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Uprighting of Molars- A Clinical Challenge

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Abstract:

All teeth are essential, yet in function and influence, some are of greater importance than others, the most important of all being the molars, especially the first permanent molar which according to E. H. Angle is the key to occlusion. Loss of a first permanent molar should be immediately addressed by prosthetic replacement or orthodontic space closure. Otherwise, the second and third molars will incline and rotate, canine and premolars will move distally into the molar space, and the opposing first molar will extrude. The over-all objective in molar uprighting is to optimally position the molars providing the space to restore the lost tooth thereby protecting the teeth against inflammatory periodontal diseases and occlusal traumatism, which together determine the optimal periodontal environment of the molars and improve the masticatory efficiency of the patient.

Dental alignment of the arches can facilitate prosthodontic as well as periodontal objectives, a strategy referred to as "facilitative orthodontics". Molar uprighting is one such challenging facilitative orthodontic procedure that requires proper clinical, radiological, and biomechanical evaluation and a good appliance selection for successful treatment results. A sound knowledge of biomechanics is necessary in order to optimize the clinical outcome of uprighting mechanics. When uprighting mechanics are used it is absolutely necessary to consider the extrusive nature of force system. It is important to recognize the components of the individual problems, the force system that is needed to achieve the specific goal, and finally the design of an appliance that will assure these objectives. The uprighting mechanics presented are very simple and biomechanically efficient to be used in daily practice.

KEY WORDS: molar uprighting, sectional mechanics, interdisciplinary orthodontics

Introduction

All teeth are essential, yet in function and influence, some are of greater importance than others, the most important of all being the molars, especially the first permanent molar which according to E. H. Angle is the key to occlusion¹. Molars occupy functionally and anatomically a key position in the oral cavity. Functionally they aid in chewing and grinding of food, and anatomically as they are located in the posterior region of the dental arches, responsible for maintaining the vertical dimension of the face².

Permanent first molars are the first permanent teeth to erupt into the oral cavity. They have been quoted as the most caries-prone tooth in the permanent dentition leading to their early loss, probably as a result of their early exposure to the oral environment³. Loss of a first permanent molar should be immediately addressed by prosthetic replacement or orthodontic space closure as it may lead to functional and anatomical disturbances. The sequelae of events include second and third molars will incline and rotate, canine and premolars will move distally into the molar space, and the opposing first molar will extrude. In addition, the patient may develop an infrabony defect at the mesial aspect of the second molar root and a reduction of the interradicular space between the second and third molars. Another aspect of loss of permanent teeth is that the masticatory efficiency of the patient is compromised. Correction of these problems is a biggest challenge to the orthodontist.⁴

The over-all objective in molar uprighting is to optimally position the molars providing the space to restore the lost tooth thereby protecting the teeth against inflammatory periodontal diseases and occlusal traumatism, which together determine the optimal periodontal environment to the molars and improve the masticatory efficiency of the patient⁵. However there are certain questions of clinical interest related to orthodontic uprighting and leveling of tipped molars⁶.

1. Will orthodontic uprighting and leveling of tipped molars prevent the progression and acceleration of destructive periodontal diseases?
2. Since tipped molars in some patients will be partially impacted and in some others extrude above the occlusal plane, will similar uprighting mechanics for tipped molars have any undesirable side effects?
3. Which of the uprighting mechanics will be most efficient for the particular case in question?

Differential diagnosis of tipped molars:

Melsen et al remarked that simple appliances for molar uprighting do not take individual patient variation into account⁶. Tipped molars should be differentiated by the type of tooth movement required in all 3 planes of space. For any particular tooth movement there is only one correct force system to be applied. Therefore a differential diagnosis of the tipped molars is important before selecting the optimal force system and appliance design.

1. In the transverse planes appropriate balance of vertical forces should be maintained along with uprighting of teeth in crossbites.
2. In the sagittal plane the appropriate combination of vertical movement and uprighting must be determined.
3. In the vertical plane molar extrusion may be desirable in some early orthodontic treatments when the tipped molar is below the functional occlusal plane.
4. In conditions where the distal aspect of the tipped molar is above the functional occlusal plane molar intrusion is required and the biomechanical principles applied become more complicated.

Case reports:

CASE 1:

An 18 year old male patient reported to the department with the **Chief Complaint** of inability to chew food on left side.

On **Extraoral Examination** (fig 1) patient presented with brachyfacial form, mild convex profile, mild class III skeletal bases, average growth pattern and potentially incompetent lips.

On **Intraoral Examination** (fig 1) patient presented with end on molar relation on right and missing lower first molar on left. Canine relationship was class I bilaterally; incisor relationship was Class I. Generalized mild spacing was present in both the arches, crossbite in relation to 23, 33 and 15, 44 with overjet of 2mm and overbite of 2 mm. Teeth missing are 14, 36 and 45 which had been extracted due to caries. The OPG (fig 2) revealed that the 37 was mesially tipped.



Figure 1



Figure 2

Diagnosis: 18 year old male patient presenting with end on molar relation on right superimposed on mild skeletal class III bases (ANB of -2°) having average growth pattern with missing 14, 36 and 45, mesial migration of 15, 16, 17 and generalized spacing in both the arches.

Treatment objectives:

1. To level and align upper and lower arches
2. To gain space in the region of 36 by **uprighting** and **distalizing** 37.
3. To get a functionally stable occlusion.
4. To achieve a balanced and pleasing profile.

Case summary:

Patient was treated by non extraction approach using the preadjusted edgewise appliance with Roth prescription. The upper and lower arches were bonded with the first and second molars being banded. Once aligning and leveling was accomplished, an implant was placed with respect to 36 (fig 3). A Guerin lock was anchored to the dental implant and an open coil spring placed on 0.019"×0.025" stainless steel wire to distalize and upright 37 in order to place the prosthesis on the implant in relation to 36.

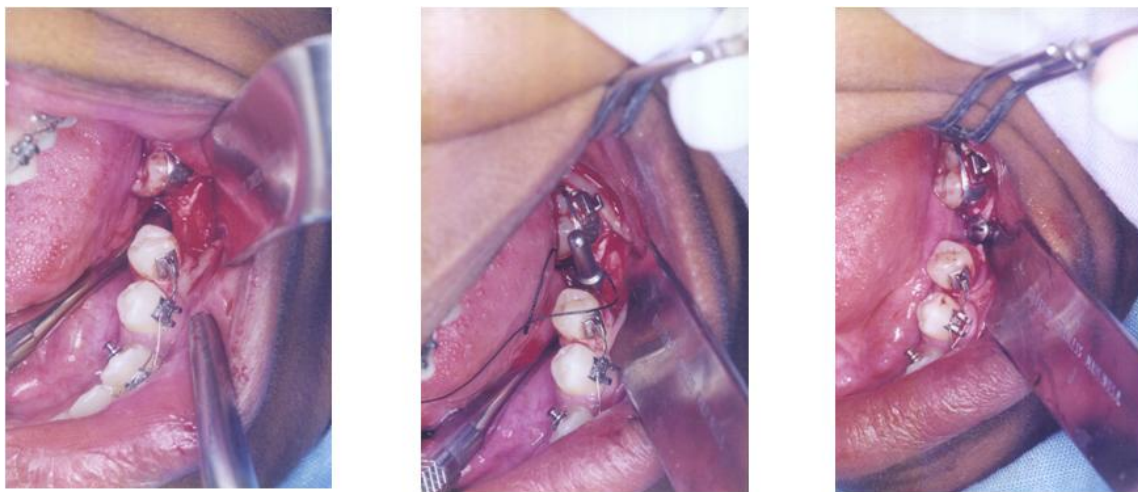
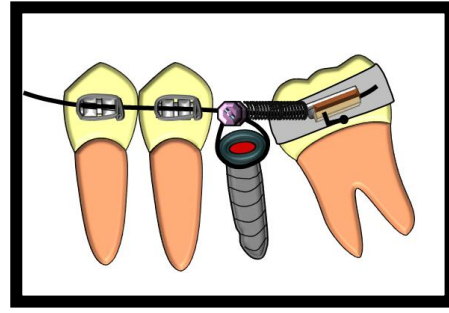


Figure 3

At the end of treatment spaces were closed and a class I dental relationship was achieved following prosthetic rehabilitation (fig 4, 5, 6). Masticatory efficiency of the patient was improved, a functionally stable occlusion was established and the patient's chief complaint was addressed.



Intra oral mirror image of the mechanics



Uprighting of 37 by using a Guerin lock anchored to the dental implant and open coil spring.

Figure 4



Figure 5



Figure 6

CASE 2:

An 18 year old male patient reported to the department with the **Chief Complaint** of pain in the lower back teeth and inability to chew food.

On **Extraoral Examination** (fig 7) patient presented with dolicofacial form, orthognathic profile, mild anterior divergence, competent lips and shallow mentolabial sulcus.

On **Intraoral Examination** (fig 7) patient presented with 36, 37, 46, 47 extracted due to caries, retained 53, unerupted 13, 18, 28, 33, 34, 38, 43, and 48. Moderate crowding was present in the upper and lower arches. Incisors showed a class I relation with overjet of 2.5mm and overbite of 4 mm. The OPG (fig 8) revealed 38 and 48 were in the apical one third of root formation and in a favorable position.

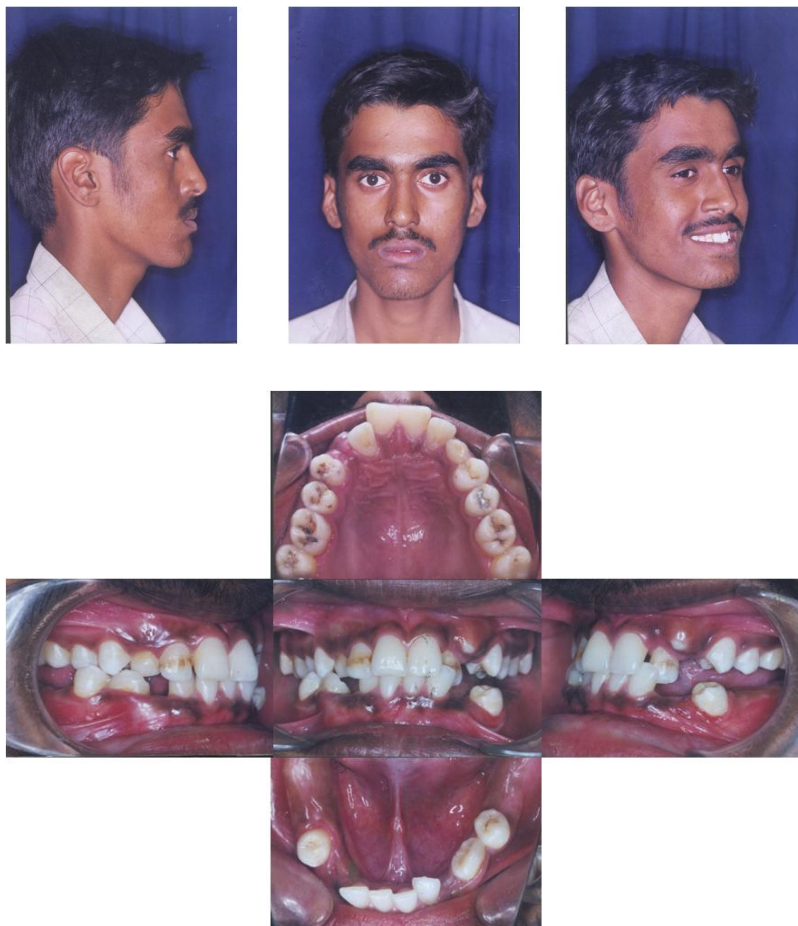


Figure 7

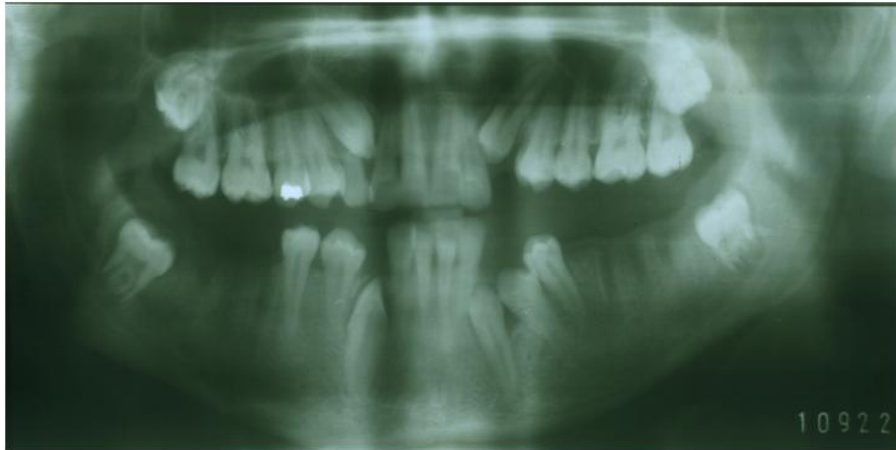


Figure 8

Diagnosis: 18 year old male patient presenting with loss of 36,37,46,47 and unerupted 13, 33 and 34, having mild class III skeletal bases with ANB of -2° having average growth pattern with mild to moderate crowding in the upper and lower arches.

Treatment objectives:

1. To level and align upper and lower arches
2. To obtain functionally stable occlusion for the patient.
3. To disimpact impacted 13, 23, 33, 34, 38, 43, 48 into favorable position in the arches
4. To achieve a balanced and pleasing profile.

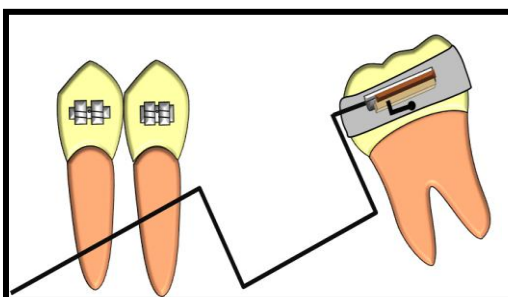
Case summary:

The patient was treated by non extraction approach using the preadjusted edgewise appliance with MBT prescription. The upper arch was bonded and banded first including second molars. In the lower arch a removable Hawley's appliance with expansion screw was given to distalize the lower premolars followed by fixed appliance. Gingivoplasty was done in relation to 38 and 48 (fig 9). A $0.017'' \times 0.025''$ rectangular stainless steel archwire along with vertical offset bends and E-chains from premolars to the molars to mesialize and upright the mesially tipped 3rd molars and distalize the second premolars (fig 10). The lower 3rd molars were

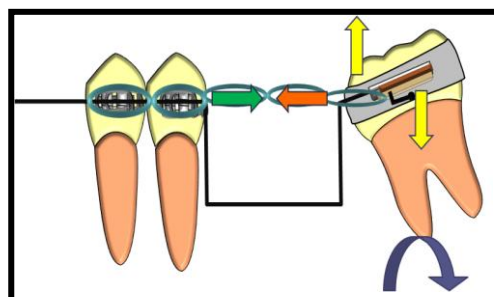
uprighted using this mechanics and brought into the position of 2nd molars to have optimal occlusal table in the posterior region (fig 11).



Figure 9



Pre activation



Post activation

Figure 10

0.017" × 0.025" rectangular stainless steel archwire along with vertical offset bends and E-chains from premolars to the molars to mesialize and upright the mesially tipped 3rd molars and distalize the second premolars

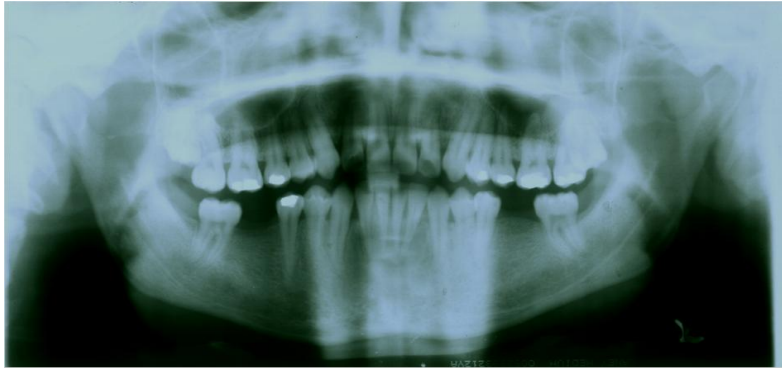


Figure 11

With non extraction line of treatment and fixed mechanotherapy we were able to level and align the arches, disimpact the impacted teeth, create a functionally stable occlusion and improve the masticatory efficiency by disimpacting the impacted lower 3rd molars and providing a prosthesis in between 35, 38 and 45, 48 (fig 12). At the end of the treatment the general well being and confidence of the patient was greatly improved and patient's chief complaint was addressed with a marked improvement in the periodontal condition and masticatory efficiency of the dentition.

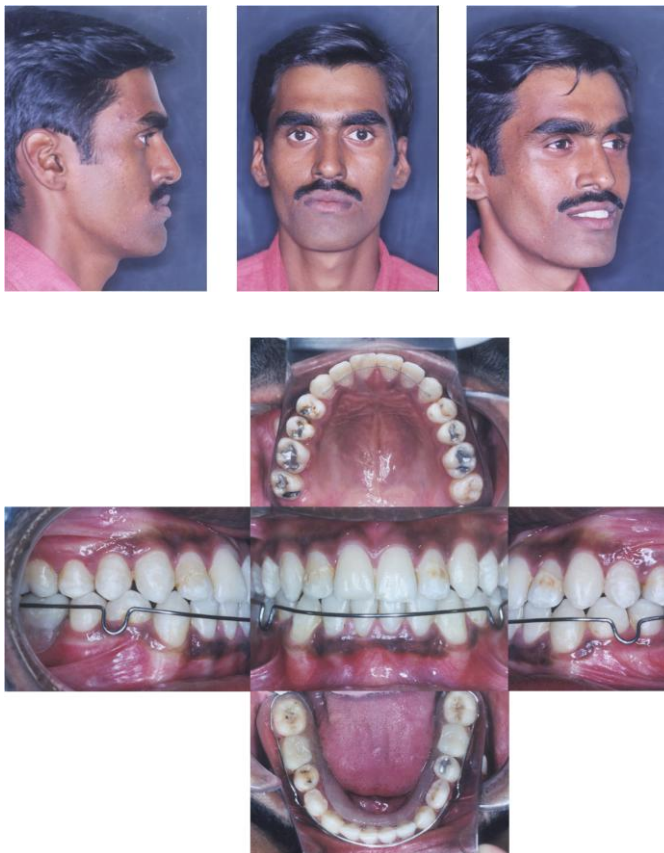


Figure 12

CASE 3:

An 18 year old male patient reported to the department with the **Chief Complaint** of forwardly placed upper front teeth.

On **Extraoral Examination** (fig 13) patient presented with mesocephalic, mesobrachyfacial form, mild convex profile, straight divergence, lower lip trap and a shallow mentolabial sulcus.

On **Intraoral Examination** (fig 13) patient presented with Class I molar relationship bilaterally, class II div 1 incisor relationship, 13, 43 and 44 in crossbite, spacing in the upper anteriors and mild crowding in the lower anteriors. The OPG and IOPA (fig 14) revealed a mesially tipped and partially impacted 27.



Figure 13



Figure 14



Diagnosis: 18 year old male patient presenting with Class I molar relationship bilaterally superimposed on Class I skeletal bases with ANB of 4° having horizontal growth pattern with spacing in the upper arch and crowding in the lower arch.

Treatment objectives:

1. To level and align upper and lower arches
2. To maintain class I molar and canine relationship
3. To obtain a class I incisor relationship
4. To achieve a well balanced facial profile.

Case summary:

The patient was treated by non extraction approach using the preadjusted edgewise appliance with MBT prescription. The upper and lower arches were bonded except the upper canines and were segmentally aligned (fig 15). The mesially impacted 27 was bonded with a button on the mesiobuccal aspect and a custom made spring of 0.016" A Niti fabricated with archmate system(fig 16, 17, 18) was placed to disimpact/unlock, distalize and upright the

molar. An elastomeric separator was also placed in between 26 and 27 to enhance the distal movement of 27. After disimpacting, open coil springs was placed in relation to 27 for further correction (fig 19).



Figure 15

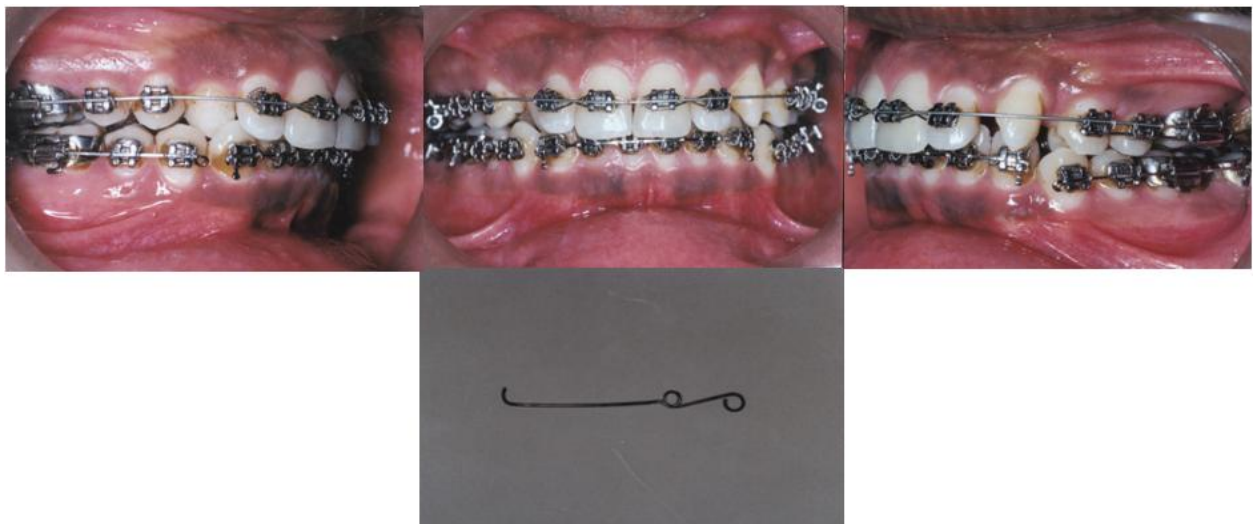


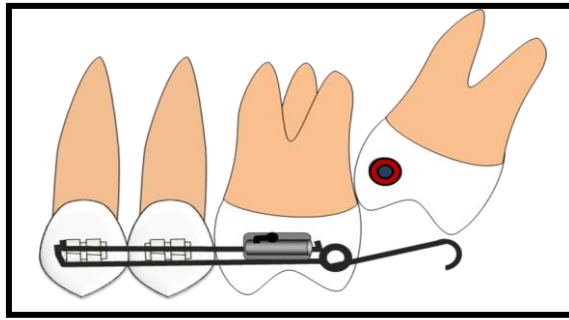
Figure 16



Mirror image of button bonded on to the mesiobuccal aspect of 27. Custom made spring to upright and distalize 27 along with elastomeric separator in between 26 and 27 .

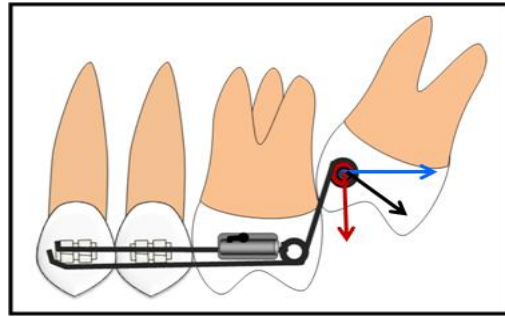
Figure 17

Pre activation



Button bonded on the 2nd molar on mesiobuccal aspect. Custom made spring to upright and distalize the molar.

Post activation



The custom made spring after engaging onto the button on the second molar will have a distalizing and occlusally directed force resulting in uprighting the second molar.

Figure 18



Figure 19

With non extraction line of treatment and fixed mechanotherapy we were able to level and align the arches, relieve the crowding, upright the mesially tipped and impacted 27 and improve the periodontal prognosis of 26 and 27, thereby contribute to optimal functioning of the molars (fig 20, 21). The chief complaint of the patient that was forwardly placed upper front teeth was addressed.



Figure 20

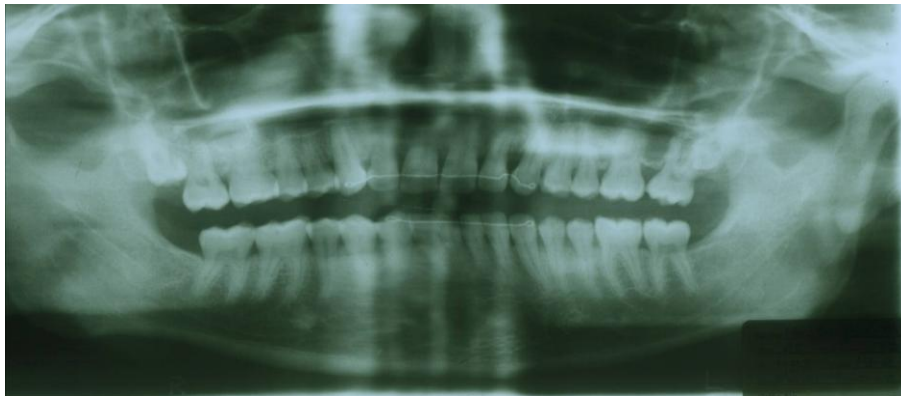


Figure 21



Discussion:

Orthodontists have given convincing evidence of the value of correctly occluded molars by the efforts they have put into making corrections in this area^{7,8}. There has been considerable variation in the length of time required to move these teeth. As clinicians we are inclined to evaluate the merits of each method of applying force to make corrections in the molar area. Uprighting of tipped molars can benefit patients functionally, periodontally and prosthodontically⁹⁻¹¹. The specific benefits to be gained depend on the directions in which the molar moves, both in the vertical and mesiodistal planes of space. Molar uprighting mechanics is not a separate treatment entity; it is an adjunctive appliance design. These mechanics can be used in conjunction with any fixed appliances and are simple to use.¹²

There are various mechanics to upright impacted teeth of which the above presented are some of the most simple. Case 1 demonstrates a simple and efficient mechanics to upright by using open coil springs anchored to dental implant by means of a Guerin lock, thereby reducing the anchorage demand. Case 2 demonstrates innovative but simple mechanics which can be used to upright mesially tipped teeth when we need to mesialize and upright molars. In this case the impacted 3rd molars were uprighted and moved mesially to replace the 2nd molars providing a good functional and stable occlusion. Case 3 demonstrates mechanics used to disimpact the impacted and mesially tipped upper second molar, which improved the periodontal health considerably of the impacted and neighbouring tooth, thereby establishing a functional occlusion and providing a longer occlusal table.

Conclusion:

Often orthodontists can be of considerable assistance in periodontal and prosthodontic rehabilitation treatment. Dental alignment of the arches can facilitate prosthodontic as well as periodontal objectives, a strategy referred to as “facilitative orthodontics”. Molar uprighting is one such challenging facilitative orthodontic procedure that requires proper clinical, radiological, and biomechanical evaluation and a good appliance selection for successful treatment results.

It's important, particularly after a discussion of orthodontic appliance selection, to reaffirm the biologic nature of molar uprighting. Treatment varies greatly from

case to case therefore Individual cases must be considered on an individual basis. There is a need to examine scientifically the extent of the differing response of teeth that are periodontally involved, as compared with those having a physiologic periodontium. An interchange of information among clinicians and investigators of the various disciplines is necessary.

A sound knowledge of biomechanics is necessary in order to optimize the clinical outcome of uprighting mechanics. When uprighting mechanics are used it is absolutely necessary to consider the extrusive nature of force system. It is important to recognize the components of the individual problems, the force system that is needed to achieve the specific goal, and finally the design of an appliance that will assure these objectives.

The uprighting mechanics presented are very simple and biomechanically efficient to be used in our daily practice. No matter what our patients present to us with, we as “Orthodontist’s” should give them a gift of functionally stable occlusion along with a pleasing face!!!!!!

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