

Fusion of a Supplemental Premolar a Rare Presentation – A Case Report

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Abstract Fusion is a developmental anomaly which results in the union of two adjacent teeth. Fusion of premolars in the permanent dentition is a rare phenomenon and fusion to a supplemental tooth could be considered even rarer. Treatment of such a complication would be to observe the condition, extraction of the fused premolar to gain space for the canine followed by orthodontic treatment, hemi-section of the fused tooth or surgical removal of the canine. Any decision should be made after careful evaluation of the This case report describes an unusual case of a supplemental premolar fused to the upper first premolar in a 12 year old patient resulting in impaction of the canine, poor aesthetics and a cross bite. Following consultation with the orthodontist the fused upper right first premolar was sectioned and the mesial portion of the fused tooth removed. The remaining tooth segment was endodontically treated. This provided adequate space for the erupting canine which only required adjunctive orthodontic alignment.

Keywords: fusion, supernumerary teeth, hemisectioning

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1. Introduction

Fusion of teeth is a rare developmental disorder where there is a union of the crowns of two adjacent teeth. This may occur due to the union of discrete tooth germs during odontogenesis [1]. The degree of fusion depends on the developmental stage of the tooth germs at the time of fusion. Complete fusion occurs early in development where there is more or less a single tooth. Incomplete fusion occurring at a later stage of development may give rise to fusion of the roots only. The union may involve enamel alone, enamel and dentine or enamel, dentine and the pulp. If the union occurs at a later stage of development only the roots fuse which is referred to as concrescence. A similar picture may be seen in gemination, where the division of a single dental follicle results in an appearance of two teeth. Geminated teeth usually have a single root with a duplicated crown [1,2].

Fusion occurs at the morphodifferentiation stage of tooth development. Pressure or physical force producing close contact between two developing tooth buds has been proposed as a possible cause. Certain contributory events such as evolution, trauma, genetic and environmental factors are implicated. Conditions which may include thalidomide embryopathy, fetal alcohol exposure and hypervitaminosis A of the pregnant mother have been implicated [2,3,4]. Fusion is associated with certain

syndromes such as chondroectodermal dysplasia and achondroplasia [4].

Fusion is commonly seen in the primary dentition (0.6%) as opposed to the permanent dentition (0.1%) [4,5]. These abnormalities are more frequent in mongoloids than in caucasians. There appears to be no gender predilection. Gemination is commonly seen in maxillary anterior teeth whereas fusion is more prevalent in the mandibular anterior region. Bilateral or symmetrical presence of geminated or fused teeth is an even rarer phenomenon. Fusion would usually result in an arch with a tooth count of one less. However if fusion has occurred with a supplemental tooth the tooth count would tally. The root canal system could be in dependant or conjoint [1,6].

The presence of teeth or teeth-like structures in addition to the 20 deciduous and 32 permanent teeth is referred to as hyperdontia. These could be single, multiple and could occur unilaterally or bilaterally. It could affect a single jaw or manifest in both jaws [7]. The morphology of such teeth are used to distinguish them. When a supernumerary is morphologically similar to a tooth in the normal series it is referred to as a supplemental tooth. On the other hand the ones that are morphologically distinct is referred to as a supernumerary.

Supernumerary teeth are occur due to mapping of an extra tooth germ. This phenomenon is attributed to hyperactivity of the dental lamina or additional splitting. Some authorities suggest that supplemental teeth are duplicates of the terminal tooth of a tooth group located at the respective position, e.g. a third upper incisor.

Anthropologic evidence has shown that the primitive dental formula in placental mammals consist of 44 teeth and a supernumerary could be an aberrant manifestation of such teeth [1]. These could be a manifestation of an underlying medical condition or be part of a syndrome. Cleidocranial dysplasia, Gardner's syndrome and Nance-Horan syndrome are classic examples of disorders associated with hyperdontia [4,8].

The presence of these teeth could lead to a number of complications [2,9]

- Caries due to deep retentive pits and fissures not amenable to natural cleansing
- Periodontal disease
- Delayed eruption of teeth
- Impaction of adjacent teeth due to deficient space
- Undesirable aesthetics
- Malocclusions due to altered eruption patterns which may include cross bites
- Endodontic complications due to possible aberrant pulpal and root canal anatomy

The following case describes the combined management of a fourteen-year old patient fused supplemental premolar fused to the first premolar which caused impaction of the canine as a result of lack of space.

2. Case Report

A 14 year old female was referred by the consultant orthodontist for an opinion and management of an abnormally shaped tooth in the upper right premolar region. Her parents had taken her to the orthodontist for management of crowding in her upper arch and the orthodontist had detected the unusual premolar on the upper right quadrant. She was thus referred to the Department of Restorative dentistry, Faculty of Dental Sciences, University of Peradeniya, Sri Lanka for the management of the above complication.

She was the eldest of the two siblings in the family and had no accompanying complaints. She was an otherwise healthy girl with no symptoms and signs suggestive of any syndrome. She was in her permanent dentition. The left upper canine had erupted around 10 months earlier and was placed buccally due to lack of space. The right upper canine was impacted though the canine bulge was felt on the buccal aspect. Her right upper first premolar appeared fused with a morphologically similar tooth. The right upper second premolar was present.



Figure 1. Occlusal view of the maxillary arch. Note: Fused upper right first premolar and presence of the right second premolar



Figure 2. View of the fused premolar on the study model

There was no evidence of any other morphologically altered teeth in her oral cavity. Her mother reported that there were no abnormal teeth in her primary dentition as well. None of her siblings or close relatives had such complications.

Based on these findings and radiographic evidence in the form of periapical and occlusal radiographs it was concluded that a fusion of an upper first premolar with a supplemental premolar had occurred. Whether the fused teeth had a common pulp could not be determined.



Figure 3. Periapical Radiograph of the region showing the fused premolar to a supplemental tooth and presence of the upper second premolar and impacted canine

It was decided to obtain study models and discuss the case with the orthodontist prior to further management. The treatment options were

1. Observe the fused tooth and carry out orthodontic treatment.
2. Extract the entire fused tooth, allow for eruption of the canine and orthodontic correction
3. Section the fused tooth, extract the mesial component, perform endodontics if necessary, and allow for eruption of the canine with subsequent orthodontic correction

Considering the space requirement, prognosis and position of the canine and ease of orthodontic treatment it was decided to go with the third option. Accordingly consent was obtained and the tooth was sectioned under local anaesthesia. Sectioning was performed in order to preserve as much tooth tissues as possible on the distal of the two fused teeth thus compromising the crown of the segment to be extracted. On sectioning it was discovered that there was a communication between the pulps of the two fused teeth. Thus the mesial of the two fused teeth was extracted and elective endodontics was performed on the retained upper first premolar.



Figure 4. Following sectioning of the first premolar



Figure 5. Extracted component

The access and communication was restored with a light cured composite bonded with dentine bonding after adequate haemostasis. The restoration was then contoured and finished.



Figure 6. Following endodontic treatment and restoration of the sectioned tooth



Figure 7. Radiographic appearance following root canal treatment

The patient was reviewed periodically to assess the eruption of the permanent canine. Within 2 months the canine tip was visible and by 4 months the tooth had completely erupted. An upper removable appliance was used to align the right canine as the patient was not keen on extensive orthodontic correction which would have required further extractions.



Figure 8. Following spontaneous eruption of the right upper canine (Occlusal View)



Figure 9. Following spontaneous eruption of the right upper canine (Frontal View)



Figure 10. Review radiograph at 18 year of age



Figure 11. Following placement of a Porcelain crown on the upper right first premolar

On a two-year review the sectioned premolar was symptom free with no evidence of mobility or periodontal pocketing. She was provided a porcelain crown at the age of 18 years as it was felt that the integrity of the tooth would be preserved with better interproximal contacts.

3. Discussion

As fusion is generally hereditary siblings and relatives could also have similar presentations. Detailed examination including appropriate radiographs should be obtained to assess the teeth. Assessment of the patients' medical history is also of paramount importance to identify possible systemic complications and associated syndromes which would have a direct bearing on the management of such patients. All other teeth should also be assessed including the history of the deciduous teeth. Potential for caries, periodontal breakdown, crowding and malocclusions should be meticulously assessed and any management should be with the concurrence of an orthodontist [1,10].

Management may entail accepting the condition with regular review of the patient to prevent any complications, where aesthetics and function are acceptable. At the other extreme would be extraction of the fused tooth if indicated facilitating correction of any resultant malocclusion and closure of residual space. Where any tooth of the normal sequence is impacted orthodontic traction and alignment may be advocated whereas alternatively the impacted tooth may be surgically removed if symptomatic. A more novel approach may be to section the supplemental tooth and allow for eruption with future orthodontic alignment of the tooth.

Prior to considering management of such a case a careful diagnosis of whether it is a geminated or fused tooth should be made as treatment and possible complications would vary. However in this condition diagnosis was not straight forward as there was no clear evidence of pulpal connections prior to sectioning.

Radiographic assessment of such a tooth is mandatory prior to planning treatment as this will reveal the complexity of the germination or fusion. Here two periapical films were exposed at different angulations in addition to a standard occlusal. Even these did not reveal the possibility of a pulpal communication. A cone beam CT scans are recommended with such teeth as it could provide a complete 3 dimensional image thus making the diagnosis accurate [11,12]. Due to lack of such facilities such investigations were not carried out.

In planning for such complex treatment a firm decision must be made on the prognosis of a tooth with complex anatomy in respect of caries and periodontal disease progression. The overall prognosis of sectioning such a tooth, the success of complicated endodontics, space requirement for possible concomitant orthodontic treatment and the compliance and motivation of the patient and parent are some of the important factors to be assessed. The patient under consideration had very good oral hygiene and was extremely motivated to carry out the planned treatment. Furthermore extraction of the entire fused tooth would have resulted in excess space considering the nature of the malocclusion. However management of the upper left quadrant would require

extraction of a premolar to facilitate alignment of the upper left quadrant.

When hemisection is planned this should be performed in such a way so as to preserve the maximum amount of tooth tissue in the component to be retained [13]. This meant compromising the crown of the component to be extracted which aided in obtaining a near normal morphology of the retained tooth with maximum retained tooth tissue. Maintenance of appropriate proximal contacts is another attribute necessary for stability of the dentition. Since the communication between the pulps did not extend subgingivally it was possible to predictably seal the communication with a light cured composite to achieve a good coronal seal following endodontics.

Endodontic treatment is not mandatory following sectioning of such teeth provided a hermetic seal could be provided to the exposed pulpal tissue as soon as possible. Many studies and case reports with a follow up period of more than 3 years have concluded that the vitality is maintained in a majority of cases [12,14,15,16,17].

For long term preservation of such a tooth a crown may be indicated and this would also help in restoring near normal proximal contacts with the erupting canine. However due to the patients age, prognosis of the tooth and continuing orthodontic treatment this was not considered feasible at this time. However during a follow-up appointment at the age of 18 a porcelain crown was placed. These patients should also be reviewed regularly in order to evaluate the prognosis of such treatment and to identify any endodontic or periodontal complications.

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