

*Original Research Article*

## Orthodontic Management of an Impacted Central Incisor with a Dual Wire Piggyback Technique

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Tooth impaction may result from various local causes, impaction of a permanent tooth is rarely diagnosed during the mixed dentition period, and an impacted central incisor is usually diagnosed accurately when there is over delay in the eruption of the tooth. Management options for such impacted central incisors can be: (i) surgical extraction and moving the lateral incisor to mimic the central incisor and similarly changing the anatomy of other teeth. (ii) Extraction of the impacted tooth followed by an implant. (iii) Surgical repositioning of the impacted tooth, and (iv) Orthodontic correction of the impacted tooth. This paper describes the successful alignment of impacted maxillary central incisor by surgical exposure of the impacted tooth followed by orthodontic repositioning using the piggy back technique and traction forces in a 13-year-old boy. Orthodontic traction causes minimal injury to the neighboring soft tissues. Orthodontic correction, though challenging, is more desirable as the person retains his natural tooth in the arch. In future, management of impacted central incisor by orthodontic alignment may become the preferred method of choice over extraction or surgical repositioning.

**Keywords:** Piggyback technique, Impacted incisor, Orthodontic repositioning, Impaction, Incisor, Orthodontic treatment.

### INTRODUCTION

Missing upper incisors are regarded as unattractive and this may have an effect on self esteem and general social interaction and it is important to detect and manage the problem as early as possible.<sup>1</sup> Missing and unerupted maxillary incisors can have a major impact on dental and facial aesthetics and were considered to be the most unattractive occlusal trait in one American study.<sup>2</sup>

The impaction of permanent central incisors is a well-recognized entity and is usually associated with trauma to one or more primary anterior teeth early in life. Tooth impaction may result from a number of local causes. Causes of non-eruption and impactions may be: 1. Arch length discrepancy 2. Presence of supernumerary teeth 3. Mucosal or bony barrier 4. Retained deciduous teeth.<sup>3,4</sup> Supernumerary teeth cause impaction of permanent maxillary incisors and has been proven in most studies.<sup>5,6,7.</sup>

Many patients with impacted maxillary central incisors are referred to the orthodontist by general practitioners or pediatric dentists because the parents are concerned about the impaction of an incisor in the early mixed dentition, even

though its occurrence is less frequent. Management options for such teeth can be: (i) surgical extraction and moving the lateral incisor to mimic the central incisor and similarly changing the anatomy of other teeth. (ii) Extraction of the impacted tooth followed by an implant. (iii) Surgical repositioning of the impacted tooth, and (iv) orthodontic correction of the impacted tooth.

The option of extraction and implant placement requires a waiting period of up to 18 years of age and cannot be undertaken at a younger, more impressionable age of 8-15 years, the time when most of the impacted teeth are normally diagnosed. If undertaken early, the osseointegrated implant becomes shorter in inciso-cervical length with time due to passive eruption of adjacent teeth. Surgical repositioning as a treatment option has a likelihood of failure either due to devitalization, or later replacement resorption; surgical trauma to the child at a young age is another disadvantage. Orthodontic correction, though challenging, is more desirable as the person retains his natural tooth in the arch.<sup>3,4</sup>

This is one such case of impacted permanent central incisor in a 13 year old. This was successfully corrected by surgical exposure of the impacted tooth followed by orthodontic repositioning using piggyback technique and traction forces.

## DESCRIPTION OF CASE

A 13year old male patient reported to the clinic with a complaint of missing upper permanent left central incisor. He gave a history of trauma 6 yrs back. The child's medical history was noncontributory. On intraoral examination, the following teeth were present;

17 16 15 14 13 12 11      22 23 24 25 26  
47 46 45 44 43 42 41 31 32 33 34 35 36 37

The patient had Angle's class I malocclusion on a class I skeletal base with bimaxillary protrusion and missing maxillary permanent left central incisor. There was a midline shift in the upper arch due to tilting of adjacent teeth into the edentulous space. Mild crowding was noticed in the lower arch (fig.1). As there was no history of tooth loss, an intraoral periapical radiograph was advised. The radiograph revealed an impacted maxillary central incisor tooth.

To localize the position of tooth relative to adjacent teeth, occlusal radiograph and another intraoral periapical radiograph were taken using tube shift technique (fig.2). In tube shift technique, cone mesially shifted but 21 moving away from cone indicating its buccal position and the radiographs revealed a favorable direction of eruption of the impacted tooth. (<30° to adjacent tooth long axis). There was lack of space for the eruption. The root formation was almost complete. All the available treatment plans were discussed with the patient and the patient agreed to proceed with surgical exposure of the impacted tooth followed by orthodontic repositioning.

Segmental management with Begg's fixed appliance and simultaneous space management and alignment of impacted teeth using piggyback technique followed by retention was planned. The Begg's appliance was chosen because of the light forces it would employ on the dentition and free tipping mechanics in mind and total treatment duration was around seven months; 3 months for the initial eruption and 3-4 months for the piggyback eruption.

As suggested by Becker A (1988)<sup>8</sup> surgical exposure can be performed in 3 accepted ways; a) Circular excision of the oral mucosa immediately overlying the impacted tooth. b) Apically repositioning of the raised flap that incorporates the attached gingiva overlying the impacted tooth. c) Closed eruption technique in which the raised flap that incorporates attached gingiva is fully replaced back in its former position after an attachment has been bonded to the impacted tooth. In this case closed eruption technique was followed. An incision was placed in the attached gingiva and the crown of the impacted tooth was exposed.

Hemostasis was achieved by irrigating with saline and placing a pressure pack. After etching the enamel, a button previously tied with a twisted ligature wire having a few eyelets was bonded on the labial surface of impacted tooth and the flap was closed (fig.3). Begg's brackets were bonded from canine to canine. 0.016 round stainless steel wire was placed as a base arch wire. The ligature wire was tied to the base arch wire and tightened at weekly intervals using the eyelets, i.e. engaging the farther placed eyelet as the tooth erupts. After a month the wire loosened due to debonding of the button.

The flap was elevated and a Begg's bracket was bonded to the labial surface of impacted tooth and a lingual button was bonded to the palatal surface of the incisor (fig.4). The flap was closed and the ligature wire that was tied to the lingual button was attached to the base arch wire. The tip of the incisor was visible in a period of three months. There was soft tissue encroachment in the slot of the bracket, which was cleared. The ligature tie was then removed and the rest of the alignment was done using 'piggyback technique'. It is a technique where a segment of Nickel-Titanium wire is piggybacked onto a stainless steel wire in regions where flexibility is desired.

The Piggyback is a unique technique where one rigid wire takes care of the arch form and a more flexible wire like Niti is used to get the individual tooth into the main arch form sequentially. (fig.5).<sup>9</sup> As the 21 moved further down, the main arch wire was observed to cause hindrance in its final occlusal movement. To overcome this obstruction the main arch wire (round .016) was given 90° bends to allow the eruption of 21 till the incisal plane (fig.6). The impacted central incisor was in occlusion in another three months. The Ni-Ti wire was removed and the incisor was secured directly to the base wire and left for another 3 months for retention purpose. The tooth (21) maintained its vitality and there was no evidence of root resorption. Post-treatment, the patient showed esthetically pleasing gingival contour and a normal clinical crown length. (fig.7).

## DISCUSSION

Maxillary incisors are the third most commonly impacted teeth in Caucasians, following the third molars and maxillary canines. They are more prevalent in Mongoloid races, suggesting that both hereditary and environmental factors may be implicated (Davis, 1987). The incidence of unerupted maxillary incisors is not known exactly, although the prevalence has been reported as 0.13% in the 5–12 year-old age group.<sup>10</sup> Due to the adverse effect on the child's social interaction and self-esteem, the problem of the impacted or ectopic incisor should be managed as early as reasonably possible.

The decision to expose or remove an impacted upper permanent central incisor, based on radiographic information, seems to be primarily guided by two factors: labio-palatal crown position and angulations to the midline. In this case as both the factors are favorable, surgical exposure followed by orthodontic traction method appeared to be promising to align the impacted tooth into proper position, thus was employed accordingly. This method of orthodontic alignment of impacted central incisors, compared to other methods, is relatively free from treatment associated complications and predictable results.<sup>4</sup>

The technique of closed eruption has been highly recommended by Lin YT. (1999), Uematsu S (2003), Paola C (2005)<sup>11,12,13</sup>, for aligning the impacted tooth compared to methods like excisional gingivectomy and apically positioned flap techniques because of better esthetic results. The extrusion force applied to the impacted central incisor was very light. This may have accounted for the little difference in the clinical crown length and maintenance of vitality of the impacted tooth post-alignment.

It is suggested that all teeth that have not erupted by 6 months after the normal eruption schedule should be subjected to radiological examination to ascertain any possible cause for the delayed eruption.



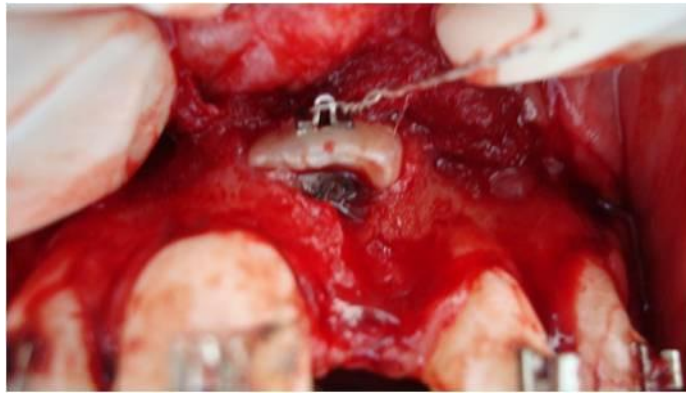
**Fig-1:** Frontal view



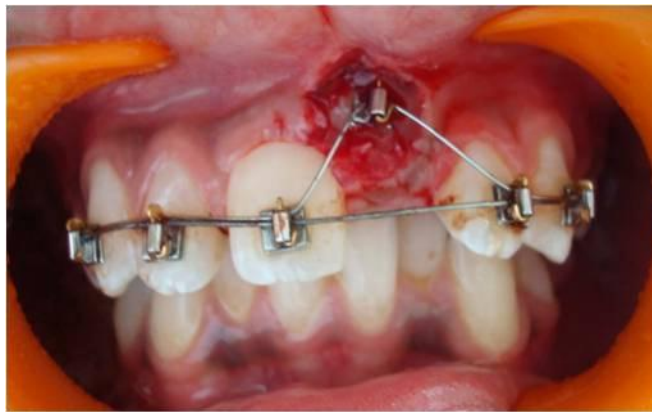
**Fig-2:** Occlusal and IOPA Radiographs(tube-shift technique)



**Fig-3:** Button bonded to the tooth



**Fig-4** (button replaced with bracket and new button bonded lingually)



**Fig-5:** (Piggyback technique)



**Fig-6:** (90°bends to allow eruption)



**Fig-7:** (Tooth in occlusion)

Wherever possible effort should be made to align the impacted incisor into proper position as there is no better alternative to natural tooth in case of esthetics and function. Orthodontic management of an impacted central incisor with a dual wire Piggy back technique is relatively free from treatment related complications and predictable results; in future it may become the preferred method of treatment over extractions or surgical repositioning.

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