Complex odontoma at the upper right maxilla: Surgical management and histomorphological profile

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Abstract

Background Odontomas are hamartomatous developmental malformations of the dental tissues. Usually asymptomatic, their presence is often revealed on routine radiographs. The study aimed to establish the efficacy of this conventional approach in treating odontomas, analysing clinical outcome, follow-up, and histomorphological profile.

Case report A case is presented with a review of the international literature. The patient, aged 8 years, had a complex odontoma localised on the front upper jaw. She was treated following the conventional surgical procedure. Post-operative course and healing were uneventful. Orthodontic treatment was necessary to realign the teeth. At the 12-month follow-up there was no recurrence or failure. Healing was excellent.

Conclusion Variations in normal tooth eruption are a common finding, but significant deviations from established norms should alert the clinician to further investigate the patient's health and development.

KEYWORDS Odontoma, Delayed permanent tooth eruption, Retained teeth, Surgical procedure.

Introduction

The term "odontoma" means "tumor formed by the overgrowth or transitory of complete dental tissue", a definition coined by Paul Broca in 1867. However, only in 1992 did the World Health Organization (WHO) recognise a classification of two types of odontoma:

- compound odontomas, consisting of malformations with representation of all dental tissue types and exhibiting organised distribution in which numerous tooth-like structures known as denticles are present;
- complex odontomas, i.e. malformations in which all dental tissues are likewise represented but that show a disorganised distribution.

Other types of odontoma also sometimes occur, presenting combinations of the characteristics of compound and complex odontomas (i.e. mixed odontomas) [Gomel and Seçkin, 1989; Kaneko et al., 1998; López-Areal et al., 1992; Patiño Illa et al., 1995; Patiño Illa et al., Litonjua et al.,1995; Lacarbonara et al., 2017].

Epidemiologically, compound odontomas are the most frequent type [Tomizawa et al., 2005; Soluk Tekkesin et al., 2012, Conti et al., 2012], and the most frequent location is at the maxillary incisors and canines, followed by the antero- and postero-mandibular regions. Complex odontomas are more often found in the vicinity of the second and third mandibular molars. The prevalence of these hamartomatous lesions is higher in children, with little difference between genders [Soluk Tekkesin et al., 2012]. Clinically, the growth of both sub-types is typically slow and painless, often associated to alterations in the permanent or deciduous dentition [Gomel and Seçkin, 1989; Kaneko et al., 1998; López-Areal et al., 1992; Patiño Illa et al., 1995; Patiño Illa et al., Litonjua et al.,1995].

These lesions are usually discovered on the occasion of routine radiological examinations (panoramic and/or intraoral X-rays) to evaluate the cause of delayed tooth eruption. Radiologically, odontomas usually appear unilocular and contain multiple radiopaque, miniature tooth-like structures known as denticles; alternatively, they may appear as a dense radiopaque mass surrounded by a thin radiotransparent rim [Tomizawa et al., 2005]. The lesions tend to be located between the roots of erupted teeth, or between the deciduous and permanent dentition [Soluk Tekkesin et al., 2012]. Odontomas are composed of various dental tissue formations, including enamel, dentin, cement, and sometimes pulpal structures, diagnosis is confirmed by histological examination.

Conventional surgery is considered to be the treatment of choice for odontomas. However, lasers have also been successfully used in treating cutaneous and mucosal lesions [Angiero et al., 2005; Rizoiu et al., 1996], and it is known that the Er:YAG laser, at a wavelength of 2,940 nm, possesses suitable properties for treating hard tissue, due to its

FIG. 1 Pretreatment panoramic radiograph showing a radiopaque mass in the upper right maxilla with well-defined borders and apically associated with the impacted canine.

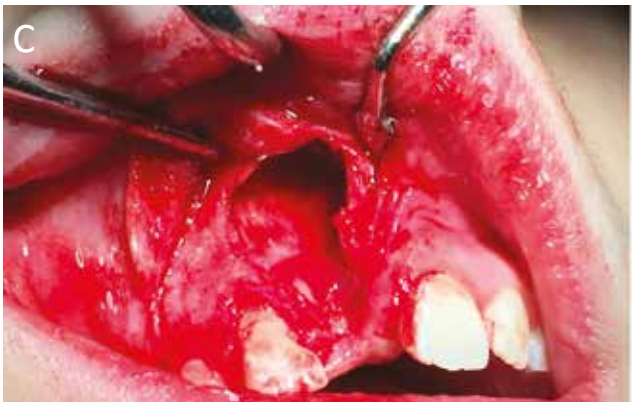

FIG. 2 Surgical procedures.

characteristic wavelength which is highly absorbed by water [Sullivan et al., 2009]. This laser system has a capability to ablate bone effectively, without producing major thermal side effects to adjacent tissues [Rizoiu et al., 1996]. In 1983, Eriksson et al. [1983] introduced the concept that, during bone surgery using rotary instrumentation, the tissue temperature should not rise above 47 °C for one minute, in order to avoid permanent cell damage. The prime mode of ablative laser-tissue interaction is photothermal, and thus the concept of potential thermal damage would apply equally with laser use. These damaging effects can be minimised by using the laser in a pulsed emission mode, and by applying cooling systems with water and air spray. It is also reported that the Er:YAG laser, set at operating parameters of 5.0 Watts average power and 20 Hz, provides good dental hard tissue cutting capacity without causing carbonisation, and that it also demonstrates significant antimicrobial activity [Ando et al., 1996].

The aim of this study was to evaluate the efficacy of managing odontomas with conventional surgery, analysing clinical outcome and recurrence.

Case report

The patient, an 8-year-old girl, was referred in September 2018 by her general dental practitioners to the Department of Oral Pathology, Department of Surgical and Diagnostic Sciences, University of Genova (Genoa, Italy). The lesion had been detected on routine radiographs for disturbances of tooth eruption. The case was diagnosed based on clinical history, physical examination, radiological studies and histological analysis of a surgical specimen (Fig. 1, 2, 3).

Conventional surgery was carried out using an intraoral approach. The lesion was of considerable size and closely associated with a permanent tooth that had failed to erupt; both lesion and tooth were removed. Other teeth, which could be repositioned in the dental arch, received orthodontic treatment.

Filling material (bone mineral) was required for bone defects, where single guided bone regeneration techniques were used to prevent formation of a significant bone defect.

Conventional surgical procedure

The procedure comprised raising a muco-periosteal flap,

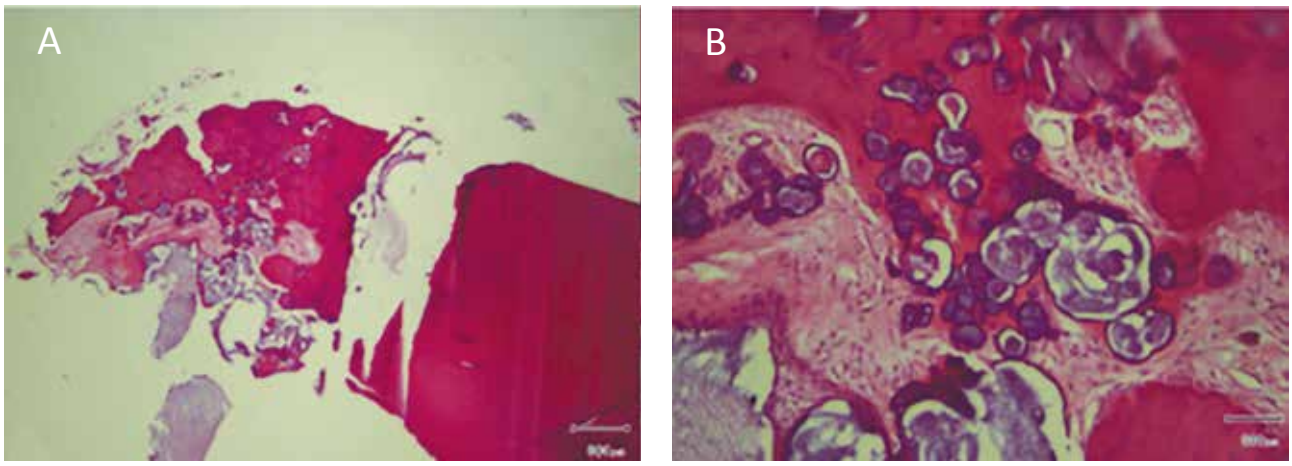

FIG. 3 Photomicrograph shows pulpal tissue adjacent to predentin and mature dentin (haematoxylin and eosin, original magnification 40x) (A). Histologically, it appears as a mass of disorganised odontogenic tissues. Cementum-like substances and dentinoid structures are intermixed. Pulp tissue, epithelial remnants, and enamel matrix can also be observed within the calcified mineralised masses (haematoxylin and eosin original magnification 20x) (B).

FIG. 4 Postoperative panoramic radiograph showing that the mass of the right upper maxilla had been removed.

FIG. 5 Restitutio ad integrum and central incisors eruption was achieved 1 year after surgery.

performing an osteotomy to reveal the lesion and resecting the odontoma and extracting the affected tooth. All phases of conventional surgery (mucosa incision, osteotomy, resection) were performed under local anaesthesia, making an incision with a 15c scalpel blade and raising a full-thickness flap, after which an osteotomy was performed, and the lesion was then removed. The cavity was filled with cortical and spongy bone of equine origin (Osteoxenon® granules, Bioteck, Vicenza, Italy). The flap was sutured with interrupted sutures of 3/0 braided silk thread, needle v-5 Ethicon, and with 3/0 PTFE suture thread, needle 3/8 Gore-tex®. The excised tissue was sent for histo-pathological study to confirm diagnosis (Fig. 2).

Post-operative treatment

Pharmacological treatment comprised administration of amoxicillin 1 gr. caps, 2 caps per day for 5 days. The patient was instructed to use a gel-bearing tray to apply 0.2% chlorhexidine-based gel to the treated zone, for 5 minutes twice daily for as long as the sutures remained in place. The patient was monitored through orthopantomography, taken pre-operatively and post-operatively (Fig. 4), at 3 months, at 6 months, and yearly after surgery (Fig. 5).

Pathological findings

The surgical piece was fixed in 10% buffered formalin and embedded in paraffin wax, sections (4 µm thick) were prepared and stained with haematoxylin and eosin (H&E). The histopathological specimen confirmed the clinical diagnosis: complex odontoma, showing haphazardly arranged hard tissues of tooth-like dentin and globules of cementum-like material, primary or immature dentin as predominant component, although enamel was also present (Fig. 3).

The case was treated with conventional surgery. At one-year follow-up, there was no failure or relapse. Orthodontic treatment was adopted, to return an impacted permanent tooth to its normal position, applying traction to the non-erupted tooth with an arch and a direct-bonding system. Acceptable occlusion was achieved 1 year after surgery (Fig. 5). At six months checkup, no post-operative complications were noted and there was no recurrence.

Discussion

Odontomas are relatively common benign hamartomatous malformations that are asymptomatic and often only diagnosed on routine radiological analysis. In some cases, there are signs such as delayed tooth eruption, or patients may report pain and present suppuration [Mizutani et al., 2006]. Approximately 70% of cases are associated to other conditions, including tooth impaction or malposition as well as malformation, resorption and devitalization of adjacent teeth [Tomizawa et al., 2005; Soluk Tekkesin et al., 2012; Conti et al., 2012].

It is reported that the ratio of compound to complex odontomas is 2:1 [Gomel and Seçkin, 1989; Kaneko et al., 1998; López-Areal et al., 1992; Patiño Illa et al., 1995; Patiño Illa et al., Litonjua et al.,1995; Soluk Tekkesin et al., 2012; Hale et al., 1973]. Compound odontomas are usually located in the anterior maxilla, either above the crowns of unerupted teeth or between the roots of erupted teeth. Conversely, complex odontomas are generally found in the posterior mandible, above impacted teeth, and may achieve several centimeters in size [Soluk Tekkesin et al., 2012; López-Areal et al., 1992; Hale et al., 1973; Angiero et al., 2005; Sasaki et al., 2002; Lewandrowski et al., 1996].

Some studies reported a correlation between patient age and type of odontoma; compound lesions being more frequent in younger patients, while complex odontomas appear to be more common in older patients [Soluk Tekkesin et al., 2012]. Further, studies of the relation between patient age and location suggest that older individuals are more likely to present odontomas in the molar region [Lewandrowski et al., 1996].

In order to diagnose odontomas, clinical data must be correlated with radiological findings and histological evaluation. It is reported that computed tomography and magnetic resonance imaging are superior to plain radiography, when establishing the intraosseous extent of the tumor, cortical perforation, and soft tissue involvement [Ando et al., 1996; Chrcanovic et al., 2010].

There is no general agreement over the best management approach for impacted teeth associated with odontomas. Morning [1980] reported that about 75% of impacted teeth related to odontoma erupt after its removal, indicating that careful evaluation should be made before extracting such an impacted tooth. However, impacted teeth are frequently reported to be removed together with odontomas [Morning, 1980; Litonjua et al., 2004]. Treatment options also include simple observation with periodic clinical and radiological check-up, to evaluate the development of these teeth [Hisatomi et al., 2002; Katz, 1989].

Conclusion

The present case report highlights the clinical, radiographic, and histomorphological findings, and the investigations required to arrive at diagnosis. The treatment described here combined with histopathological analysis reinforces the concept that the established treatment protocol is the best approach. Variations in normal tooth eruption are a common finding, but significant deviations from established norms should alert the clinician to further investigate the patient's health and development. Clinical experience and the dental literature suggest that an individualised radiographic examination should be performed for any paediatric patient who presents with clinical evidence of delayed permanent tooth eruption, or with temporary tooth displacement or retained deciduous teeth, with or without a history of previous dental trauma. Early diagnosis helps the clinician adopt a simpler and less complex approach to treatment and ensures better prognosis.

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