

Twain Impaction-A Novel Orthodontic Approach

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ABSTRACT

Primary failure of eruption (PFE) contend one of the varied rationale for etiology of malocclusions with eruption sequence disturbances. In a contemporary world of modernisation and advanced technological innovations, orthodontics is being revising its literature with new dimensions fortifying the biomechanics with biological considerations. The Poul Gjessing universal spring which is a distinguished and highly efficient spring assured simultaneous three dimensional control of teeth, which being a sculler achievement of many specialists. This seldom case report details a unique in its incidence with ectopically erupted and impacted first premolar interfering the late eruption pathway of canine, leading to twain impaction.

Keywords: Canine impaction, Premolar impaction, PG Spring, Primary eruption failure, 3-D tooth movement

CASE REPORT

A 20-year-old, Chinese origin male patient reported to the clinic with a chief complaint of gaps between his teeth and inability to chew on his right side, which made him disturbed during peer gathering. His medical history was non-contributory to the malocclusion and no familial expressions were noticed to patient consciousness apart from mild irregularities among siblings with proper recorded consent.

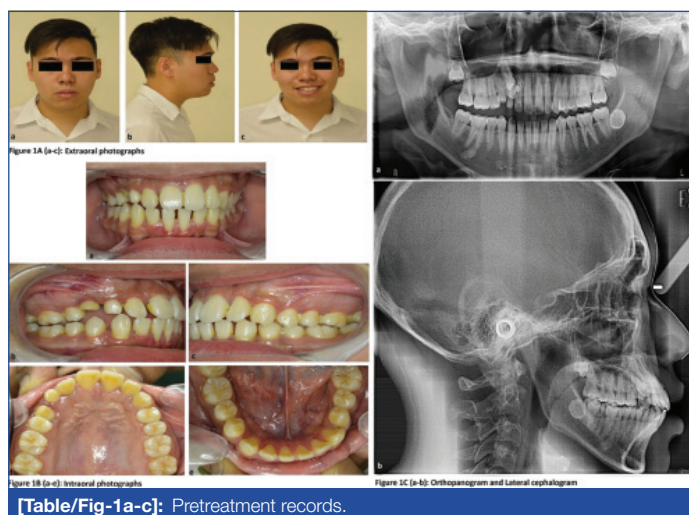
DIAGNOSIS

On clinical examination, extra oral features were balanced with only increase in the lower facial height, shallow mentolabial sulcus and potentially incompetent lips [Table/Fig-1a]. Intraorally the hygiene was fair with full complement of permanent teeth except right permanent maxillary canine (13) and first premolar (14) with their predecessors, retained deciduous canine (53) with first molar (54) and the third molars [Table/Fig-1b]. There was no evident reason inferred either from the case history or clinical examination for the retention of primary teeth. A shallow crater like feature was evident both clinically and radiographically in relation to 54, with inward sloping of adjacent alveolar bone depicting the localised focal area of "fold-in" effect of anterior and posterior right maxillary alveolar segments suspecting a non-responding or negative inward pull force from within the alveolar bone, leading to lateral open bite [Table/Fig-1b,c].

However, generalised anterior spacing was seen in both the arches with normal overjet, overbite and end on posterior inter-occlusal relationship on right side. Occlusal wear facets were evident as a feature of pathologic canine guidance during left side excursion. A comprehensive diagnosis revealed Angle's Class II division 1 subdivision dento-alveolar malocclusion on Class-I skeletal bases with class I soft tissue profile and retained primary teeth, impacted permanent teeth, increased lower facial height, dental midline incongruence, proclined-protruded incisors and strained mentalis muscle on closure of lips [Table/Fig-2].

Treatment Objectives

The objectives were to correct the dental component to establish function and aesthetics with good alignment and levelling of the arches. Extraction of 53 and 54 was planned to facilitate passive eruption of impacted teeth thereby, uprighting of 14 can provide space for canine eruption.



[Table/Fig-1a-c]: Pretreatment records.

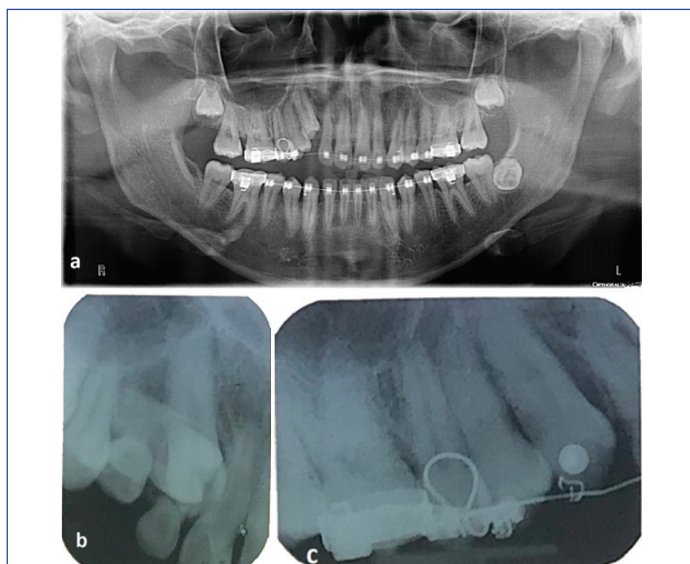
Parameters	Normal	Obtained	Inference
SNA	82°	79°	Retrognathic Maxilla
SNB	80°	77°	Retrognathic Mandible
ANB	2°	2°	Class I Skeletal bases
MPA	32°	41°	High
UI-NA (Angle)	22°	30°	Proclined Incisor
UI-NA (Linear)	4 mm	11.5 mm	Protruded Incisor
LI-NB (Angle)	25°	33°	Proclined Incisor
LI-NB (Linear)	4 mm	12 mm	Protruded Incisor
UI-LI (Angle)	131°	110°	Proclined Incisors
"S" Line-UL	0 mm	3 mm	Protrusive Lip
"S" Line-LL	0 mm	6 mm	Protrusive Lip
Wit's Appraisal	-1 (Males)	-1	Class I Skeletal bases

[Table/Fig-2]: Pretreatment cephalometric tracing values.

Treatment Plan and Procedure

Surplus space deemed non-extraction approach with 0.022 MBT prescriptions (adequate control on force and arch stability). Aligning and levelling was achieved sequentially till 0.019X0.025 NiTi. The PG Universal Spring (PGUS) [1] made of 0.016 X 0.022 SS was preferred to upright the first premolar. Once the objective of uprighting, retraction and proper bucco-palatal root position achieved, the spring was discontinued and 0.017X0.025 NiTi was loaded as continuous arch wire with open coil spring to prevent

relapse and maintain the space [Table/Fig-3]. The impacted canine was stationary in its position requiring surgical exposure.



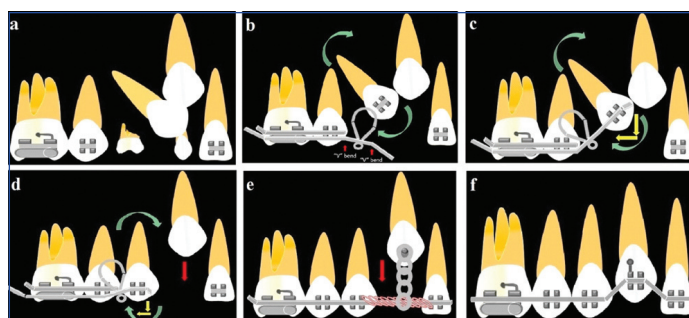
[Table/Fig-3]: Midtreatment opg showing the uprighting of 14 (a) with PGUS and achieving three dimensional stability compared to pre (b) and mid treatment (c) periapical radiographs.

DISCUSSION

Primary failure of eruption (PFE) contend one of the varied rationale for aetiology of malocclusions with eruption sequence disturbances resulting in partial or complete unerupted teeth in the absence of a mechanical obstruction. The manifestations were first described by Proffit WR and Vig KW, [2]. Its prevalence being 0.06% with the posterior teeth most commonly affected, was grouped into three different types depending on the features presented either mesial to or distal aspect of involved tooth and severity as described by Frazier-Bowers SA et al., [3]. Later, It was also stemmed into primary failure of eruption (PFE), mechanical failure of eruption and indeterminate failure of eruption depending upon the cause by Sylvia A et al. However, genetic mutation in the *PTH1R* gene is also one systemic factor resulting in PFE [4]. In this case, the primary failure of eruption of 14 leads to mechanical interference and failure of eruption of 13, contemplating the chronologic and eruption sequence of 13.

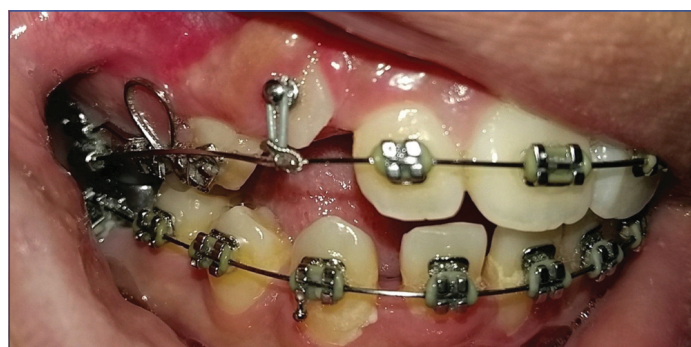
In a contemporary world of modernisation and advanced technological innovations, orthodontics, is being revising its literature with new dimensions fortifying biomechanics with biological considerations [5-8]. The bio-friction between the root and bundle bone generated, spread the transparency over experimenting materials, bracket prescriptions, mechanics, designs, accessibility and their combinations to achieve optimal forces for three dimensional control and conceptual placement of tooth along with anchorage configurations [9-11]. The Poul Gjessing (1985) universal spring, commonly used for retraction, intrusion and uprighting of anterior teeth has other clinical applications also such as alignment of the buccal teeth and extrusion movements. All these applications are achieved by the sectional wires to avoid the untoward effects of a continuous arch wire; either includes en-masse incisor retraction or individual canine retraction [11-13]. A novel approach was presented by uprighting first premolar by this distinguished and versatile spring which assured simultaneous three dimensional controls of teeth in the antero-posterior plane and retraction, so that adequate space will be provided for passive eruption of canine [Table/Fig-4]. Most of the closed loop and open loop springs which are designed for retraction have some degree of uprighting mechanics or can also be converted into uprighting springs by incorporating a gable bend or by angulating the alpha or beta bends thereby, generating

a rotational moment in the vertical plane [14,15]. An accentuated downward "v" bend to generate couple is placed mesial and distal to the loop which also prevented the force decay due to fatigue of the bends while loading and activation of the spring in the occluso-distal direction, in this condition to upright the premolar [Table/Fig-4b]. However, PG spring retained the uniqueness for its efficiency. The spring also achieved a good bucco-palatal root position concurrently, as the tooth was also bucco-palately inclined and a sculler achievement for many specialists. The literature was seldom furnished with the bucco-lingual control of tooth which was clearly explained by the inventor [12]. Twisting of the posterior extension for about 45° bucco-palately initiated the 3-dimensional control of tooth directing the force palatally. The spring design, extra length of wire incorporated and the rectangular wire in twin bracket made it possible to achieve bucco-palatal torque, there by reducing the total treatment time many folds.



[Table/Fig-4]: Diagrammatic representation of simultaneous uprighting and retraction of first premolar (a-c). Followed by vertical traction eruption of canine after adequate space generation (d-f).

As no signs of ankyloses observed along with individual tooth abnormalities like dilaceration for both the teeth, alternative treatment plans like apicotomy were ruled out [16]. A regular closed flap technique with bonded attachment and traction was preferred and immediate traction was also suggested in adult patient inspite of anticipation [17]. Once the crown had clinical appearance [Table/Fig-5] box elastics were used to level the occlusal plane for achieving a good intercuspation [Table/Fig-6].



[Table/Fig-5]: Mid treatment intraoral photograph.



[Table/Fig-6a-c]: Mid treatment intraoral photographs showing the clinical progress to attain functional occlusal plane.

CONCLUSION

Ectopic eruption, primary eruption failure and impacted teeth have diversified factors which can lead to tooth size-arch length discrepancies (TSALD) beyond functional occlusal plan disclusion contributing as one of the primary local etiologies for malocclusion. The clinician should possess sound knowledge with experience in critically understanding and analysing such etiologies to minimise

the risk for failures. They should also be highly skilled with force and moment generating orthodontic materials to get the desired outcome in positioning the tooth in its most neutral zones thereby minimising the drawbacks.

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