Clinical Note

Surgical Treatment and Dental Implant Rehabilitation after the Resection of an Osseous Dysplasia

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(Accepted for publication, August 31, 2016)

Abstract: Osseous dysplasia (OD), which is subdivided into four subtypes (focal cemento-osseous dysplasia, florid osseous dysplasia, periapical cemental dysplasia, and familial gigantiform cementoma), is an idiopathic process located in the periapical region of the tooth-bearing jaw areas, characterized by a replacement of normal bone by fibrous tissue and metaplastic bone. Unless accompanied by bulging or secondary infection of the jawbone, treatment is not necessary. However, treatment for extirpation is required when a secondary infection is present. Consequently, occlusion reconstruction becomes difficult because of large bone defect. Herein, we report the surgical technique to maintain the alveolar ridge form after resecting the lesion and for the case of an infected alveolar bone in a patient with OD. The loss of the buccal cortical bone was inevitable after removal of the infected area. For postoperative occlusal reconstruction, we performed a bone graft to maintain the alveolar ridge form at the same time as the tumor extirpation. Deficient buccal cortical bone was rebuilt with bone taken from the mandibular ramus and a bioactive resorbable plate. We describe the management of OD and the surgical technique for alveolar ridge form management by resecting the lesion and infected alveolar bone.

Key words: Dental implant, Osseous dysplasia, Alveolar ridge form management

Introduction

Osseous dysplasia (OD) is an idiopathic process affecting the periapical region of the tooth-bearing jaw areas, characterized by a replacement of normal bone by fibrous tissue and metaplastic bone. OD refers to a group of diseases indicating these particular bone-related lesions in the odontogenic tumor classification by the World Health Organization (WHO) in 20051. In the previous WHO classification, this group of diseases was classified as cemento-osseous dysplasia. However, it is difficult to histopathologically discriminate the cementum on root surface from other hard tissues independent of the root. Therefore, because no great clinical significance to distinguishing this lesion exists, any cementitious-type disease was lumped into a disease group as "osseous dysplasia"1,2. OD is a synonym of periapical cemental dysplasia, periapical osseous dysplasia, focal cemento-osseous dysplasia, and periapical cementoma.

Usually, unless accompanied by bulging or secondary infection of the jawbone, treatment for OD is not necessary3. However, OD renders these sites more susceptible to infection and acute conditions4. Therefore, treatment for extirpation is required when a secondary infection is present. Consequently, occlusal reconstruction is necessary after removal of the causative tooth; however, it is very difficult to maintain the alveolar ridge after lesion resection. Herein, we report the surgical technique to maintain the alveolar ridge form after resecting the lesion and infected alveolar bone in a patient with OD.

Materials and Methods

Patient

In June 2009, a 55-year-old Japanese woman who complained of pain associated with the left mandibular molar was referred to a general dental practitioner. Because repeated endodontic therapy did not improve the pain, the patient was referred to our hospital.

The patient’s past medical history included hypertension, for which she was receiving medication. No evidence of immunosuppression due to diabetes or steroid therapy existed. On clinical examination, the patient had tenderness at the apical part of the mandibular first molar. Although her occlusion showed a deep bite skeletal Class II tendency, no obvious malocclusion
such as occlusal trauma was found. Panoramic radiographs obtained at the initial visit after the patient referral showed multiple radiopaque lesions at the upper and lower jaws (Fig. 1A). In particular, imaging revealed widely ovoid radiopaque masses, $20 \times 15$ mm in diameter, around the periapical areas of the mandibular first molar (arrow). CT images revealed the relationship between the lesion and the structures around the lesion, which is a radiopaque conglomerate separate from the bone with a radiolucent border.

findings, we made a clinical diagnosis of focal OD. The radiolucent border was cut off from the continuity of her mandibular buccal cortical bone, and was fenestrated to the buccal gingiva. Working under the clinical diagnosis of focal OD with mandibular infection, we first performed antibiotic therapy using cephalosporin after quinolone. However, her clinical symptoms did not improve; we did not think we could save the infected tooth and lesion, so we planned surgical resection. Although we planned tumor resection as well as tooth extraction, because we expected mandibular deficit due to the surgery, reconstruction of posterior mandibular bone defects by autogenous bone block graft simultaneously was planned. Written informed consent was obtained from the patient for publication of this study and accompanying images.

**Surgical technique**

During surgery under general anesthesia, the OD was removed and the mandibular first molar causing the infection was extracted. A corticocancellous buccal block graft was then obtained from the ipsilateral retromolar area using piezosurgery. We placed the block bone continuously with the anterior and posterior areas of existing vital bone around the bone defect area, and fixed it in place with a bioactive resorbable osteosynthesis plate and screws (SuperFIXSORB MX®, Takiron Co., Ltd., Osaka, Japan). Next, a bone graft harvested from the retromolar site, together with particulate bone obtained from the rest of the block, was used to fill the space between the grafted bone and the native alveolar bone (Fig. 2). The mucosal incisions were closed with a 4-0 resorbable suture in a single layer.

**Histopathological examination**

Histological finding of this lesion showed the formation of
dense sclerotic calcified cementum-like masses. These structures were fused to each other. The lesion comprised cementum-like substances characterized by islands of calcified deposits and areas of loose fibro-collagenous stroma, which showed the evidence of proliferation. The cementum-like substances mainly showed acellular structure (Fig. 3A, B); however, they were continuous in the tooth root, and thus, the tooth cementum became thickened. Moreover, the partial hard tissue showed the loss of bone cells, indicating the presence of a sequestrum.

These findings indicated that this patient had already suffered periapical OD. Because of inflammation that occurred by infection, osteomyelitis developed. Tooth cementum became thickened and connected to periapical OD area. Thus, this lesion was diagnosed as periapical OD with osteomyelitis.

Ethics statement/ confirmation of patient permission
The authors confirm that the patient undergoing the procedure described in our clinical note was fully informed about her condition and consented to the clinical and surgical procedures, which included taking photographs of the lesion and the procedure. Authors confirm that personal details of the patient included in any part of the paper and in any supplementary material have been removed before submission.

Results
Four months after surgery, the grafted bone showed good ossification and maintained the same form as preoperative alveolar bone. For occlusal reconstruction of the missing tooth, the patient preferred rehabilitation by a dental implant. CT evaluation of the mandible was undertaken prior to implantation to measure the bone height and width and to select the appropriate implant size (Fig. 4). The dental implant was inserted under local anesthesia. The grafted buccal cortical bone was ossified and alveolar ridge form had been saved as preoperative it (Fig. 4). Osseointegration of all dental implants was confirmed and followed by successful integration of the definitive prosthesis following provisional restoration with good self-care peri-implant bone loss. On postoperative follow-up five years later, a good clinical course was confirmed (Fig.5).

Discussion
Focal OD was classified by the WHO in 2005 as a bone-related lesion, and is a non-neoplastic fibro-osseous lesion. Focal OD is one of the subgroups of OD1-3. The clinical features of this lesion include localization and diffuseness. These lesions are subclassified as periapical OD and focal OD based on the site of
presentation\(^1\). Focal OD is termed when it is seen in the posterior quadrant in the periapical region of vital teeth. If the same process is seen in the anterior region, then it is termed periapical OD\(^3\). The classic radiographic appearance is amorphous, lobulated, and mixed radiolucent and radiopaque masses with a sclerotic border in the jaws\(^6\). Mature lesions appear more radiopaque than early-stage lesions, and have the soft tissue capsule\(^7\). All presentations of OD progress through three stages of development, beginning with the "early or osteolytic stage" and are commonly described as well-defined, unilocular, radiolucent lesions with the accumulation of well-vascularized fibrous tissue\(^8\).

As deposits of cementoid calcifications accumulate within the lesion, this leads into the next stage, described as the "intermediate" or "cementoblastic" stage, with a mixed radiolucent and radiopaque appearance\(^4,8,11,12\). With further radiopaque progression (calcification buildup), the lesion matures and is described as being in the "osteosclerotic or inactive" stage\(^9-11\). According to the literature, OD lesions may eventually become completely radiopaque and ubiquitous throughout the mandible\(^4,8,10,12\).

In this case, the panoramic radiography and CT findings revealed localized, well-defined, round, and radiopaque lesions of the mandible with clear, radiolucent, and demarcated masses in contact with the root of the mandibular left second premolar to second molar teeth. Lobular, irregularly shaped radiopacities were also present in the right mandibular molar area. Therefore, this lesion was considered to be in the "mature" stage.

Many of these lesions are asymptomatic; they grow to a certain size and then stop growing. Therefore, unless accompanied by bulging or secondary infection of the jawbone, treatment is not necessary\(^9\). Owing to the hypovascularity within these lesions, especially in the more progressive lesions with an increasingly radiopaque appearance, indicating a buildup of osseous and cementoid calcifications, these lesions become more susceptible to infection and acute conditions, such as abscesses, fistulas, sequestrums, and osteomyelities\(^4,10,12\). This is the underlying reason for sensitivity and susceptibility of focal OD to inflammation and secondary infection\(^4,13\). In this case, surgical extirpation was required for the secondary infection by repeated root canal treatment. Due to the nature and evolution of this lesion, treatment is generally unnecessary. However, in the present case, removal of the tooth and the infected surrounding bone was required.

Loss of buccal cortical bone was expected due extraction of the infected part. For postoperative osseous reconstruction, we performed a bone graft to save the alveolar ridge form\(^14\). Bone lid surgery is the surgical method to save the traditional alveolar ridge. Herein, cortical bone surrounding the lesion is removed and repositioned again after lesion removal. However, this surgical indication is for healthy cortical bone conditions. In this case, it was necessary to remove the infected bone. Although we could simultaneously remove the lesion using our technique, according to the conventional method, the reconstruction of the alveolar ridge would require a staged approach.

In addition, in our method, deficient buccal cortical bone was rebuilt using bone taken from the mandibular ramus. Then, the defect due to the excised lesion was filled with crushed bone from the rest of donor site. A bioactive plate system was selected for bone fixation and cross-linking. Generally, it is very difficult to maintain the alveolar ridge after tumor resection. However, the current method using a bioactive resorbable plate for the fixation of the cortical bone was very easy and useful. This material, composed of a reinforced composite of unsintered hydroxyapatite (u-HA) and poly-L-lactide (PLLA) is suitable for use as an internal bone fixation device not only because of its mechanical properties such as safe and reliable absorption\(^15\), but also because of its bioactivities, including osteoconduction\(^16\). This plate is useful in alveolar ridge formation as an auxiliary of good bone augmentation, such as in the present case. Postoperatively, the plate was completely ossified after reconstruction of a satisfactory alveolar ridge. It enables occlusal reconstruction with a dental implant, with good postoperative results.

In conclusion, understanding the characteristics of OD is very important when performing treatment. Although excision of the lesion was unfortunately required in the present case, our proposed surgical method was effective.

**Conflicts of interest**

The authors have declared that no COI exists.

**References**

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