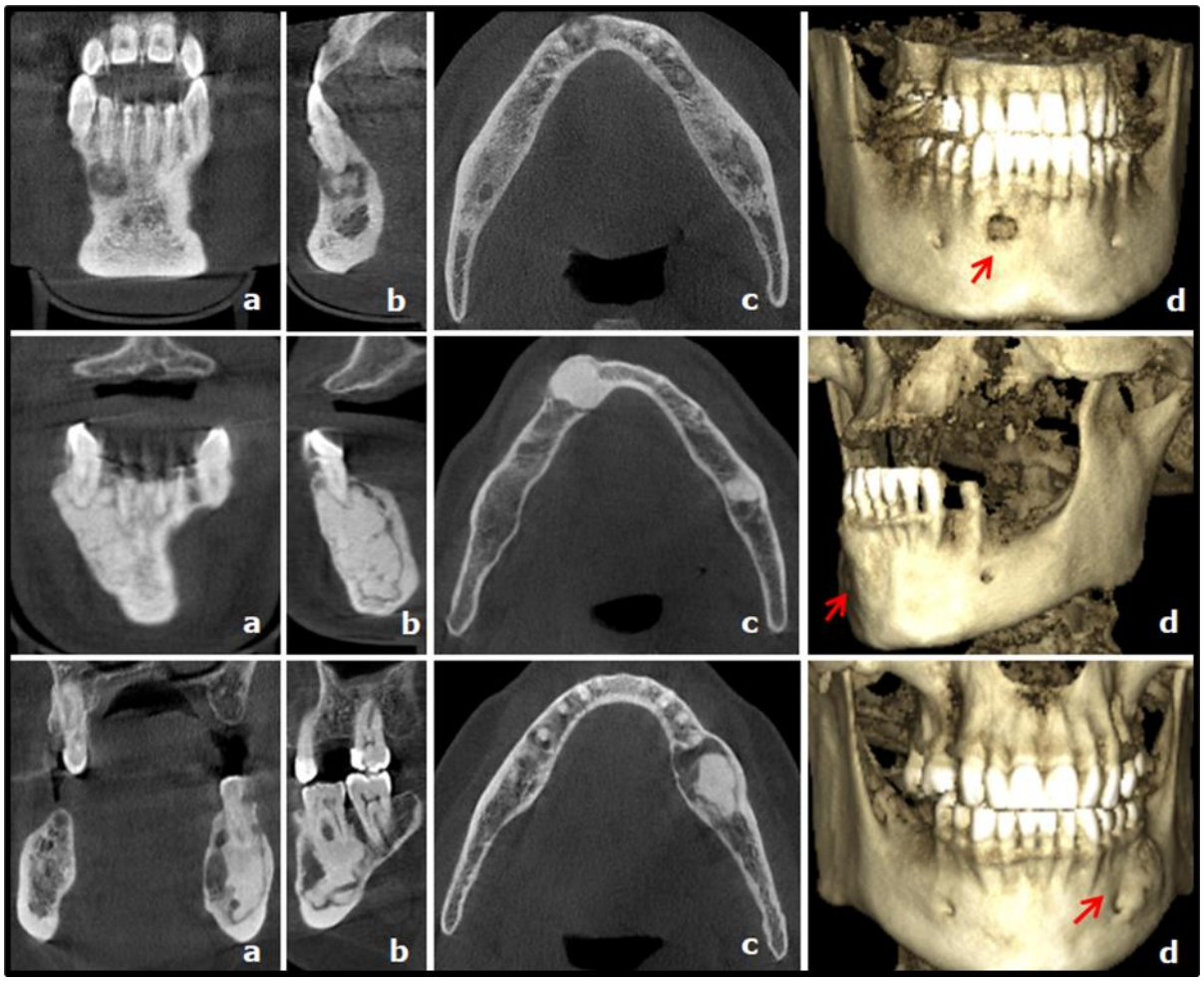

Figure 4. Effects of COD lesions on cortical bone observed as expansion and perforation in **a)** coronal, **b)** sagittal, **c)** axial planes, and **d)** 3D reconstruction images.

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HISTOPATHOLOGICAL FEATURES

The diagnosis of COD often relies on the clinical and radiological features without the need for biopsy. Biopsy may be required only in atypical cases in which the diagnosis cannot be clearly established (3,10,16). On gross examination, the submitted specimen usually appears as haemorrhagic, brown, gritty tissue fragments (16). Because the lesion is not encapsulated, biopsy specimens may present minute interface with normal bone, partly attributable to the surgical curettage of the lesion (16,24-26).

All COD subtypes have similar histopathological appearance, containing a combination of woven bone and cementum-like particles in a connective tissue stroma (18,21). As mentioned earlier, the disease progression follows three stages as osteolytic, mixed, and matured osteogenic (13,18). In the osteolytic stage, a vascular fibrous stroma containing osteoid and some basophilic cementoid structures can be observed. With increasing maturation, the stroma becomes more fibrotic and a more prominent osteoid trabeculae formation is noted with the appearance of thicker curvilinear bony trabeculae with a characteristic "ginger-root" pattern and possible presence of distinct cementoid masses. As the lesion evolves to the mature stage, it becomes denser, less cellular, and less vascular (14,18,21,27). It is noteworthy that COD generally presents with only focal or no osteoblastic rimming (3,5,16).

DIFFERENTIAL DIAGNOSIS

As COD progresses through different stages of maturity, it may be confused with other radiolucent, mixed or radiopaque lesions of the jaws due to the widely varying radiographic features (3). Therefore, the differential diagnosis list may be extensive, ranging from inflammatory periodontal or cystic lesions to even some odontogenic tumours (7,8,12,28,29).

The radiolucent appearance of the early stage of COD may mimic inflammatory apical pathologies associated with non-vital teeth, such as radicular cyst or periapical granuloma (3,7,12,13,16,29-31). In addition, COD may be misdiagnosed as residual cyst in edentulous areas (32). Since COD lesions cannot be differentiated from these inflammatory lesions by radiographic features alone, clinical information such as vitality testing of the relevant tooth and questioning about any previous tooth extraction in the affected area is necessary (7,12,13,29). Typically, radiolucent, mixed or radiopaque lesions at the apical region of vital teeth point to COD (10,16).

In the mixed stage of the lesions, CODs may be confused with other benign fibro-osseous lesions as the similar histopathological appearances make it difficult to differentiate them from each other (1,10,27,33). The distinction between COD and fibrous dysplasia may be based on the differences in patient age, bilateral presentation of the lesions, marked facial asymmetry, and developing malocclusion (4,10,12,16,33,34). Additionally, unlike in COD, in fibrous dysplasia, the borders and the surrounding bone appear as a gradual transition radiographically (34). Cemento-ossifying fibroma, which is another fibro-osseous lesion, can also be differentiated from COD by its encapsulation and clear separation from the surrounding healthy bone (2,4,33,35,36).

In the mixed radiopaque-radiolucent stage, CODs, except for those that are secondarily infected, may be confused with osteomyelitis (2,4,8,10,24,37). COD is usually not infected and can be differentiated from focal

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sclerosing osteomyelitis, which is characterized by an asymptomatic, non-expansile, and inflammatory periapical lesion associated with a tooth with a deep carious lesion (8). Similarly, the differentiation of COD from chronic sclerosing osteomyelitis can be based on the absence of inflammatory signs (4,8,27,37). These two lesions should not be confused with situations where CODs are secondarily infected resulting in osteomyelitis, because the secondarily infected amorphous bone foci display a wider and more profound radiolucent border (10). On the other hand, during the intermediate stage, COD may also be misinterpreted as ameloblastoma with a mixed radiolucent/opaque pattern. However, while ameloblastoma is a locally destructive lesion that can lead to root resorption, COD usually does not cause root resorption (8).

In the mature stage of COD, the radiological manifestation may bear a resemblance to idiopathic osteosclerosis or dense bone island, but the presence of a radiolucent periphery, even though very slight, denotes the diagnosis of COD (10,33). Another lesion to be considered is odontoma, which in some cases may have a periapical location. In odontoma, the organization of the tooth-like structures in the internal aspect and the identification of denser radiopaque enamel may be useful in the differential diagnosis (10). Furthermore, in the presence of a solitary mature COD form, cementoblastoma may be included in the differential diagnosis, particularly if the lesion is close to the periapical region of the mandibular first molar (10). However, cementoblastoma is usually attached to the partly resorbed root surface and exhibits a more concentric and less undulating expansion than COD. In addition, cementoblastoma is clinically symptomatic and painful, unlike a COD lesion (10,33). In particular, florid COD should be differentiated from Paget's disease, in which cotton wool-type radiopaque areas are present in addition to hypercementosis. Paget's disease affects the entire mandible as well as being polyostotic and involving other bones, whereas florid COD is generally confined to the tooth-bearing areas of the alveolus and is centered superior to the inferior alveolar nerve canal (10,34). The well-defined nature of florid COD, thanks to its radiolucent periphery and surrounding sclerotic border, may also be helpful in the differential diagnosis (10). In addition, patients with suspected Paget's disease may also be checked for an increase in alkaline phosphatase levels (34).

TREATMENT AND PROGNOSIS

CODs usually do not require treatment unless the lesions are complicated by infection and osteomyelitis, and periodic follow-up with clinical and radiographic examination every two or three years is sufficient (3,6,9,11,19,28,35,38). In addition, maintenance and reinforcement of proper oral hygiene procedures should be encouraged to prevent tooth loss due to periodontal disease. Any trauma to the COD site, including trauma from surgical procedures or removable dentures, should also be avoided to prevent the exposure of the sclerotic masses into the oral cavity (11,38).

Symptomatic patients are more difficult to manage due to the chronic inflammation and infection that develops in the densely mineralized avascular tissue (38). Pain, suppuration, and presence of areas surrounded by osteolysis with or without bone sequestration are considered as indications for intervention in infected COD (39). Although bone hypovascularization prevents antibiotics from reaching these areas in sufficient concentrations, conservative treatment through local and/or systemic antibiotic therapy should be the first choice (3,19,22,31,39,40). Curettage and necrotic bone removal are the most recommended surgical approaches for such conditions (39).

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COMPLICATIONS AND PREVENTIVE STRATEGIES

Infection is considered to be the main complication that can be encountered in an individual with COD. In the literature, infected COD cases are frequently reported as osteomyelitis (8,17,39-47). Triggering factors for the development of osteomyelitis, by causing access of the oral bacteria and ultimately secondary inflammation, include dental caries giving rise to pulp necrosis, chronic inflammatory periodontal disease, tooth extraction, and minor irritation from removable dentures in edentulous areas (39,40,47). On this account, elective procedures including tooth extraction, periodontal surgery, and implant surgery are contraindicated in COD patients (48,49). Where possible, less invasive treatment procedures such as tooth-supported fixed or removable partial dentures that do not require tooth extraction or edentulous ridge support, should be preferred (22,40,48). On the other hand, antibiotic prophylaxis is recommended in cases where avoidance of invasive procedures is not possible (14,22,39).

Non-epithelial lined cysts, including simple and aneurysmal bone cysts, may occasionally occur along with COD as another possible complication (7,18,23,25,50-52). Simple bone cyst development, which is more common in florid COD in comparison to other subtypes, is associated with the establishment of resorption foci in the mineralized tissue. These non-epithelial lined cavities eventually coalesce and form a large multilocular space that can be seen on radiographs (2). The concomitant occurrence of COD with aneurysmal bone cyst is rare and may be related to the possible pathogenesis of aneurysmal bone cyst (18,26). The stroma of COD frequently displays typical cavernous-like vascularity commonly related with bony trabeculae, and free haemorrhage is often interspersed within artefactual spaces throughout the lesion (14,18). Aneurysmal bone cyst may result either from a local circulatory disturbance due to local trauma or from the presence of a pre-existing lesion in the affected bone. This hemodynamic disturbance may cause a significant increase in venous pressure and development of enlarged vascular spaces in the affected bone (18,53,54).

SUMMARY / SONUÇ

The accurate diagnosis of COD, which can only be achieved with sufficient information about its clinical and radiological features, is the most critical step in preventing irrelevant iatrogenic dental procedures and potential complications related to the disease. Once the clinical and radiological features are clearly determined, no biopsy or surgical procedure will be required. However, periodic radiographic follow-up is required for confirmation of the diagnosis, and recall examinations of the patients should also be performed regularly for maintenance and reinforcement of proper oral hygiene procedures to control periodontal disease and prevent tooth loss.

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