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Bilateral mandibular dentigerous cysts in a non-syndromic patient: comprehensive review of the literature and case report

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Abstract:
Dentigerous cysts are the second most frequent odontogenic cysts. They are usually solitary and associated with impacted third molars in young patients. Multiple cysts are rare and generally occur in syndromic patients. We present the surgical and endodontic management of a bilateral mandibular dentigerous cysts in a non-syndromic patient and a comprehensive literature review.

A 25-year-old woman was referred with pain in the right side of the mandible. Clinical, radiological and anatomopathological examinations led to the diagnosis of dentigerous cysts associated with impacted mandibular third molars. The patient's follow-up was marked by the pulp necrosis of mandibular second molars, which were treated endodontically. Bone repair was complete at 18 months.

The literature review identified only 43 cases of multiple dentigerous cysts occurring in healthy patients reported over the past 10 years. The endodontic treatment of resorbed adjacent teeth was rarely attempted in the cases reported in the literature. Surgery for large bone lesions carries the risk of complications requiring a multidisciplinary approach.

Key words: *Dentigerous cyst, bilateral; nonsyndromic, impacted tooth*
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INTRODUCTION

Dentigerous cysts belong to the developmental odontogenic cysts group. Derived from epithelial residues of the dental lamina, they develop at the enamel-cement junction of an impacted tooth. Dentigerous cysts represent the second most common odontogenic cysts after radicular cysts.[1] They are often unique and associated, in order of frequency, with the inclusion of the mandibular third molar, maxillary canine and mandibular second premolar.[2] Multiple localisations have rarely been reported in the literature in non-syndromic patients. We report a rare case of bilateral mandibular dentigerous cysts associated with adjacent teeth resorptions, managed by surgical and endodontic treatment in a non-syndromic patient, along with an updated review of the literature.

Observation

A 25-year-old woman was referred to the dental emergency department by her dentist for severe pain in the right side of the mandible (visual analogue scale score 80/100), accompanied by deterioration of general condition and asthenia. The pain was radiating to the temporal region and exacerbated when chewing or brushing.

The patient had no medical condition or surgical history apart from hepatitis A. She was a smoker (5 pack-years). General examination did not reveal any lymphadenopathy or facial asymmetry. The oral examination revealed a mucous cap partially covering the crown of the right mandibular second molar, whose gum was oedematous and erythematous. Pulp sensitivity tests were positive on all mandibular teeth, the percussion test was negative, and palpation of the buccal and lingual cortices was painful on the right side of the mandible. The teeth had physiological mobility.

The panoramic radiograph showed bilateral homogeneous radiolucent lesions with well-defined borders, extending from the mandibular angles to the distal roots of first molars, and from the alveolar ridge to the basilar border of the mandible *(Figure 1)*. The lesions were associated with the crowns of the impacted mandibular third molars, the right third molar being driven back towards the mandibular rising branch. The Cone Beam Computed Tomography (CBCT) examination showed

Figure 1: Panoramic radiograph showing bilateral mandibular angular radiolucent lesions related to the impacted mandibular third molars

thinning of cortical plates and repression of the lower alveolar nerve *(Figure 2)*. The apices of second mandibular molars adjacent to the lesions were resorbed, in particular the distal root of the one on the left. The presumptive diagnosis was bilateral mandibular dentigerous cysts with an infectious complication on the right side.

The two cysts were enucleated and both mandibular third molars were removed under general anaesthesia *(Figure 3)*. The enucleation specimens were sent for anatomopathological analysis which confirmed the diagnosis of dentigerous cysts. The post-operative course was uneventful. The patient consulted two months later for facial cellulitis originating from pulp necrosis of the right mandibular second molar. Cold and electrical pulp sensitivity tests were also negative for the left mandibular second molar. The cellulitis was treated with antibiotic therapy (amoxicillin and metronidazole) and analgesics (paracetamol and tramadol). Both mandibular second molars were treated endodontically with the placement of a temporary

Figure 2: Preoperative CBCT (coronal (A), axial (B), right and left, (C, D) sections) showing extensive bilateral osteolysis extending from the mandibular angles to the distal roots of the first molars, and apical root resorptions of the second molars.

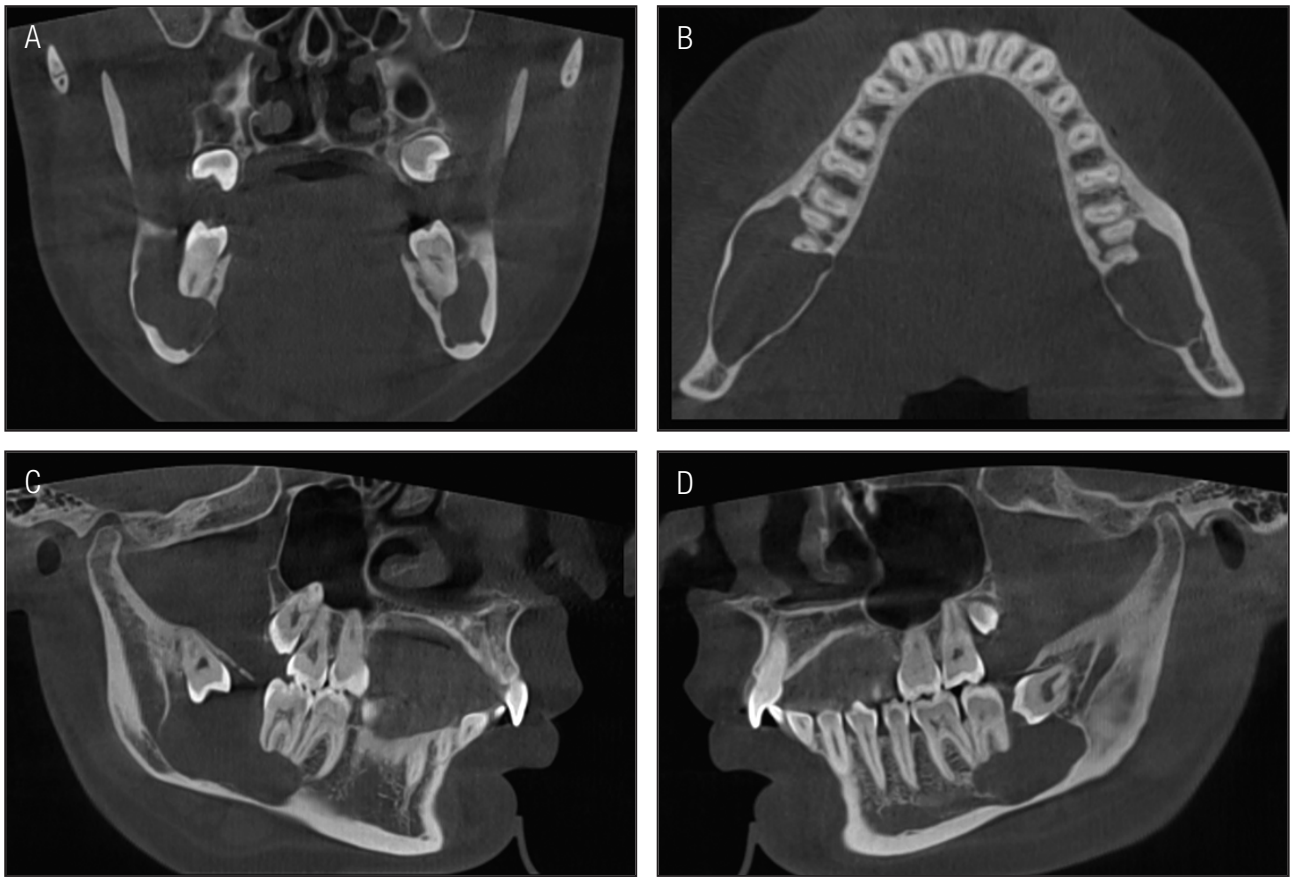
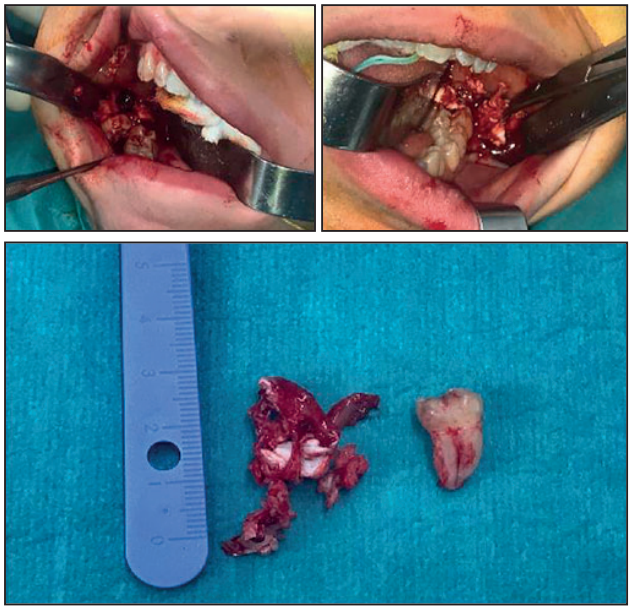


Figure 3: Intraoperative clinical photographs



filling based on calcium hydroxide, renewed every two weeks until the symptoms had disappeared and the canal had dried up; and this for 4 months. A CBCT was carried out four months after the intervention and before performing the final root canal fillings. It showed ongoing but late bone repair on the left side where drying of the root canals was more difficult to achieve. The right mandibular second molar was sealed with tricalcium silicate-based cement (Mineral Trioxide Aggregate, MTA®), indicated for its biocompatibility and easy manipulation. A gingival sulcular suppuration and a seepage of the canals were persistent on the left mandibular second molar, which led to pain at chewing. For this reason, antibiotic treatment with good bone diffusion (ofloxacin and clarithromycin) was prescribed until the symptoms improved and the canal drying was obtained (14 days). After stopping the suppuration, the left mandibular second molar was filled with MTA® *(Figure 4)*. The patient was seen every three months until the end of the follow-up (at 18 months) to check bone repair and vitality of mandibular first molars *(Figure 5)*.

Discussion of the literature review

Dentigerous cysts are the second most common odontogenic cysts after radicular cysts, with a prevalence of approximately 21%; they are more frequent in the male population with a peak between the second and the fourth decade.[3] They

Figure 4: Post-endodontic retro-alveolar radiographs of right (A) and left (B) mandibular second molars

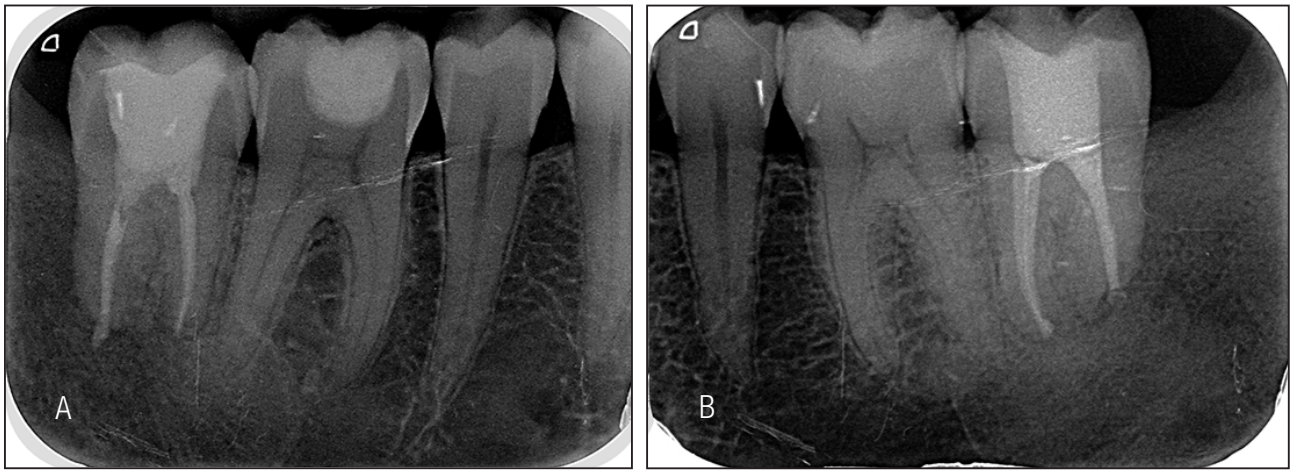


Figure 5: Panoramic radiograph at 18 months showing complete bone healing

are mostly associated with the inclusion of the mandibular third molars. Their discovery is generally fortuitous except in the event of secondary infection or delayed tooth eruption.[4] These are generally unique cysts in healthy patients. Indeed, multiple localisations have rarely been described in patients without major syndromes.[4,5] In a series of 2,082 histologically confirmed dentigerous cysts, Zhang *et al.*[6] found that multiple cysts not associated with any syndromes or systemic conditions represented 2.5% of cases. However, there is no clear evidence to suggest the cause of bilateral dentigerous cysts in non-syndromic patients.

According to the authors, the number of cases reported from 1943 (year of publication of the first case of non-syndromic multiple dentigerous cysts) to 2009 was small, varying from 11[7] to 42.[8] However, as dentigerous cysts represent a common pathology, a publication bias cannot be excluded. Another explanation may be the underdiagnosis of these lesions before the use of new imaging methods such as CBCT permitting the identification of multiple lesions. These forms generally occur within certain syndromes such as Maroteaux-Lamy, Gardner and Gorlin syndromes or cleidocranial dysplasia.[9,10] Medication (a combination of cyclosporin A and calcium channel blockers) has been associated with multiple dental cysts.[5] In the reported case, a general disease and taking medication were ruled out after interview and general examination by patient's attending physician.

We carried out a literature review from January 2009 to December 2019 on PubMed, Scopus and Google Scholar databases using the search equation ('bilateral' OR 'multiple' OR 'bimaxillary') AND ('dentigerous cyst') AND ('jaw' OR 'mandible' OR 'maxilla') and by performing a manual bottom-up search based on the selected publications; 53 articles in the English language, limited to humans, were identified; after reading the titles and abstracts, 39 articles presenting multiple, bilateral (mandible or maxilla) or bimaxillary dentigerous cysts were selected; among them, three articles were excluded because either they reported cases of single cysts associated with two or multiple included teeth or because they described multiple cysts in patients with syndromes or systemic conditions.

The synthesis of the 36 publications retained in the review.[7,8,11-44] reporting 43 cases of multiple/bilateral/bimaxillary dentigerous cysts is presented in *Table 1*.

The mean age was 18.07 years-old (standard deviation, SD = 12.18), and 67.44% of patients were men (29 cases out of 43).

- Regarding the circumstances of cysts discovery, the diagnosis was fortuitous in 37.21% of cases (16 patients) or following infectious accidents in 39.53% of them (17 patients) or dental mobility in 6.98% of cases (3 patients). Data were not available for 16.28% of cases (7 patients)
- The affected arches were the mandible bilaterally in 53.49% of cases (23 patients); the maxilla bilaterally in 27.91% of cases (12 patients); the maxilla and mandible in 18.60% of cases (8 patients) with 2, 3 or 4 quadrants affected
- The dentigerous cysts were related to impacted mandibular second premolars in 14 patients (32.55%), maxillary canines in 13 patients (30.23%) and mandibular third molars in 12 patients (27.90%)
- Regarding the number of cysts, 79.06% of cases (34 patients) had 2 cysts, 9.30% (4 patients) presented 3 cysts, 9.30% (4 patients) had 4 cysts and 2.33% (1 patient) developed 5 cysts
- Concerning the size of the cysts, 25.58% of cases (11 patients) presented cysts smaller than 2cm; 47% (20 patients) presented at least one cyst between 2cm and 4cm; 11.63% (5 patients) presented at least one cyst larger than 4cm. Data were not available for 16.28% of cases (7 patients).

The anomalies of the teeth adjacent to the cysts and their treatments were as follow:

- 34.88% of cases (15 patients) had at least one resorption of the adjacent teeth
- Only two patients (4.65%) received an endodontic treatment of the resorbed tooth.[22,29]
- Two patients (4.65%) were treated by marsupialization of the cysts with initial conservation of the resorbed teeth[39,42] but in one of the cases, the resorbed tooth was removed later.[42]
- Nine patients presented resorptions of the deciduous teeth; for two patients, we assume that they have got extracted because the authors did not specify the fate of these teeth.[25,26]
- Teeth with resorption were therefore extracted in 80.0% of cases (12 patients of 15); in 20.0% of the patients (3 patients of 15) they could have been kept, as in the case we reported.

The treatment of cysts consisted of enucleation with the extraction of the impacted teeth for 65.11% of cases (28 patients), while 27.91% (12 patients) were treated with a marsupialisation technique, allowing the evolution of teeth and their eruption spontaneously or after orthodontic traction (in two cases).[28,32] We noted that a patient received an orthodontic traction of the impacted tooth after marsupialisation of one of the cysts and enucleation and extraction of the affected teeth on the other side.[22] The surgical interventions were performed under general anaesthesia for 41.86% of patients (18 patients of 43) and under local anaesthesia for 13.95% (6 patients of 43) (information was missing for the others).

The management of dental cysts mostly consists in the removal of the impacted teeth during the enucleation of the cysts. The anatomical pieces must be sent for anatomopathological analysis, the main issue of which is the differential diagnosis with ameloblastoma or other tumours. Indeed, Zhang *et al.*[6] have shown that 0.5% of dentigerous cysts can co-exist with other more serious conditions, such as keratocystic odontogenic tumours or cystic ameloblastoma, indicating the importance of histologically confirming any jaw cyst, even when it presents clinically as a classic dentigerous cyst.

When the cysts are large and have proximity to noble anatomical structures or when the impacted teeth are important for occlusion (canines or premolar for example), the marsupialisation technique whether associated or not with orthodontic traction can be considered. In the reported case, the patient had refused the proposed marsupialisation treatment; despite the repression of the lower alveolar nerves by the cysts, no neurological complication was identified in the postoperative period. In the cases included in the literature review, no neurological complications were described despite the large size of some lesions.

In our case, the pulp necrosis of the mandibular second molars can be explained by a possible rupture of the vascular-nerve

Table 1 – Part 1: Summary of cases of non-syndromic bilateral or multiple dentigerous cysts reported between 2009 and 2019

Author / Year of publication	Sex	Age	Teeth affected by cysts	No. of cysts	Circumstance of diagnosis	Size of cysts	Adj. teeth resorption	Treatment	Loc. or gen. anesthesia	Post-op evolution	Duration of follow-up
Aher et al, 2013	M	24	Md. third molars	2	Incidental discovery	3cm and 4cm	Yes: Md. first and second molars	Enucleation and extraction of md. first, second and third molars	GA	Total bone repair	6 months
Akay et al, 2011	F	7	Md. second premolars	2	NA	NA	NA	Marsupialization	NA	NA	NA
	F	8	Md. second premolars	2	NA	NA	NA	Marsupialization	NA	NA	NA
	M	7	Md. second premolars	2	NA	NA	NA	Marsupialization	NA	NA	NA
	M	8	Mx. and md. second premolars	4	NA	NA	NA	Marsupialization	NA	NA	NA
	F	9	Mx. canines	2	NA	NA	NA	Marsupialization	NA	NA	NA
	F	8	Mx. canines, 1st & 2nd premolars	2	NA	NA	NA	Marsupialization	NA	NA	NA
	M	9	Md. second premolars	2	NA	NA	NA	Marsupialization	NA	NA	NA
Alkhudair et al, 2019	M	19	Mx. third molars	2	Infection	2cm	No	Enucleation & extraction of mx. 3rd molars	GA	No complications	5 years
Asha et al, 2017	M	7	Md. first molars	2	Infection	1cm and 2cm	Yes: Md. deciduous 2nd molars	Enucleation and extraction of md. deciduous second molars and permanent first molars	NA	NA	NA
Cura et al, 2015	M	45	Mx. first premolars, md. canines	4	Infection	1cm to 2cm	No	Enucleation and extraction of mx. first and second premolars and md. canines	GA	Mucosal healing	10 days
Cury et al, 2009	M	5	Md. first molars	2	Infection	3cm	Yes: Md. deciduous 2nd molars	Enucleation and extraction of md. deciduous second molars	GA	No complications	12 months
Devi et al, 2015	M	17	Mx. right first and second incisors, left second incisor and canine, md. canines and first premolars	4	Incidental discovery	2cm and 3cm	Yes: Mx. deciduous incisors, md. deciduous 2nd molars	Enucleation and extraction of mx. right first and second incisors, left second incisor and canine, md. canines and first premolars	GA	NA	NA
Dhupar et al, 2017	M	8	Mx. right canine, md. left second premolar	2	Incidental discovery	1cm	No	Enucleation and extraction of right canine and premolars, and md. left deciduous second molar and second premolar	GA	Mucosal healing	NA
Gogula et al, 2018	M	40	Md. third molars	2	Infection	1cm and 3cm	No	Enucleation and extraction of md. third molars and left second molar	LA	Partial bone repair	6 months
Grewal et al, 2010	M	11	Mx. right first incisor and left canine	2	Infection	6cm and 4cm	Yes: Mx. left deciduous canine, first and second premolars	Enucleation and extraction of right first incisor and left canine	GA	NA	NA

Table 1 – Part 2: Summary of cases of non-syndromic bilateral or multiple dentigerous cysts reported between 2009 and 2019

Author / Year of publication	Sex	Age	Teeth affected by cysts	No. of cysts	Circumstance of diagnosis	Size of cysts	Adj. teeth resorption	Treatment	Loc. or gen. anesthesia	Post-op evolution	Duration of follow-up
Hansford et al, 2015	F	6	Mx. canines, first and second premolars, md. canines, first and second premolars	3	Infection	2cm	No	Marsupialization and extraction of mx. deciduous first molars and left deciduous canine, md. deciduous canines and deciduous first molars	NA	Total bone repair	2 years
Imada et al, 2014	F	42	Md. third molars	2	Incidental discovery	1,6 et 2,3cm	No	Marsupialization failure. Enucleation and extraction of md. third molars	GA	No complications	18 months
Ishihara et al, 2012	M	13	Md. second premolars and left third molar	3	Incidental discovery	1cm	Yes: Md. left 2nd molar	Marsupialization and orthodontic traction of md. right 2nd premolar. Enucleation and auto-transplantation of md. left 2nd premolar. Hemi-section and endodontic treatment of md. left 2nd molar. Enucleation and extraction of md. left 3rd molar	NA	Total bone repair	2 years
Jeon et al, 2016	M	15	Mx and md. third molars	4	Incidental discovery	2cm	No	Enucleation and extraction of mx. and md. third molars	GA	Total bone repair	10 years
Kannan et al, 2010	M	32	Mx. canines	2	Infection	1cm	No	Enucleation and extraction of mx. canines	LA	NA	NA
Kanth et al, 2011	F	9	Md. second premolars	2	Infection	1cm and 4cm	No	Enucleation and extraction of md. second premolars	LA	No complications	6 months
Kaushik et al, 2015	M	34	Md. canines	2	Incidental discovery	1cm and 4cm	No	Enucleation and extraction of md. canines	NA	Mucosal healing	1 year
	F	17	Mx. canines	2	Incidental discovery	1cm	No	Marsupialization and orthodontic traction of mx. canines; extraction of mx. deciduous canines	NA	NA	NA
Khandeparker et al, 2018	M	10	Mx. right second premolar and left canine	2	Infection	3cm and 1.5cm	Yes: Mx. left deciduous canine and right first premolar	Enucleation and extraction of right premolars, and left deciduous and permanent canines	GA	Loss of view	Loss of view
Manoranjan et al, 2011	F	11	Md. left first premolar, and right first and second premolars	2	Infection	3cm and 1cm	Yes: Md. left deciduous 1st molar, right deciduous molars	Enucleation and extraction of md. left deciduous first molar, right deciduous molars and first premolars	GA	NA	NA
Mehdizadeh et al, 2019	M	28	Md. third molars	2	Dental mobility	3cm and 4cm	Yes: Md. left first and second molars	Enucleation and extraction of md. third molars, and left second molar Endodontic treatment of md. left first molar and right second molar	NA	Partial bone repair	NA

Table 1 – Part 3: Summary of cases of non-syndromic bilateral or multiple dentigerous cysts reported between 2009 and 2019

Author / Year of publication	Sex	Age	Teeth affected by cysts	No. of cysts	Circumstance of diagnosis	Size of cysts	Adj. teeth resorption	Treatment	Loc. or gen. anesthesia	Post-op evolution	Duration of follow-up
Morais et al, 2014	M	15	Md. second molars	2	Infection	2cm and 0,5cm	No	Enucleation and extraction of md. left third molar	NA	Total bone repair	7 months
Moturi et al, 2018	F	19	Mx. right first incisor and left second premolar; md. right canine and second molar, and left third molar	5	Incidental discovery	1cm	No	Enucleation and extraction of mx. right first incisor and left second premolar; md. right canine and second molar, and left third molar	GA	NA	NA
Pant et al, 2019	M	10	Mx. canines	2	Infection	>1cm	No	Enucleation and extraction of mx. deciduous and permanent canines	NA	NA	NA
Prabhakar et al, 2011	M	10	Mx. right first incisor and left canine	2	Incidental discovery	6cm and 3cm	Yes: 22	Enucleation and extraction of mx. right first incisor, left second incisor and canine	GA	Total bone repair	1 year
Prasad et al, 2010	F	12	Mx. canines and md. second premolar	3	Incidental discovery	5cm to 8cm	Yes: Md. right deciduous canine and molars	Enucleation and extraction of mx. canines, md. right permanent second incisor, canine and premolars, and right deciduous canine and molars	GA	Partial bone repair	6 months
Saluja et al, 2010	M	22	Mx. incisors and second premolars, md. canines and second premolars, and right first premolar	3	Incidental discovery	2cm	No	Enucleation and extractions (unspecified teeth)	GA	NA	NA
Sanjay et al, 2015	F	24	Md. canines	2	Dental mobility	1,5cm	No	Enucleation and extraction of md. canines	NA	NA	NA
S. Hiremath et al, 2011	M	7	Md. first premolars	2	Infection	2cm	No	NA	NA	NA	NA
Sharma et al, 2019	F	27	Mx. third molars	2	Infection	1cm	No	Enucleation and extraction of mx. third molars	GA	Total bone repair	6 months
Shirazian et al, 2011	M	10	Md. second premolars	2	Infection	5cm and 4cm	Yes: Md. deciduous 2nd molars and right deciduous 1st molar	Marsupialization	NA	Mucosal healing	2 months
Sindi et al, 2019	M	44	Md. third molars	2	Incidental discovery	2 cm	No	Enucleation and extraction of md. third molars	GA	NA	NA
Tamdage et al, 2011	M	10	Mx. right second premolar and left canine	2	Incidental discovery	1cm	No	Enucleation and extraction of mx. right second premolar and left canine	NA	NA	NA
Tikekar et al, 2010	M	11	Md. second premolars	2	Incidental discovery	1cm	Yes: Md. right deciduous 2nd molar	Marsupialization and extraction of md. deciduous second molars	LA	NA	NA

Table 1 – Part 4: Summary of cases of non-syndromic bilateral or multiple dentigerous cysts reported between 2009 and 2019

Author / Year of publication	Sex	Age	Teeth affected by cysts	No. of cysts	Circumstance of diagnosis	Size of cysts	Adj. teeth resorption	Treatment	Loc. or gen. anesthesia	Post-op evolution	Duration of follow-up
Vasiapphan et al, 2018	M	27	Md. third molars	2	Infection	<1cm	No	Enucleation and extraction of md. third molars	LA	Total bone repair	6 months
Vassiliou et al, 2015	F	38	Md. third molars	2	Dental mobility	2cm and 6cm	Yes: Md. left 1st and 2nd molars	Enucleation and extraction of md. third molars and left first and second molars	GA	No complications	24 months
Yonel et al, 2019	M	42	Md. third molars	2	Incidental discovery	2cm	Yes: Md. left 1st and 2nd molars, and right 2nd molar	Enucleation and extraction of md. second and third molars and left first molar	LA	Total bone repair	24 months

Note: M = male; F = female; Md = Mandibular; Mx = Maxillary; GA = general anesthesia; LA = local anesthesia; NA = information not available

bundle during cysts enucleation. The literature review showed that, in most cases, the teeth resorbed on contact with the dentigerous cysts were extracted. In the presented case, despite the pulp necrosis of the mandibular second molars and the difficulty to obtain root canals drying for 4 months, drying required for the achievement of tight apical fillings, these teeth were preserved due to the young age of the patient. The enucleation of the cysts associated with the endodontic treatment of the adjacent affected teeth favoured bone repair, complete after 18 months.

In the cases included in the literature review, patients' follow-up ranged from 10 days to 10 years and showed ongoing or complete mucosal and bone healing (depending on the length of follow-up). No recurrence of dentigerous cysts has been reported in the literature.

Conclusion

Multiple non-syndromic dentigerous cysts are rare in healthy patients. The literature review showed that they are more likely to affect young male patients and they are more frequently related to mandibular second premolars, maxillary canines and mandibular impacted third molars. Its discovery is mostly either fortuitous or caused by infectious complications. Adjacent teeth, even if they have significant resorptions, should be preserved whenever possible, but the endodontic treatment of these teeth was rarely attempted in the cases reported in the literature. Enucleation is the most frequently performed surgical treatment. Regular monitoring helps to control bone healing and to treat potential complications. Collaboration across different specialties is essential for the treatment of large lesions. Furthermore, systematic clinical examinations should be performed to rule out any associated syndrome.

Conflict of interest

The authors declare that they have no conflict of interest to declare. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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