

Case Report

Diagnostic of a maxillary anterior double tooth and management by a mixed endodontic and surgical approach: a case report

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Abstract – Introduction: The purpose of this case report was to discuss the diagnosis and management of a rare dental anomaly involving a maxillary central incisor with a bifid crown, treated through a combined endodontic and surgical approach. Dental anomalies, such as gemination and fusion, can lead to irregularities in tooth size, structure, and number, which can pose challenges in diagnosis and careful consideration for effective management. **Observation:** A 13-year-old patient sought consultation for aesthetic and orthodontic concerns related to the double tooth (DT). Despite the complexity of the malformation, a conservative mixed endodontic and surgical approach was chosen after multidisciplinary discussion. The patient underwent endodontic treatment followed by crown resection and gingival plastic surgery. Post-operative follow-up showed satisfactory results. **Conclusion:** This case report emphasizes the challenges in DT diagnostic and the importance of a multidisciplinary approach. Various treatment modalities were explored, highlighting the lack of standardized guidelines and the importance of individualized care.

Introduction

Double tooth (DT) is a dental anomaly resulting in irregularities in the size, shape, structure, and number of teeth. Tannenbaum and Alling (1963) classified these anomalies, defining gemination as the cleavage of a single tooth germ, either partially (true gemination) or completely (twinning). Fusion, on the other hand, results from the union of two separate tooth germs, impacting enamel and dentine (true fusion) or dentine and/or cementum (late fusion) [1]. The distinction of gemination from fusion can be a real challenge for practitioners, due to their clinical similarities [2]. Aguilo *et al.* (1999) proposed a classification to describe different types of DT based on morphology (Fig. 1) [3].

The aetiology of germination and fusion remains unclear, but possibilities include trauma, genetic predisposition and environmental factors such as thalidomide embryopathy, foetal alcohol exposure or hypervitaminosis A during

pregnancy [4]. Prevalence rate of DT seems to vary in different reports, but the overall prevalence appears to be 0.5% in the primary dentition [5] and 0.1–0.2% in the permanent dentition [6,7]. Maxillary central incisor seems to be the most commonly affected tooth [8], causing aesthetic issues as well as orthodontic spacing problems such as crowding, diastema or protrusion. Due to their irregular morphology, DT also present a high predisposition to develop caries and periodontal disease [9].

In this case report, the diagnostic and the management of a maxillary central incisor DT, opting for a conservative mixed endodontic and surgical approach after multidisciplinary discussion is presented.

Observation

A 13-years-old patient, referred by her orthodontist, sought management for a complex dental anomaly toward tooth 11 before orthodontic treatment. Various practitioners failed to provide a satisfactory solution other than extraction,

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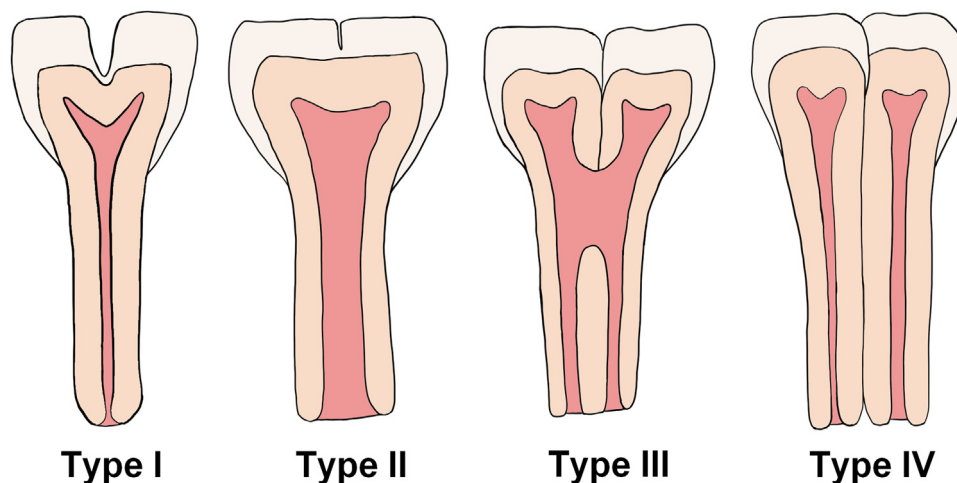


Fig. 1. Classification of double teeth by Aguilo *et al.* (1999). Type I: bifid crown with single root. Type II: large crown with large root. Type III: two fused crowns with a conical single root ending with two canals. Type IV: two fused crowns with two fused roots.

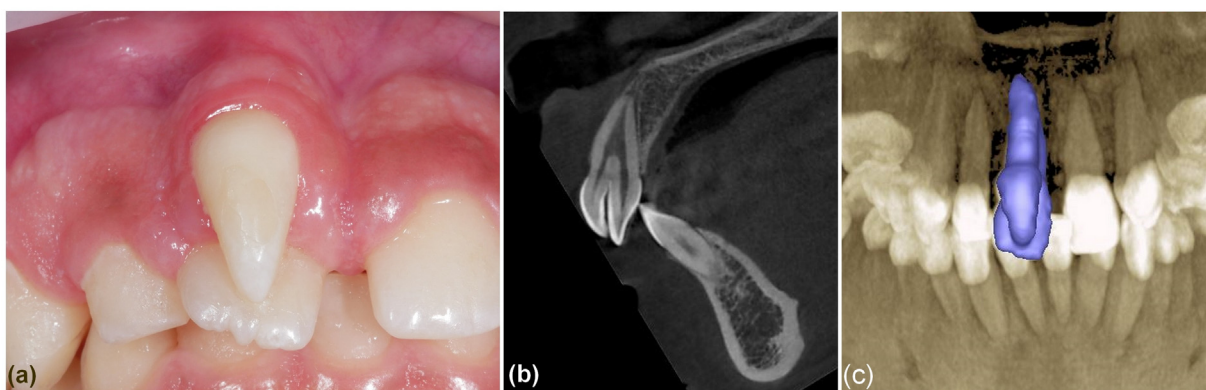


Fig. 2. Clinical and radiological examination of tooth 11. (a) Intra oral examination showing the dental malformation with the shape of a fang, above the tooth 11. (b) Cone Beam Computed Tomography (CBCT) showing tooth 11. (c) 3D reconstruction CBCT showing tooth 11.

leading to a consultation at the Department of Oral Medicine of Henri Mondor hospital. The patient's main concern was the aesthetic flaw. Patient had no medical issues, and no familial or prenatal factors were identified.

Intra oral examination showed a class II malocclusion with deep overbite, normal number of teeth in the arch, and an abnormal crown above tooth 11 (Fig. 2). No discoloration, pain, or mobility were observed, but signs of inflammation and gingival recession were present. Periodontal probing depth was normal. According to the patient, oral hygiene was difficult, and teeth brushing often induced gingival bleeding.

Vitality testing yielded a positive response. CBCT scan revealed an abnormal tooth 11 with a bifid crown and a single large root (Fig. 2), evocating the diagnosis of geminated tooth. Considering clinical examination, diagnosis of fusion with a supernumerary tooth was also evocated due to the conical shape of the bifid crown. Despite diagnosis uncertainty, the diagnosis of DT was adopted since it has no repercussion on the treatment planning.

Choosing a treatment was difficult due the patient's age, orthodontic concerns, aesthetic issues, and tooth vitality. Four solutions were proposed, ranging from less invasive to more invasive (Fig. 3). Following multidisciplinary discussion (including oral surgeons, endodontists, restorative dentistry specialists and the patient's orthodontist), a combined endodontic and surgical approach was selected. After explaining the treatment steps and associated risks, consents from the patient and her mother were obtained. Treatment plan involved endodontic treatment at first, followed by crown resection surgery associated with gingival plastic procedure two month later.

First, the endodontic treatment was performed. Local anaesthesia was administered using articaine hydrochloride 4% with adrenaline (1:100,000), tooth 11 was isolated using rubber dam. Access to the roots canals was achieved through a double vestibular and palatine cavity made with a muller bur (Fig. 4). Working lengths were determined with an apex locator. Canal shaping was realized using WaveOne Gold

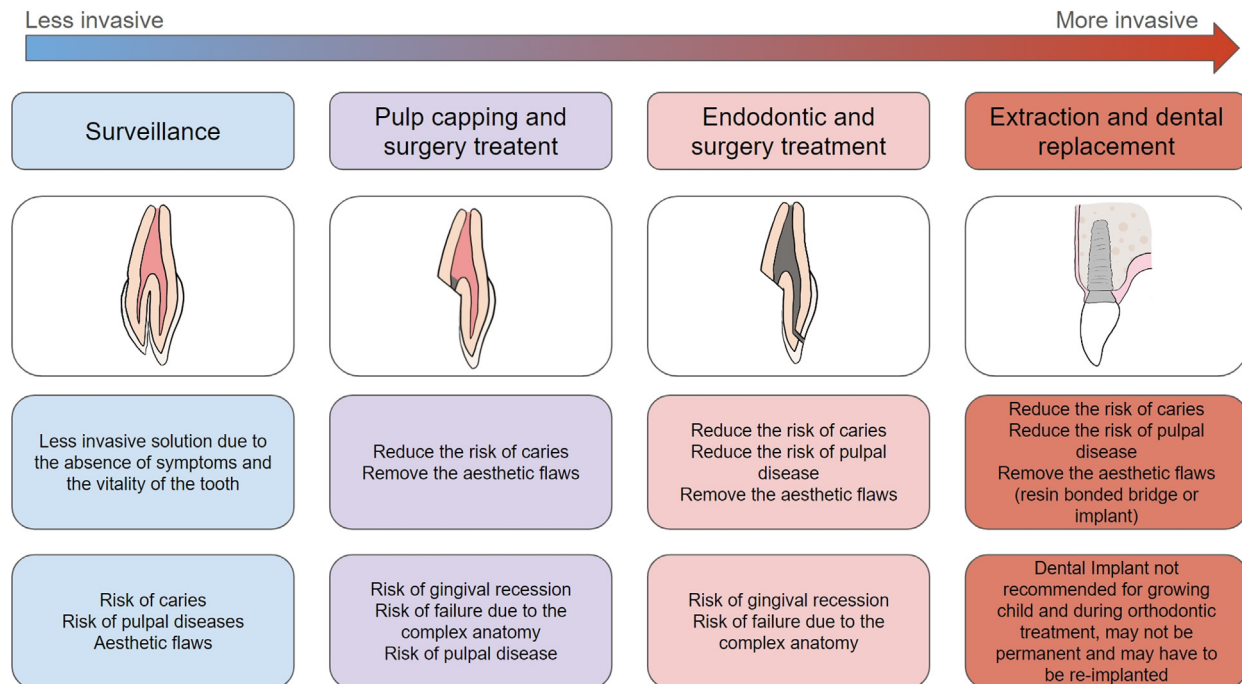


Fig. 3. Therapeutic gradient, from less invasive to more invasive.

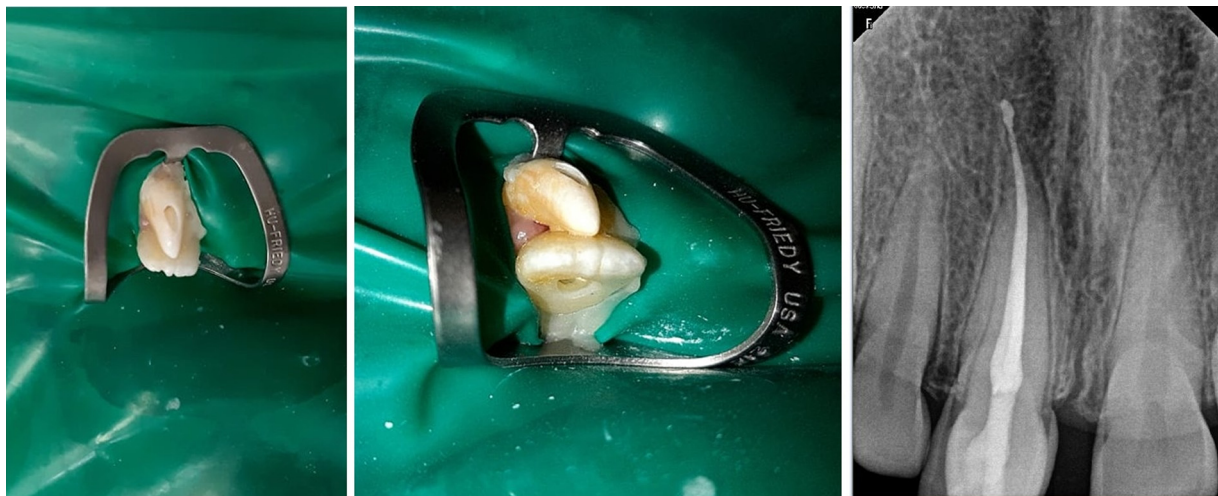


Fig. 4. Endodontic treatment of tooth 11.

(Dentsply) and XP-endo Finisher (FKG), followed by root canal irrigation with 2.5% sodium hypochlorite (NaOCl) and EDTA 17%. Furthermore, canal was filled with zinc oxide eugenol sealer and gutta percha using warm vertical condensation. To facilitate subsequent surgery, vestibular branch of the Y-shaped tooth was filled with flowable composite.

Two months later, crown resection associated with gingival plastic surgery was performed. After isolating the surgical field, local anaesthesia was administered using articaine hydrochloride 4% with adrenaline (1:100,000). Dental floss was threaded between the double crown to test the permeability, then a thin speedy disk to accentuate the separation. Speedy disk was used with high caution due to the curve of the separation and the

proximity with periodontal tissues. An intrasulcular incision was made using a #15c blade, and a minimal flap of partial thickness was elevated. Vestibular crown was meticulously resected with a Zekrya bur, leaving the root intact and an exposition of the endodontic access cavity previously filled with composite. Minimal regularization was performed with a diamond bur to harmonize the tooth shape, followed by polishing using a pop on disk. Gingival recession was managed with a laterally positioned flap (LPF) technique. Dimension of the gingival recession was taken with a periodontal probe. Measures were then reported on the donor site, away from the marginal soft tissue to reduce the risk of gingival recession of the donor tooth 12. Partial thickness flap was elevated and

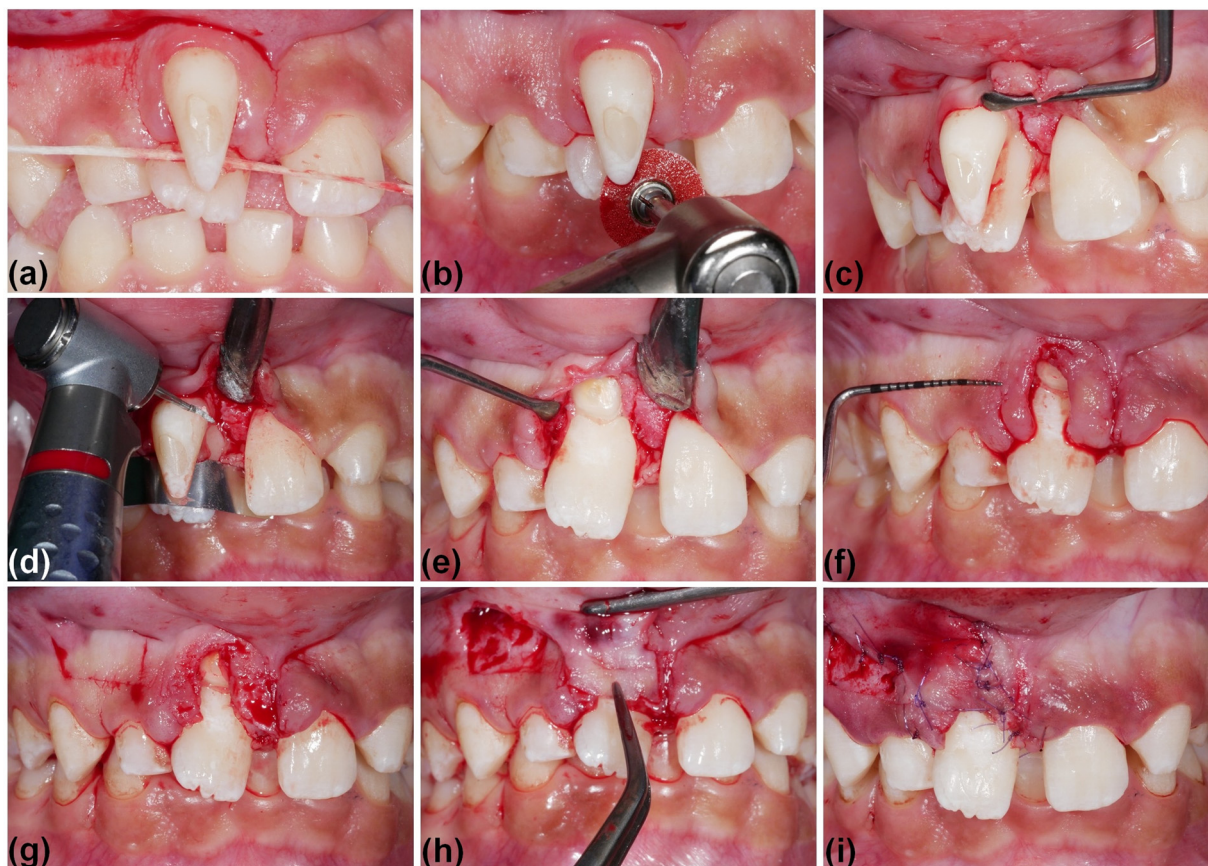


Fig. 5. Surgery procedure of tooth 11. (a) Test of permeability. (b) Use of speedy disk. (c) Visualization of the common root. (d) Resection of the vestibular crown. (e) Visualization of the endodontic access filled with flowable composite. (f) Measures of the gingival recession. (g) Report of the measures on the donor site. (h) LPF technique. (i) Sutures.

laterally positioned to a prepared de-epithelialized receiving site. Finally, the lateral position graft was sutured with absorbable monofilament (Monocryl 4/0), using mattress stitches to stabilize it first, then simple stitches to complete the surgery (Fig. 5).

Patient was advised to follow post-operative instructions. Post-operative follow-up visits was done at day 7, day 15, 6 weeks and 6 months (Fig. 6), and showed no complication such as post-endodontic pain, post-operative infection, or gingival recession. Despite orthodontic treatment was possible after soft tissue healing and good compliance to oral hygiene, it only began after 6 months due to patient's personal issues. The patient was satisfied with the aesthetic result of the tooth.

Discussion

Despite numerous cases reported, determining the right diagnosis of DT remains challenging for practitioners, as well as finding therapeutic guidelines.

DT are usually asymptomatic and therefore do not require any treatment, but understanding potential associated problems are important to provide prophylactic measures. The irregular anatomy of DT contributes to aesthetic concerns

since it often affects the anterior region [8], causing psychological distress [10,11]. DT may also introduce orthodontic anomalies due to their larger size, such as traumatic occlusion, crowding, rotation, protrusion, diastema, and disturbances in dental arch length [10,11]. Moreover, DT present a high susceptibility to caries and periodontal disease, due to the presence of fissures or grooves in the bifid crown, constituting a vulnerable area where plaque can accumulate [9,10].

Given the multiple morphological variations of DT, many treatment approaches have been documented [12]. Bernardi *et al.* (2020) proposed preventive measures for asymptomatic cases, including topical fluoride application, fissure sealing with flowable composite and regular monitoring [12]. Shah *et al.* (2012) suggested a protocol for concerning DT. DT with a single root and an appropriate supplemental tooth should undergo auto-transplantation. If no supplemental tooth is available, crown modification is considered, and extraction is the last resort if crown modification is impractical. DT with separate roots should be treated by surgical hemi-section and endodontic treatment [13]. While these protocols can help practitioners, decision should be made through a multidisciplinary approach, tailoring treatment to individual cases.

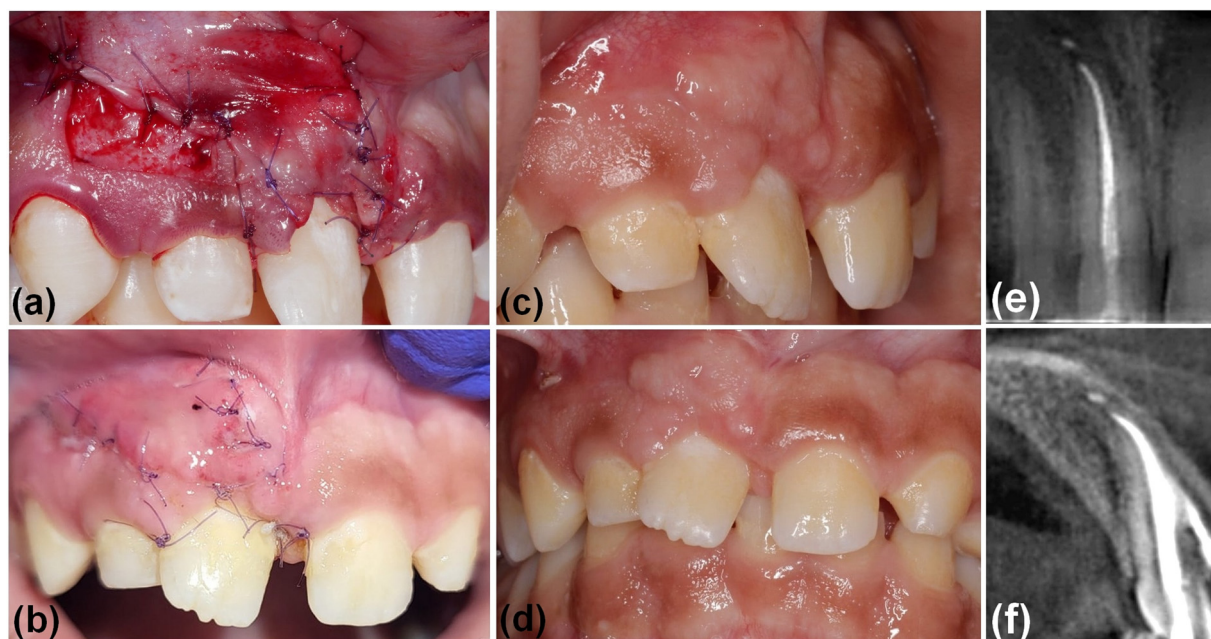


Fig. 6. Follow-up of tooth 11 after surgery. (a) Post operative result. (b) Follow-up after 1 week. (c, d) Follow-up after 1 month. (e, f) Low dose CBCT of tooth 11 after 6 months.

In this case, due to the patient's concerns, surgery was necessary to remove the aesthetic flaw. Partial crown removal was chosen as a more suitable solution, considering the patient's young age and the orthodontic treatment plans. Extraction was excluded since dental replacement would have been complex during active growth period [14,15]. In accordance with the planned surgery, preventing pulpal exposure was deemed essential before surgery. Direct pulpal capping (DPC), though a potential more conservative solution, was theoretically indicated in this case due to the patient's young age, the iatrogenic pulpal exposition (thus short delay of pulpal exposition) and the absence of carious lesion [16]. This solution was unfortunately dismissed due to technical difficulty of access with the Y-shaped cavity (such as difficulty to manage pulpal bleeding, difficulty to manipulate and fill precisely the cavity with DPC materials), and uncertainties in postoperative pulpal reactions [17]. Moreover, DPC requires several months of pulpal vitality surveillance due to uncertain success of the capping, thus delaying the surgery. Instead, endodontic treatment was chosen to overcome DPC's uncertainties and delay, despite the tooth's vitality and the challenging Y-shape of the root canal. Dual vestibular and palatine canal access was necessary. The main root canal was filled conventionally, while the vestibular branch received only composite resin on 15 mm to anticipate the resection which was targeted approximately at 12 mm. Flowable composite resin was chosen for its dual filling and obturation capacity, its mechanical strength, resistance, marginal integrity and aesthetic properties [18]. Although this material is known for its ease of application, flowable composite resin posed difficulty during placement due to its viscosity, the limited access, and light transmission constraints. The use of new

self-adhesive resins and bulk-fill materials could facilitate application. Other materials, such as tricalcium cement or glass ionomer cement could have been considered. Tricalcium cements are also known for their mechanical strength and marginal integrity, but their manipulation are complex and their poor anti-washout properties represent a weakness. Glass ionomer cements have interesting properties such as gingival biocompatibility, however their poor mechanical properties make them more suitable for temporary filling material.

As planned, surgical resection exposed the composite on the vestibular site, creating a permeable zone for bacterial infiltration. Gingival recession was managed with a LPF technique since there wasn't risk to damage tooth 12 given the patient's adequate keratinised tissue (>3 mm), avoiding a second surgical site, unlike other covering techniques such as free gingival graft or subepithelial connective tissue graft [19]. Surgical resection removed the deep fissure, lowering the risk of caries, pulpal, and periapical diseases, and avoided extraction. Orthodontic treatment was deemed possible after soft tissue healing (6 weeks after surgery) and good oral hygiene maintenance, since orthodontic treatment has been associated with risk of adverse effect on the periodontal tissue in the literature, such as gingival inflammation, gingival hyperplasia, attachment loss, and gingival recession [20,21].

Although the large morphological variations of DT reported in literature, 2 cases report of DT were found similar to this case. Kim *et al.* (2005) reported a case of a supernumerary fused tooth on the labial surface of the right central incisor (tooth 11) in 11 years old boy. Treatment plan was decided without CBCT, pulpal connexion between the labial supernumerary fused tooth and the central incisor was discovered during the removal of the labial fused tooth, thus an

endodontic treatment of the central incisor was performed immediately during the intervention. Mineral trioxide aggregate (MTA), a tricalcium cement, was used to seal the communication, and restoration was made with composite by the patient's restorative dentist afterward. The use of MTA led to a decreased fill density (washout) on the six-month radiograph, probably related to its long setting time according to authors [22]. Assadian *et al.* (2023) reported a case of supernumerary tooth fused to the labial surface of a left central incisor (tooth 21) in a 11-year-old boy. A CBCT was performed and revealed a pulpal connexion between fused supernumerary tooth and tooth 21. Treatment plan involved endodontic treatment and removal of the labial fused tooth in one-time intervention. Endodontic treatment of tooth 21 was performed (filling with MTA), followed by the fused tooth crown resection, then temporary sealing of the exposed pulpal communication was made with glass ionomer cement, and finally, permanent restoration was realised 10 days later with composite resin. According to authors, the major concern while using MTA is, once more, its washout potential following exposure to fluid flow [23]. The absence of gingival surgical management during crown removal resulting in gingival recession on tooth 21, leading to oral exposure of the sealed pulpal cavity and a remaining aesthetic disturbance.

Conclusion

Thorough clinical and radiographic examination are crucial for diagnosis the type of DT, which can sometimes be challenging like this case report. Despite wide array of strategies are reported in literature, multitude morphological variation of DT makes difficult to establish standardized guidelines, and management of such DT may be complex. Treatment should be determined on an individual basis, with a multidisciplinary discussion, to achieve optimal treatment and avoid invasive intervention. In this case, full functionality of the tooth, orthodontic and aesthetic considerations were significant for the patient, and were taken under consideration during the multidisciplinary discussion.

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Conflicts of interest

The authors declare that there is no conflict of interest in regard to this article.

Data availability statement

The data used for this case can be accessed by contacting the corresponding author, C.V.

Ethics approval

Ethical approval was not required for this study.

Informed consent

Written informed consent was obtained from the patient and her family.

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