Management of impacted teeth disregarding canines – An overview

Nikhil Asok^{1*}, Stuti Raj², Geetha Asok³, Senthil Sasidharan⁴

¹⁻⁴Consultant, ^{1,2}Dept. Orthodontics and Dentofacial Orthopedics, ³Dept. of Oral and Maxillofacial Surgery, Millennium Dental Clinic, Thrissur, Kerala, ³Opolis Dental Care, Chandigarh, ⁴Millennium Dental Clinic, Thrissur, Kerala, ⁴Millennium Dental Clinic, Thrissur, Kerala, India

***Corresponding Author: Nikhil Ashok**

Email: nikhilasok@gmail.com

Abstract

Impacted tooth refers to a tooth that fails to erupt into the dental arch within a specific time. Dental impaction may be the consequence of local factors. Most commonly in orthodontics, canines are the impacted teeth that is discussed widely. Hence, this review article overlooks canines and takes into account the other teeth in the oral cavity that has to be brought to the arch. The management of the severely impacted teeth is often a complex undertaking and requires the joint expertise of a number of clinicians. It is important that these clinicians communicate with each other to provide the patient with an optimal treatment plan based on scientific rational. With a lot of newer advancements coming to the field of dentistry, it has become easy for the diagnosis of the impacted teeth and treat accordingly. Once the diagnosis is clearly done, the treatment plan should be crystal clear so as to treat each and every case of impaction in the individualized manner. With newer materials being flushed into dentistry, more accurate and time saving treatment can be done without affecting the adjacent teeth. Although newer techniques are made available, the conventional methods for the correction of problem should be clearly kept in mind as that stand as the basic biomechanics. It is always a combination of all the techniques that provides the best possible result.

Keywords: Impacted tooth, Micrognathia.

Introduction

Impacted tooth refers to a tooth that fails to erupt into the dental arch within a specific time. Under normal circumstances, a tooth erupts with a developing root and with approximately three-quarters of its final root length. If an erupted tooth has less root development, it would be appropriate to label this tooth as prematurely erupted. This will usually be the consequence of the early loss of a deciduous tooth, particularly one whose extraction was dictated by deep caries with resultant periapical pathology. At the opposite end of the scale, we find the unerupted tooth which exhibits a more completely developed root.^[1] Dental impaction may be the consequence of local factors. These factors may include mechanical obstruction (by a supernumerary tooth, cyst, or tumour), insufficient space in the dental arch due to skeletal incongruities (micrognathia), or the premature loss of deciduous teeth or a tooth–arch size discrepancy. Systemic factors such as genetic disorders, endocrine deficiencies, and previous irradiation of the jaws are also associated with a failure of tooth eruption.^[2] Prevalence of impacted maxillary canines is 0.9–2.2% and of impacted mandibular canines is 0.05–0.4%.^[3]

Prevalance ^[4,5]	Maxilla	Mandible
Central Incisor	0.04 %	-
Lateral Incisor	0.02 %	-
Canine	2.84 %	0.22 %
First Premolar	0.12 %	0.48 %
Second Premolar	0.12 %	0.24 %

First Molar	0.02 %	-
Second Molar	0.08 %	0.06 %
Third Molar	21.90 %	17.50%

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Maxillary incisors

Delayed eruption of maxillary incisors requires monitoring or intervention when

1. There is eruption of contra lateral teeth that occurred greater than six months previously;
2. Both central incisors remain unerupted and the lower incisors have erupted greater than one year previously;
3. There is deviation from the normal sequence of eruption (e.g. lateral incisors erupting prior to the central incisor).^[6]

Incidence

The incidence of unerupted maxillary central incisor in the 5–12-year-old age group has been reported as 0.13%. In a referred population to regional hospitals the prevalence has been estimated as 2.6%.^[6]

Predictive measurement of impaction from panoramic radiograph

1. The maturity of the unerupted incisors is assessed by Cvek's classification. (Figure 1)^[7]

Fig. 1: Cvek's Classification Group 1 to 5

2. Bryan et al.⁸ estimated the angle of the long axis of the unerupted permanent tooth to the mid-sagittal plane (Figure 2)

Fig 2: Prediction by estimating angle of long axis

3. Vertical position of impacted permanent incisors in relation to the contralaterally erupted central incisor was analysed by Smailiene et al.⁹ To determine initial vertical position of impacted tooth, the thirds of the root length of the erupted contralateral central incisor were used (Fig 43). Three possible vertical positions of impacted incisor have been defined:

- V1- sector at the level of gingival third of the root;
- V2- sector at the level of middle third of the root;
- V3 – sector at the level of apical third of the root.

Management

If there has been a loss of space, it is necessary to create space prior to treatment and maintain that space throughout the treatment phase. The treatment possibilities vary from conservative to more aggressive approaches.^[6]

Extraction of any obstruction, the creation of space, and the observation for spontaneous eruption are the simplest form of management. 70% of teeth have been reported to erupt spontaneously after removal of obstruction, without any further treatment. In the case of a supernumerary tooth, it is often possible to remove the supernumerary tooth avoiding damage to the underlying incisor, and allow the incisor to erupt on its own.^[6]

* Johnsons modified twin wire appliance^[1]

- The appliance is based on fixed molar bands, interconnected by a soldered palatal arch.
- Long, narrow gauge (0.020 in internal diameter) tubes slide freely, but accurately and without lateral 'play' in the round molar buccal tubes (0.036 in), and are made to extend anteriorly to the deciduous canine area.
- An initial anterior, multistrand, sectional 0.036 in round molar tubes is used. The anterior sectional archwire in this case is a single 0.016 in wire, since only one erupted permanent incisor is present and the usual multi-strand wire is not needed.
- The alignment of the buccal tubes shows a downward tip as they proceed mesially, to encourage open bite closure and to aid the mechanically assisted eruption of the impacted tooth.
- Wire (0.0175 in) or nickel–titanium wire (0.016 in) is held in the long narrow tubes by a friction fit, created by placing three or four bends in the multi-strand wire (more difficult to do effectively with the nickel–titanium wire) and then drawing it through the tube between two pliers, one of which should be grooved.

The appliance once constructed is transferred to the mouth and cemented in place, brackets are bonded to the anterior teeth and the prepared initial archwire is placed. The brackets may be of virtually any type, although there are several advantages to Begg brackets in this situation as their vertical slot makes them particularly suited to the light vertical traction that may need to be applied to encourage eruption of the impacted tooth. (Figure 3, 4, 5).

Fig. 3: The modified Johnson twin-arch 2 × 4 (2 × 2) appliances in place, using Begg brackets on the lateral incisors. At surgery, the supernumerary teeth are identified on the palatal side and extracted to leave empty sockets. A

minimal area of the labial surface of the incisors is exposed, without removing surrounding bone. Removal of bone inferior to the incisors would have left a deep defect, by including the sockets of the extracted supernumerary teeth. Attachment bonding. The lock pins in the Begg brackets are released to permit raising the archwire and ensnarement by the twisted ligatures. The lock pins are re-engaged to apply vertical traction to the incisor teeth. The full flap is sutured back to its former place.

Fig. 4: If space is not available it is gained through an open-coil spring and then the incisor is pulled to its position.

If all the incisors are missing –

Fig. 5: The incisors are surgically exposed. Eyelet attachments are bonded. After suturing, a self-supporting 'stopped' labial archwire is placed into the molar tubes. Displaced superiorly by gentle finger pressure, the anterior part of the archwire is ensnared by all four steel pigtails, to deliver extrusive force.

A final treatment option, which should only be used in cases when the unerupted incisor is severely ectopic or if there is extensive pathology and/or risk to adjacent teeth, is extraction of unerupted incisor. In the case of a dilacerated tooth with an extremely acute angle of dilacerations, it is possible for the labially oriented portion of the root to become impacted on the buccal cortical plate. For this reason, dilacerated incisors are often extracted. It is essential that care be exercised to avoid damage to adjacent teeth during removal. The surgeon also should take precautions to avoid loss of alveolar bone that could adversely affect future treatment possibilities including replacement with a bridge, implant, or orthodontic space closure.^[6,10]

Mandibular Second Premolar

Mandibular second premolars rank third — after third permanent molars and maxillary permanent canines in frequency of impaction.

Prevalence

The overall prevalence in adults has been reported to be 0.5% (the range is 0.1% to 0.3% for maxillary premolars and 0.2% to 0.3% for mandibular premolars).

Etiology

Premolar impactions may be due to local factors such as

1. Mesial drift of teeth arising from premature loss of primary molars;
2. Ectopic positioning of the developing premolar tooth buds;
3. Pathology such as inflammatory or dentigerous cysts.
4. They may also be associated with over-retained or infraocclusal ankylosed primary molars or with syndromes such as cleidocranial dysostosis.^[11]

Management

Treatment options for impacted teeth include observation, intervention, relocation, and extraction.

1. Levelling and aligning
2. NiTi open coil spring was placed between mandibular 1st premolar and 1st molar to create space for the 2nd premolar
3. Once adequate space was created, surgical exposure of the 2nd premolar. Before performing the surgical intervention, we should examine the interocclusal clearance of the opposing dentition, in order to verify that sufficient vertical space exists between the impacted second premolar tooth, in the mandible and the opposing maxillary premolar tooth.
4. A muco-gingival incision is made and a muco – periosteal flap extending from the first molar to the first premolar area from the buccal side, the flap at the 2nd premolar area, is reflected so as to expose the bone surrounding the impacted second premolar.
5. Bone is carefully removed in order to expose the height of the crown of the impacted second premolar tooth. Then we use the tunnelling technique and we attach the tooth with the attachments and bring it into position.

Orthodontic treatment with traction of a tooth can be divided into three phases, the first phase comprises the beginning of orthodontic treatment to surgical exposure of the tooth lasting from two to five months and varying, depending type of malocclusion and which teeth are involved. The second phase, between 12 to 18 months, commences with the application of traction and bringing the tooth into the arch. The third phase is when the orthodontic treatment is finalized with the proper alignment of the tooth in the arch. The traction of an unerupted tooth adds between 10 to 18 months to complete orthodontic treatment time.^[12-14]

Maxillary second premolars

Impacted premolars may lead to aesthetic concerns, masticatory inefficiency and oral hygiene difficulties as well as follicle pathology and destruction of adjacent structures, including neighbouring teeth. Odontogenic cysts, most commonly dentigerous cysts, have been reported to arise from impacted teeth. These dentigerous cysts may further be subjected to inflammatory changes and secondary infection, resulting in symptoms such as pain and swelling. Adenomatoid odontogenic tumours have also been reported to arise in such cases. In addition, maxillary premolars tend to be palatally positioned, in contrast to mandibular premolars, which are buccally positioned, making it difficult for patients to discover them. Often, they are discovered only after pain and swelling occur, thus leading to their late reporting. This can prove to be a risk, as such impacted teeth tend to be in proximity to the nasal cavity or the maxillary antrum.^[15]

Management

Similar to that of mandibular second premolar.

Second Molars

Prevalence

The prevalence of impacted second molars is low and varies from 0% – 2.3%.^[16]

Etiology

The etiology can be traced to systemic (syndromes, multiple teeth) or local (one or few permanent teeth) factors such as crowding, craniofacial morphology and deviation in the dentition, or disturbances in the periodontal membrane and disruption of nerve supply. Systemic diseases connected with generalized failure of eruption are considered etiologic factors according to Suri et al.^[16] Heredity is also mentioned as an etiologic factor.

Management

Indications for treatment of impacted and retained second molars mentioned in the literature are the risk for resorption of neighbouring teeth, caries and periodontal problems, follicular cysts, malocclusion, difficulties in treating deep bite, pericoronal inflammation, and pain. Treatment of these teeth often requires a multidisciplinary treatment approach. Surgical techniques, orthodontic solutions, and combined surgical and orthodontic treatment. One of the most common treatment solutions mentioned is surgical exposure of the second molar and extraction of the third molar. Extracting the retained or impacted second molar, with the intention of replacing it with the third molar, was the least successful treatment regimen.

Procedure

1. Surgically expose just the occlusal surface; extract the third molar at the same time, if indicated.

2. Fabricate a custom eyelet and bond it in the second molar's central groove with the vertical loop portion touching the distal portion of the first molar.
3. Pass a light stainless-steel ligature wire through the vertical custom eyelet loop.
4. Fabricate the 0.018-in stainless steel sectional arch and adjust the arm length so that its terminal loop will lay directly distally to the custom eyelet loop.
- 5.

Fig. 6: A, Fabrication of the 0.014-in custom eyelet. The eyelet is bent perpendicular to the twisted pigtail, which is bonded in the central groove with the eyelet touching the first molar. B, Exploded view of the distal tipping assembly. C, the 100-g super elastic spring is held fully compressed as the 0.018-in wire is placed through the first molar tube from the distal aspect. D, A second needle holder locks on the wire so that the spring will remain compressed after the distal needle holder is released. With the needle holder locked mesially, use the pre-threaded ligature wire to tie the looped end of the 0.018-in wire to the custom eyelet.

- Place the 100-g super elastic open-coil spring over the 0.018-in stainless steel sectional arch. (Figure 6)

Fig. 7: The 0.018-in stainless steel distal tipping assembly is tied in. The 100-g superelastic spring is severely compressed against the first molar tube.

1. With a Mathieu needle holder, compress the open-coil spring 100% and lock the needle holder to hold the compressed spring in place.

2. Holding the sectional spring assembly outside the mouth, thread the same stainless-steel ligature wire (Step 3) through the sectional's terminal loop. (Fig 7)
3. Thread the mesial end of the .018 sectional arch into the distal opening of the first molar tube and slide the sectional wire mesially through the first molar tube until the needle holder touches the distal aspect of the first molar tube.
4. Take a second Mathieu needle holder and lock it onto the sectional wire where it emerges from the mesial side of the first molar tube. This will continue to hold the nickel-titanium (NiTi) spring compressed when the more distal needle holder is released and removed.
5. Release and remove the more distal Mathieu needle holder.
6. Tighten the pre-threaded stainless-steel ligature until the terminal end loop of the .018 sectional wire is firmly tied to the vertical loop of the custom eyelet. Cut the excess ligature free and tuck the remaining pigtail.
7. Release and remove the remaining Mathieu needle holder. This will allow the compressed NiTi spring to drive the sectional wire distally, and to apply a constant distal tipping force to the second molar.
8. Adjust the length of the remaining sectional wire mesial to the first molar tube. Then bend the very mesial end 90 degree towards the teeth and away from the cheek. Make sure there is enough wire remaining mesial to the first molar tube to allow the sectional wire to slide distally enough as the spring expands and the second molar tips distally to clear the first molar. If the 90-degree bend is too close to the molar tube, the sectional will be prevented from tipping the second molar far enough.

Impacted deciduous teeth

The total impaction of deciduous teeth is a rare condition, and few cases have been reported in the literature.^[18]

Prevalence

The prevalence of children with submerged deciduous molars varies between different epidemiologic surveys ranging from 1.3 to 35%.^[18]

Etiology

The etiology of this condition is still unknown.

1. However, recent histological and SEM studies of the root surfaces of extracted secondary teeth have shown most of these teeth to be ankylosed. The cause of this ankylosis is uncertain.
2. The only factor found in a few cases is genetics.^[18,19]

Worth and Haase^[20] proposed possible causes of impactions of deciduous teeth:

1. Developmental anomalies (for example, cleidocranial dysostosis),
2. Malposition and/or malformation of the deciduous tooth,
3. Lack of space,
4. Trauma,
5. Local inflammation,

6. Deficient eruptive force

Management

In cases of tooth impacted due to underlying odontoma-²¹

- The small size of the odontoma made it difficult to identify on radiographs, even though its presence was suspected. Following removal of the odontoma, closing the incision and allowing the primary teeth to erupt spontaneously was considered. Failure to erupt would require a second surgical exposure to place an orthodontic attachment on the teeth.

Due to ankylosis

Consequences of deciduous molar ankylosis are loss of arch length, impaction of succedaneous teeth, ectopic eruption path of succedaneous teeth, supraeruption of opposing dentition, periodontal compromise to adjacent permanent teeth, surgical complication of deciduous tooth removal (trauma), introduction of epithelial tissue into the bony alveolus and attenuated alveolar growth.

The removal of ankylosed deciduous molars is unwarranted unless the succedaneous tooth is erupting abnormally or the occlusal surface of the ankylosed deciduous molar is level with the gingival height of the adjacent teeth.

If underlying permanent teeth is unerupted:

1. Regaining the arch length
2. Surgical exposure and removal of impacted deciduous teeth
3. Wait and watch for eruption of underlying permanent successor
4. Re-exposure and orthodontic traction on permanent successor if it fails to erupt spontaneously.

Space regaining is done by using removable or fixed orthodontic appliances. Once the space is regained surgical exposure is done followed by removal of the impacted deciduous teeth and closing the flap to allow the eruption of the underlying permanent teeth. Till this time, space maintainers should be placed in the arch so that the regained space is not lost. If the permanent teeth are not erupting spontaneously, a second surgical exposure is indicated and orthodontic traction is applied on the tooth to bring it into arch.^[22]

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Conflict of Interest

None.

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