Maxillary Reconstruction with Particulate Bone Graft and Titanium Mesh: A Treatment Option for Large Complex Odontoma of the Maxilla

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ABSTRACT

Odontomas are the most common type of odontogenic tumor and are generally asymptomatic. The purpose of this paper was to describe the case of a complex odontoma in a patient who had asymptomatic swelling in the central maxillary region, along with unerupted central and lateral incisors. In this case, surgical excision of the lesion was performed and an iliac bone graft was introduced into the defect area with a titanium mesh covering up the grafted harvesting bone. After 2 years of follow-up, no recurrence was identified. Patient followup is still in progress to evaluate bone graft resorption, and the patient awaits complete bone development. Oral rehabilitation with an osseointegrated titanium implant is expected in the future. An option of the large complex odontoma treatment is discussed.

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KEYWORDS: COMPLEX ODONTOMA, TITANIUM MESH, SPACE MAINTAINER, ILIAC BONE GRAFT, ORTHODONTIC TRACTION

Odontomas are the most common type of benign odontogenic tumors and are usually asymptomatic.[1] They have been divided into 2 histological types: (1) compound odontomas; and (2) complex odontomas. The compound type presents a high pattern of cell differentiation, whereas the complex type is characterized by a diffuse mass of randomly arranged enamel, dentin, and cementum.[2] Compound odontomas are more commonly found in the anterior maxilla, and complex odontomas are more commonly found in the mandible's posterior region.[2]

Odontomas are most frequently diagnosed during the second decade of life, and rarely during the primary dentition.[3] Women and men are affected equally.[4] The etiology of this disease is still unknown, but many factors have been considered to play an important role in its pathogenesis, such as local trauma, infection, and genetics. Odontomas have been associated with failure of primary or permanent teeth eruption; thus, they can also be related to missing permanent teeth and cystic changes.[2,3]

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Radiological characteristics include the presence of an irregular mass surrounded by a thin radiolucent capsular space and the presence of radiopaque compact bone.[1,2] The diagnosis may be made during routine radiological exams due to delayed eruption of primary or permanent teeth.[2,4] The treatment of choice has been surgical removal, and no recurrence of complex odontoma has been reported to date. Conservative surgical approaches preserve the surrounding dentition.[3]

When a bone defect is found in the alveolar ridge, bone grafts are necessary to reconstruct the alveolar ridge and prepare the region for future implant surgery. A titanium mesh can be inserted over the grafted bone for protection, decreasing the risk of bone resorption.[5]

The purpose of this paper was to report a case of surgical removal of an odontoma and reconstruction of the maxilla. An iliac crest bone graft with titanium mesh was used to reconstruct the bone defect.

CASE REPORT

A 10-year-old Caucasian female was referred to Oral and Maxillo facial Service in Hospital das Clinicas São Paulo, Brazil, by her dentist with a chief complaint of a missing front tooth. Intraoral examination showed absence of the maxillary right central incisor and enlargement of the anterior region of the hard palate and maxilla (Figure 1). A panoramic radiograph showed a radiopaque mass with poorly defined limits, circumscribed by a radiolucent halo in the area of the incisor, with displacement of the adjacent teeth (Figure 2). Computerized tomography (**CT**) scans revealed a hyperdense lesion, with its superior limits invading the floor of the nasal cavity and its posterior limits in the hard palate, corresponding to the area of the primary incisors, as shown by 3- and 2-dimensional reconstruction (Figure 3a-c).

A different therapeutic approach was planned for this case, based on the child's age and the extent of the neoplastic tissue, which could cause a large bony defect. Excision of the lesion was performed under general anesthesia, with alveolar ridge reconstruction and application of an iliac crest bone graft with a titanium mesh (Figure 4a-c). Removal of the lesion by the maxillofacial surgeons and removal of the iliac crest bone graft by an orthopedic surgeon was performed simultaneously.

Macroscopic analysis showed an irregular 4 cm-diameter calcified mass (Figure 5). The lateral incisor compromised by the lesion was extracted. Histopatological examination showed the presence of immature tubular dentin, circumscribed by a circular cavity containing immature enamel (Figure 6), which supports the diagnosis of complex odontoma.

Surgery was uneventful, and no complications were noted after 1 week or upon removal of the sutures. At the 6-month follow-up, we noticed a significant increase

Figure 1. Intraoral view enlargement of the anterior region of the hard palate and maxilla.

Figure 2. Preoperative panoramic radiograph showing a radiopaque image in the area of the permanent maxillary right central incisor.

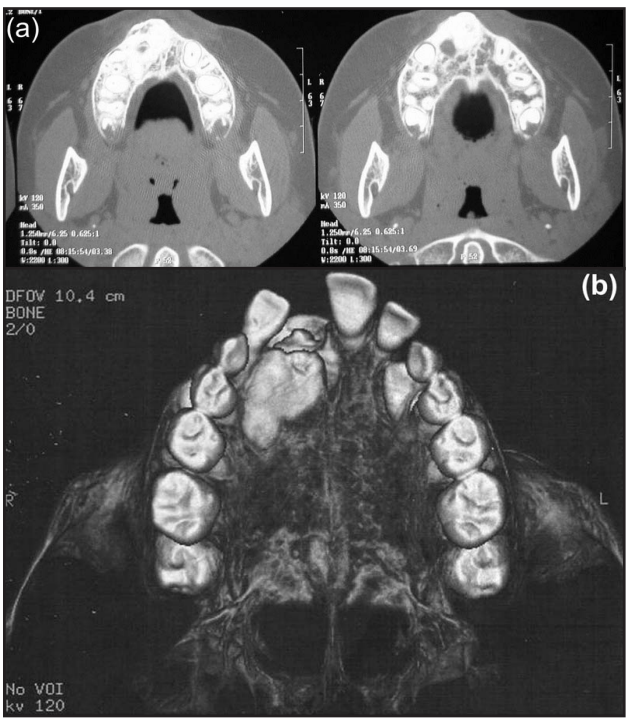

Figure 3. (a) Axial 2-dimensional computed tomography scan showing a hyperdense lesion in the anterior alveolar ridge. (b) Three-dimensional CT scan showing an inferior superior view with an irregular circumscribed lesion in the hard palate.

in alveolar ridge volume, with reconstitution of normal shape and outline. New panoramic, periapical radiographs were obtained to examine the titanium mesh (Figure 7a-b). The titanium mesh was removed 8 months after surgery, and orthodontic appliances was positioned at the remaining teeth with a space maintainer at the central incisor region to keep esthetics (Figure 8).

The canine tooth was guided to regular eruption through orthodontic treatment after 2 years of surgery, and a temporary oral rehabilitation program was provided to the patient.

At the 2-year follow-up, no recurrence of the lesion was observed and the alveolar ridge was in position. The patient is still under follow-up, and complete bone development and oral rehabilitation with dental implants are expected.

DISCUSSION

Odontomas occur mostly during the second decade of life,[1-3,6-9] but the present case occurred during the first decade of life. This can also be expected because permanent maxillary central incisors often erupt when children are 7- to 8-years-old.[10]

The case demonstrated an association between the impaction of the canine and the dental buds of the incisors. Several authors[1,2,3] have shown that an odontoma can interfere with eruption of the adjacent teeth, causing impaction. The extension of the lesion and size on the presented case was not common for complex odontoma[11].

The tumor interfered with the normal dentition of the young patient, causing occlusal and esthetic disturbances. Because of the complexity of this case, a total tumor excision was performed and reconstruction of the maxilla with a particulate illiac bone graft was proposed. The impact on the patient was considered serious because of the potential for interference with the normal eruption of the teeth.

Complex odontomas can grow and affect the orbital floor and maxillary sinus.[1,3] In our case, a CT scan was performed to clearly delimitate the lesion, aid surgical planning, and provide a 3-dimensional view. As in previous reports, 3-dimensional computed tomography (3D-CT) examination was important for the correct diagnosis of tumor expansion and involvement. The exact position of all structures involved (the nasal floor, lateral incisor, impacted canine, alveolar ridge, and hard palate) was verified by 3D-CT, assisting the surgical decision to maintain the canine and extract the tumor and the right lateral incisor involved.

The most common approach to treatment of an odontoma has been conservative surgical removal.[7] Moreover, the probability of recurrence can be very low if the tumor has been completely removed.[3] Our patient had a bone defect after removal of the lesion, and an iliac bone graft was placed in this area to create the conditions for a planned implant. We performed alveolar ridge augmentation after removal. Graft remodeling

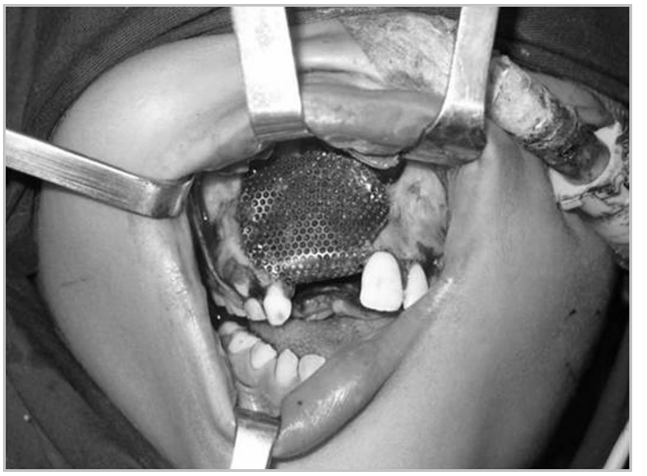

Figure 4. Titanium mesh filled with bone graft and secured into position with screws in the area of the bony defect.

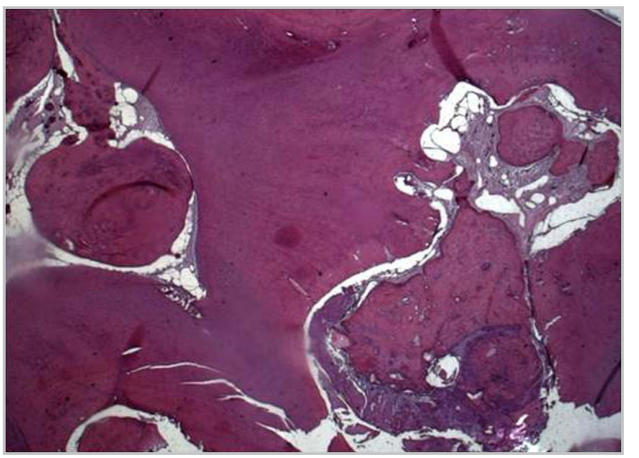

Figure 5. Histopatological examination confirming diagnosis of complex odontoma (hematoxylin and eosin stain; original magnification=100X).

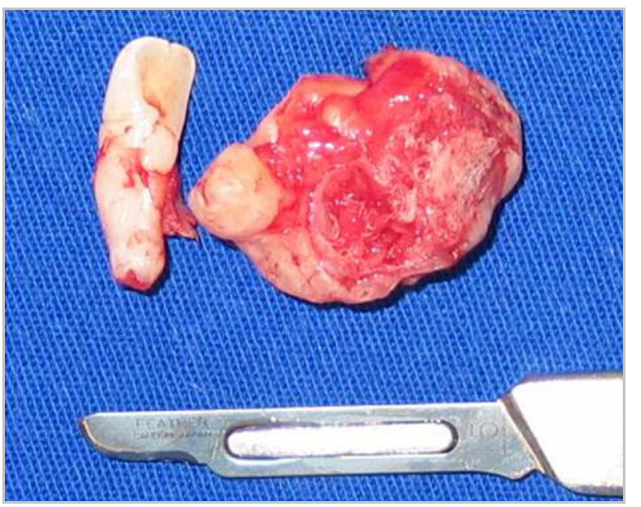

Figure 6. Macroscopic view of the surgical specimen, comparing the impacted tooth and the odontoma.

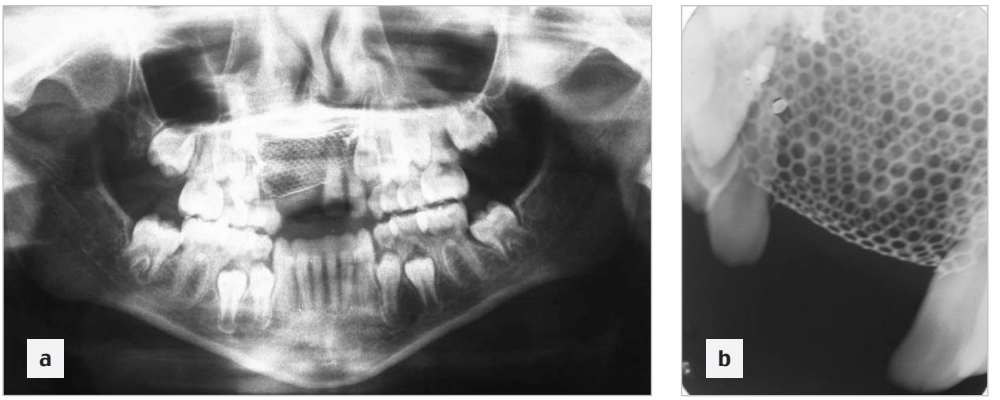

Figure 7. (a) Postoperative panoramic radiograph showing the titanium mesh in position. (b) Postoperative periapical radiography showing a partial bone formation.

Figure 8. Intraoral view showing aspects of postoperative area after titanium mesh removal.

and resorption occurred 1 year after the procedure. In this case, 2 years after surgery, the alveolar ridge was secure, and few bone resorption sites were identified. The degree of resorption can increase over the years.[10]

The bone graft was protected by a titanium mesh, which must be rigid enough to prevent soft tissue from collapsing, thus maintaining a space for the grafted bone. Smooth-surfaced titanium barriers are less susceptible to bacterial contamination than other types of resorbable membranes.[5] The choice to use an iliac bone graft was made because the surgery cavity had a large size, and the shape of the alveolar ridge could be rearranged with the titanium mesh. Illiac bone graft is not recommended in children during the growth stage, but the impact caused by dental esthetics and bone deformation could be even greater in the future.

After removal of the tumor and extraction of the adjacent involved teeth, an orthodontic traction was applied to the canine. A large space was present between the permanent left central incisor and the primary right first molar, which could interfere with normal dental eruption. Recovery of functional aspects (such as chewing) and esthetic needs was made possible by orthodontic traction, which repositioned the impacted canine in the dental arch. The presence of the esthetic space maintainer (lateral incisor) also helped orthodontic traction and the positioning of the impacted canine on the alveolar ridge.

An esthetic space maintainer was indicated for temporary use[12] until the patient reaches the age at which it would be possible to carry out definitive treatment with osseointegrated implants. Placement of implants in complete bone has been recommended.[12] Our patient is being followed until she receives a complete oral rehabilitation, with implantation planned in the future.

The placement of an iliac graft protected by titanium mesh after complex odontoma excision is an option for the reconstruction of injured alveolar ridges, with recomended complementary orthodontic treatment of the adjacent teeth. Follow-up of this patient is extremely important to control alveolar ridge resorption and assess the implant site.

We recommended multidisciplinary psychological and dental approaches to follow the child's growth. This patient is likely to undergo a new surgical intervention to correct resorption and for future rehabilitation of oral osseointegrated implants.

REFERENCES

1. Mehra P, Singh H. Complex composite odontoma-associated with an impacted tooth. N Y State Dent J 2007;73:38-40.
2. Johnson J, Whaites EJ, Sheehy EC. The use of multidirectional cross-sectional tomography for localizing an odontome. Int J Paediatr Dent 2007;17: 129-33.
3. Singer SR,Mupparapu M, Milles M, Rinaggio J, Pisano D, Quaranta P. Unusually large complex odontoma in maxillary sinus associated with unerupted tooth. N Y State Dent J 2007;73:51-3.

4. Tomizawa M, Otsuka Y, Noda T. Clinical observations of odontomas in Japanese children: 39 cases including one recurrent case. Int J Paediatr Dent 2005;15:37-43.
5. Louis PJ, Gutta R, Said-Al-Naief N, Bartolucci AA. Reconstruction of the maxilla and mandible with particulate bone graft and titanium mesh for implant placement. J Oral MaxillofacSurg 2008;66: 235-45.
6. Junquera L, Vicente JC, Roig P, Olay S, Rodríguez-Recio O.Intraosseousodontoma erupted into the oral cavity: An unusual pathology. Med Oral Patol Oral Cir Bucal 2005;10:248-5.
7. Alvarez SG, Jimenez FM, Gómez FJT , Vecino FJA, Fernandez CS. Calcifying odontogenic cyst associated with complex odontoma: Case report and review of the literature. Med Oral Patol Oral Cir Bucal 2005;10:243-7.
8. Kensuke K, Munekatsu K, Yoshiaki T, Shinsuke T. New regenerative surgical treatment of cystic diseases of the jaw by utilizing grafting of cancellousiliac bone and replanting of patient's teeth. J Craniofac Surg 2004;15:792-6.
9. McDonald RE, Avery DR. Eruption of the teeth: Local, systemic, and congenital factors that influence the process. Dentistry for the Child and Adolescent. Indianapolis, Ind: Mosby; 2004: 186-215.
10. Kahnberg KE, Vannas-Löfqvist L. Maxillary osteotomy with an interpositional bone graft and implants for reconstruction of the severely resorbed maxilla: A clinical report. Int J Oral Maxillofac Implants 2005;20:938-45.
11. Hisatomi M, Asaumi JI, Konouchi H, Honda Y, Wakasa T, Kishi K. A case ofcomplex odontoma associated with an impacted lower primary second molarand analysis of the 107 odontomas. Oral Dis 2002;8:100-5.
12. Fudalej P, Kokich VG, Leroux B. Determining the cessation of vertical growth of the craniofacial structures to facilitate placement of single-tooth implants. Am J Orthod Dentofacial Orthop 2007; 131(suppl):59-67.