Multidisciplinary management of bilateral symmetrical double maxillary central incisors

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Abstract

A case of bilateral maxillary permanent double teeth of the central incisors is described. Treatment comprised of surgical separation, periodontal therapy, conservative pulp therapy and orthodontic alignment. Surgical splitting and removal one half of the double tooth resulted in acceptable shaped tooth. Periodontal therapy involved augmentation of the bone defect covered the exposed part of the root. Orthodontic treatment involved alignment of teeth and relief anterior crowding. No root canal therapy was performed, and the teeth showed no evidence of increased mobility. The intervened teeth remained vital and periodontal health maintained. A follow-up examination after four years revealed a good prognosis and stability. At the age of 19 the two centrals were crowned by porcelain fused to metal jacket crown for esthetic and acceptable shape.
Introduction

Double teeth are relatively uncommon developmental abnormalities. The terms that are usually used to describe the condition include gemination, fusion and concrescence.\textsuperscript{1} Germination is an incomplete attempt by the tooth bud to divide, resulting in a bifid crowns and usually with a single pulp chamber. Gemination has a frequency of 0.5%, which is similar to that of fusion and is more common in the primary dentition.\textsuperscript{2} Gemination tends to occur in a familial pattern, and its significance is similar to that of fusion in that both conditions may result in retarded eruption of the permanent successor. Fusion has an incidence of 0.5% and is more common in the primary dentition. The classic definition of fusion is the dentinal union of two embryologically developing teeth. Although fused teeth can contain two separate pulp chambers, may appear as large bifid crowns with one chamber, which makes them difficult to distinguish from geminated teeth. It may occur between two normal teeth or between a normal tooth and a supernumerary structure. The anomaly may occur unilaterally or bilaterally. Clinically, fusion and gemination are usually distinguished by counting the number of teeth in the arch. If there is a deficiency in the normal complement including the bifid crown, the condition is fusion.
Fusion with a supernumerary tooth must also be considered and ruled out because this would not affect the normal number of teeth. Concrescence is a twinning anomaly involving the union of the root surfaces of two teeth by cementum only once the crown is formed.\textsuperscript{3} Its etiology is thought to be trauma or adjacent tooth malposition. Because it can occur after root development, concrescence is technically not a developmental anomaly. Double teeth are identified clinically rather than radiographically because it is difficult to distinguish between geminated and fused teeth based on radiographic root morphology.\textsuperscript{4} However, in terms of treatment, differentiation between fusion and gemination may not be critically important.

The etiology of double tooth is unknown, although some cases can be hereditary.\textsuperscript{5} The clinical presentation is varied according to the degree of fusion, size of teeth and the angle of fusion. Most occur in the anterior maxilla,\textsuperscript{6} although some cases of double teeth in the premolar and molar regions have been reported.\textsuperscript{1} The distribution of double teeth occurs in the primary and permanent dentitions. Double teeth were found more often in the mandible than the maxilla in the primary dentition. The occurrence of double teeth mostly in the unilateral and rarely occurred bilaterally. Over all the prevalence is less than 1\% of the population, with
an increased prevalence in the primary dentition.\textsuperscript{1, 5} Primary double teeth may also be associated with double permanent successors.\textsuperscript{1, 5}

Double teeth usually occur in the anterior region of the mouth and result in large and unaesthetic teeth, which may cause caries and gingival alteration, and also tends to interfere with normal occlusal development. The problems associated with this anomaly include esthetics, possible loss of arch length and delayed or ectopic eruption, caries along the line of demarcation, and periodontal abscesses.\textsuperscript{3} The unaesthetic appearance of double teeth presents a great challenge for dentist. By not treating the condition, complications may arise including caries, gingival problems and crowding. The extraction of these teeth would necessitate prosthetic replacement at a very early age. Reshaping and restoration usually failed to achieve the desired results in the most cases.

Very few reports dealt with the management of double teeth. Treatments described for permanent double teeth were the combination of endodontic, hemisection, and orthodontics, with planned prosthetic restoration of the properly aligned incisors.\textsuperscript{7} Shapira et al\textsuperscript{8} treated double maxillary incisor treated by a two-step separation procedure and removal of the distal segment followed by endodontic and composite build-up
restoration of the mesial segment. Marechaux\textsuperscript{9} separated and extracted a supernumerary teeth fused to a maxillary central incisor. Orthodontic realignment of the teeth was planned.\textsuperscript{9} In this study we report a conservative approach in which two cases of double teeth were treated by a combination of surgical separation, periodontal therapy, conservative pulp therapy and orthodontic alignment.
Case history

Z.M.S., 14-year-old Jordanian boy came to the Prince Rashed Ben Al-Hassan Hospital with a chief complaint of unaesthetic appearance due to large upper central incisors and malposed upper left canine. (Fig. 1.A and B).

The patient had no medical problems. Oral and extraoral structures were within normal limits and revealed no anomalies. There was no history of trauma. The clinical intraoral examination revealed large anomalous left and right maxillary central incisors with median diastema. The patient had bilateral class I molar relationship with mild crowding in the maxillary anterior teeth and mild spacing in the lower anterior teeth. The right double maxillary central incisors exhibited an incisal notch, rotated slightly with 12mm mesiodistal diameter; the two crowns were fused by enamel, and dentine together with a shallow vertical groove labially delineating the originally separate crowns. The contra lateral left central incisor has a mesiodistal diameter of 19mm with palatal accessory (Talon) cusp and was not similar to the right incisor. The left maxillary canine was malposed labially with no enough space available. The
overjet was 6mm of the anterior teeth and 0mm overbite. Spacing found mesial to the left canine and distal to the right canine in the upper arch.

Radiographic examination showed the presence of all permanent teeth. The maxillary anterior occlusal and periapical films disclosed dentin and enamel fusion of two teeth (Fig.2). In the right central incisor, a periapical views showed radiolucent line separated the two fused crowns extended incisally to the level of singulum and union extended to the cervical region of the crown and half of the length of the roots coronally with separate two apical halves. Apices of the roots seemed to be completely formed. It was unclear whether the pulp chambers were separated or not (Fig.3). In the left central incisor a periapical radiograph showed complete union of the crowns with radiopaque of the accessory cusp resemble enamel with radiolucent extension of pulpal tissues, and the union extended to coronal third of the roots with two completely formed apices (Fig.4).

The treatment plan comprised sectioning the crown and part of the roots of double tooth followed by teeth alignment using fixed orthodontic appliance. Under local anesthesia a full-thickness labial and palatal mucoperiostial flaps with lateral extensions were raised, in order
to expose the root surfaces of double teeth. The two portions of the right central incisor were splitted from the incisal edge to the coronal third of the roots along the groove in the enamel in the zone of the union of the two teeth. Using a separating metal disc with water coolant in the slow speed handpiece and a diamond bur, on high speed with water coolant, removing the distal tooth fragment with accessory cusp using surgical forceps. It was found that the area of union extended further apically than was indicated on the radiographs. No evidence of pulpal communication or exposure could be seen. Once haemostasis was achieved, the cut surfaces of the retained portion was carefully cleaned, polished, shaped and smoothed with diamond burs. At the same visit the second left central incisor was splitted from the incisal notch using a diamond bur, on high speed with water coolant, removing the distal tooth fragment by using surgical forceps. A pinpoint pulpal exposure of the cervical area of retained fragment was found. The pulp exposure was covered by hard setting calcium hydroxide and sealed with glass ionomer cement to hold the calcium hydroxide and reshaping the cut surface of the distal part of the retained root. After the two teeth were completely separated, the small distal components were removed and the favorable mesial portions were retained. The defects distal to the roots were filled with artificial bone graft substitutes to promote normal healing. The flaps were replaced and
sutured with 4-0 black silk sutures (Fig. 5). Anterior occlusal standard view was taken post-operative; showing the separated remaining roots with bony augmentation of the defects resulted from the removal of the separated roots (Fig. 6). The mesiodistal dimension of the right central incisor became 6mm and the left one became 5.5mm after separation. As each component of the double teeth were narrower than the corresponding contralateral teeth, the remain components would require recontouring with an acid etching and light cured composite resin restoration in appropriate size. The patient was followed up for pulp vitality clinically and radiographically. A periodic control evaluation is essential, mainly to observe the pulp vitality and periodontal status of the teeth.

After 3 months, periapical radiograph showed no evidence of pathology in the periapical area of the left central incisor. Crevice depths around the remainder of the teeth were 2mm with no associated attachment loss. The distance between the left central incisor and right central incisor was 4mm and the distance between the left central incisor and left canine was 5mm.
Six months later, fixed orthodontic appliance using edgewise technique was fitted (Fig. 7). The upper teeth were aligned with multiflux wire. Then plane and rectangular arch wires were used to put the teeth in proper position. Orthodontic phase was concluded within eleven months. A Howley retainer was used for the next six months.

The appearance was greatly improved with well-aligned anterior teeth (Fig. 8). The treated teeth did not exhibit pulpal complications, increased mobility or any periodontal problems at the end of orthodontic treatment and four years post-treatment radiographs did not show any evidence of root resorption or periapical pathology, although long-term follow up is necessary (Fig. 9). At age of 19 years during review visits the patient asking for improving the appearance then two porcelain fused to metal jacket crowns were fitted (Fig.10).

Discussion

Bilateral double teeth are less common in the permanent dentition than the primary dentition. Also, bilateral double tooth in the permanent dentition has been found more frequently in the maxilla than in the mandible. Further, 100% of the permanent bilateral fusion cases in the
maxilla involve the central incisors, 83% of these involve a supernumerary tooth,\textsuperscript{3} the same as in this case. Problems associated with double tooth include poor esthetics, crowding, abnormal eruption, residual periodontal defects, dental caries, overjet problems and difficulties in management.

A treatment goal includes esthetic restoration of the dentition, minimizing eruption difficulties, elimination of caries, maintenance of anterior arch-length and relief crowding. Several treatment modalities are currently used for double tooth in the permanent dentition. Among these are surgical divisions, selective shaping with or without placement of full crowns, orthodontic tooth repositioning, and surgical removal followed by prosthetic replacement. The selection of any or a combination of these treatment modalities depends on teeth affected, arch involved, esthetic demand, occlusion, patient’s age, periodontal tissue condition, financial capability, and individual desire.

Splitting a double tooth presents several difficulties. Exposure of dentine may result in dentine sensitivity or exposure of pulp and pulp infection. Soft tissue healing may result in the formation of periodontal pocket or a long junctional epithelium. The decision on which of the sectioned segments to retain was based on visualizing the amount of root
and bone remaining, as well as on the crown morphology. Retained crown morphology may require re-shaping of the crown.

Endodontic treatment of retained double tooth presented several options, the first being endodontic treatment to be carried out before the surgical procedure. Because it was felt to be safer and without complication of dentine sensitivity. The second treatment option is to postpone the endodontic treatment until surgical separation and evaluation of possible pulpal communications between the teeth at surgery. If there is no communication efforts should directed toward preservation of tooth vitality for better prognosis. If there is a communication between the teeth, the pulp exposure site could be treated conservatively by direct pulp capping using calcium hydroxide followed by glass ionomer cement, which may help in preventing dentine sensitivity. The ideal option was to carry out immediate root treatment if pulp exposure occurs at the time of surgery.

In this case there was no pulpal communication seen in the site of separation of the left central and the retained root remained vital, therefore there was no need for endodontic treatment. In the right central incisor the small pulpal exposure occurred during splitting was treated by covering the exposed pulp with calcium hydroxide and the defect in dentine was restored by glass ionomer cement without losing the vitality.
Pearson and Willmot have treated a case of double tooth by endodontic treatment before the surgical procedure, which we found unnecessary in our cases. In our cases the vitality was preserved and the conservative procedure implemented gave a good prognosis. The maxillary incisors will be checked periodically, however, appropriate endodontic treatment will be done, if necessary. Smith reported a case of double teeth with no pulpal communication between the tow components of maxillary lateral incisor fused to supernumerary tooth unilaterally.

Bone defects distal to the retained roots compromise the tooth support and its ability to withstand functional stresses following treatment. The ideal result of treatment of the defects is by regenerating the lost supporting tissues. This technique provided a successful treatment of bone defect and for ridge augmentation. Crowding was relieved and alignment of the teeth was achieved by using fixed appliances to obtain more comprehensive occlusal correction. Some authors advocated the use of removable orthodontic appliances in the treatment of splitted double teeth. Removable appliances are suitable for non-rotated splitted tooth, which can be brought together by tipping. Such approach was found inappropriate in our cases.
Therefore, we consider that a multidisciplinary approach and cooperation of pediatric dentist, orthodontist and restorative dentist are necessary for the correct treatment of double teeth.
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Legends to Figures

Figure 1. A- Unpleasant appearance of maxillary left and right central incisors (Double tooth) and labially erupted left canine prior to treatment.

B- Occlusal view of the maxillary anterior teeth.

Figure 2. Upper anterior occlusal radiograph showing double teeth with two separate root canals and two pulp chambers.

Figure 3. Periapical view of the right maxillary double central incisor.

Figure 4. Periapical view of the left maxillary double central incisor.

Figure 5. Frontal view showing the central incisors after surgical splitting of the double teeth and before orthodontic treatment.

Figure 6. Radiographic X-ray showing the augmentation in the bony defects after surgical separation of the double maxillary central Incisor.

Figure 7. The dentition during orthodontic treatment.

Figure 8. Clinical view after orthodontic treatment and acid-etched resin restoration for re-shaping of the crowns of double teeth.

Figure 9. Periapical radiograph after four years post operative of maxillary central incisors.
Figure 10. Anterior clinical view after fitting the porcelain jacket crowns.