

Hybrid Removable Essix Appliance for Molar Uprighting: A Case Report

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Abstract Background; Placing and restoring a dental implant when the mesio-distal space is reduced at the occlusal plane and/or the bone level can result in less than satisfactory treatment outcomes. Patient: A 24-year-old male patient with need of fixed replacement of his missing tooth 46 which was lost long time before. Posterior tooth 47 was tipped mesially toward the adjacent edentulous space. Hybrid removable Essix appliance was fabricated for molar uprighting on tilted molar and for saving the available space at 36 position after implant placement two weeks ago. After 3 months and 15 days of treatment by hybrid appliance the tooth 47 was uprighted for placement implant at 46 position. Discussion: The objective in tooth 47 uprighting is ideal positioning of this tooth which will eventually gain more space at 46 position for a fixed crown implant prosthesis. The ideal position of tooth 47 will provide an optimal periodontal environment. Mesial movement and tipping of tooth 47 may initiate a vicious cycle of traumatic occlusion, functional interferences and space problems in conjunction with implant insertion. After the tipped molar is uprighted by Hybrid appliance, the functional and periodontal situation can be improved along with maintaining the available space at 36 position during the treatment period. Conclusion: This limited orthodontic treatment improved the periodontal environment and developed appropriate space for implant prosthesis. The newly designed appliance was aesthetic, cheap, and comfortable, and was successful for uprighting mesially tilted molar.

Keywords: *implant planning, interdental space, thermoplastic Essix appliance, minor orthodontic movement, expansion screw*

Cite This Article: Mohammed Riad Yehya, "Hybrid Removable Essix Appliance for Molar Uprighting: A Case Report." *International Journal of Dental Sciences and Research*, vol. 6, no. 4 (2018): 95-99. doi: 10.12691/ijdsr-6-4-4.

1. Introduction

In the process of aging, some teeth are lost due to periodontal disease, caries or other reasons which generate an imbalance in the equilibrium and loss of the integrity of masticatory system. When these missing teeth are not replaced properly for a long time they have a tendency to migrate towards the empty space in an attempt to fill the space. Some authors have confirmed an increase in prevalence of occlusal interferences connected with unopposed posterior teeth comparative to that found in intact arches. [1,2] The tooth distal to the extraction site will tilt mesially into the space. [3] As a result of tilting and drifting of teeth, stresses are being concentrated in some areas which cause resorption of bone in that area leading to weakened periodontal support of teeth while planning the fixed prosthodontic therapy. [4] If the tilting is severe, more extensive corrective measures are needed. The treatment of choice is uprighting of molar by minor orthodontic treatment. [5] Tylman stated that mandibular molars that are tipped beyond 24° should not generally be used for fixed partial denture abutments [6].

The new Essix appliance was first introduced as a retainer by Sheridan and colleagues in 1993. [7] The appliance is a thermoplastic, light and almost invisible removable plastic

device that snap over the teeth. Thereafter, various usages of Essix have been described by several authors [8-12]. Sheridan and Colleagues [13,14] used windows, divots and thermosealing. Rinchuse [15] used a spring added to the Essix plates in order to maintain tooth movement. Babacan H. and Doruk C. used Essix-based molar distalization appliance with expansion screw for molar distalization and mesial tipping [16].

The aim of this study is to introduce a method for minor tooth movement by using Hybrid Removable Essix Appliance for uprighting the tilted molar 47 and exam the clinical complexities of this method.

2. Case Report

A 24-year-old male patient represented to the prosthodontics department in college of dentistry-Qassim university with chief complaint of missing tooth 46, which had been extracted in childhood because of severe caries. Additionally, the patient ask for saving the available space at 36 position after implant placement two weeks ago. The patient's medical history was non-contributory. Tooth 45 was intact, and tooth 47 had a small occlusal composite and was tipped mesially (Figure 1). Mesial tipping of this tooth had resulted in a space compromise of the edentulous area at 46 position. The mental foramen used

as reference to draw line on the panoramic radiographs to determine the angular measurement of tooth 47 before and after the treatment. [17] This reference line passed through the centre of the mental foramen. To determine the long axes of double rooted tooth 47 followed the average image of

the mesial and distal root canals. [18] It was found that the degree of tilt for tooth 47 was 37 degree which it may initiate a vicious cycle of functional interferences, traumatic occlusion, space problems in conjunction with implant insertion, and periodontal problems.

CRANEX D



Figure 1. Initial diagnostic panoramic radiograph showing the edentulous space on each side and mesial tipping on tooth 47

2.1. Treatment Plane

Patient was not willing for expensive fixed orthodontic treatment to upright tooth 47. After taking a consultation from Department of Orthodontics about the case, appropriate consent was signed by the patient before starting the treatment plan. The Hybrid Removable Essix Appliance in this case used for uprighting the tilted molar 47 for gaining space for implant at 46 position and for saving the space after implant placement at 36 position before the second stage surgery.

Treatment options and considerations for restoring the missing tooth 46 were discussed. Fixed partial bridge from tooth 45 to tooth 47 has relatively more invasive treatment option than single implant. Additionally, the three units fixed bridge has probable root canal treatment of tooth 47 if occlusal-mesial reduction encroaches on mesial aspect of pulp chamber in the young patient. Flossing under pontic is essential to maintain long-term periodontal health. Single implant and crown for replacing the missing tooth 46 has Less invasive than fixed partial bridge as abutments would not be prepared and Hygiene (flossing) would be easier.

2.2. The Laboratory Technique

The fabrication sequence for the hybrid removable Essix appliance is described on a demonstration case. An accurate impression must be taken to encompass the complete dentition and one-third of the alveolus by alginate or polyvinyl siloxane. A working cast is gained from quality die stone. The long axis of the incisors should be perpendicular to the base of the cast to increase the efficiency of thermoforming. Additionally, the cast should only be about 2 cm high.



Figure 2. Thermoform a sheet of 0.040-inch type 'A' Essix material over the cast

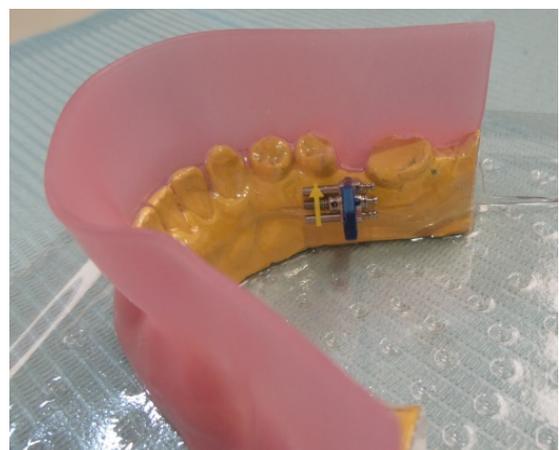


Figure 3. The expansion screws are placed on the model above the Essix appliance and the buccal vestibule is boxed out with baseplate wax



Figure 4. The hybrid removable Essix appliance after applying cold cure acrylic and removing it from the model



Figure 5. The hybrid removable Essix appliance after polishing

A 0.040-inch (1 mm) sheet of Essix type A Essix® (RaintreeEssix, Inc. 4001 Division St. Metairie, LA 70002, USA) plastic was vacuumed over the prepared model and then removed from the vacuum machine and allowed it to cool without cutting off the excess plastic around the model (Figure 2). An expansion screws (Dentaurum, Turmstrasse 600-500-10 Ispringen, Germany) was placed just mesial to the molars while the Essix appliance was on the model (Figure 3). In order to keep the cold cure acrylic minimal in the buccal sections of the Essix plastic, the vestibular aspects and the occlusal surfaces were boxed out with baseplate wax. The cold cure acrylic was applied only to the lingual side of the appliance. After

polymerization, the hybrid removable Essix appliance was cut away with a wheel saw and removed from the model (Figure 4). The lingual border of hybrid appliance was trimmed in the same manner as a conventional removable appliance and in the same manner as conventional Essix retainer regarding the buccal aspect. Finalize the fabrication by polishing (Figure 5).



Figure 6. Intra-oral photograph for the Hybrid Essix appliance from the lingual side. The buccal side shows the transparent appearance of the appliance

2.3. The Clinical Technique and Results

After extraction of 48, the patient instructed to wear The Hybrid Essix appliance (Figure 6) fulltime except during cleaning and eating and instructed to activate screw a quarter of a turn once every week (a quarter turn proximates 0.1 mm according to manufacturer's instructions). The teeth and the appliance must be rinsed after drinking any acid containing drinks, such as fruit juice or soda drinks. Demineralization of the enamel can be caused by these fluids if they are not rinsed from it. The appliance must be cleaned with a commercial retainer cleaner and a toothbrush in order to keep it hygienic and odor-free. To avoid compromising the aesthetic appearance of the appliance, Toothpaste should not be used because its fine abrasive particles scratch the surface of the appliance.^[17]

CRANEX D



Figure 7. Post-operative panoramic radiograph shows the uprighted tooth 47

After 14 activations, the required angle 25 degree of the tooth 47 had been achieved (Figure 7) with distal movement of the crown occurring over a period of three months and two week. A narrow implant platform (Nobel Biocare Select Tapered implant, Gothenburg, Sweden) was inserted at 46 position and the same appliance was then worn as a retainer for the same period. After the tipped molar is uprighted, the occlusal function can be improved and mesial periodontal lesions can be eliminated or reduced without periodontal surgery.

3. Discussion

When a space caused by molar extraction is left for a long period of time, adjacent teeth tend to drift toward the edentulous space because of the loss of proximal contacts. Since molars have a tendency to migrate mesially, molars distal to the extraction site often incline mesially. This may result in problems including but not limited to [18] :

- Alveolar bone loss at the site of the missing tooth
- Disturbed masticatory function leading to unilateral or anterior chewing
- Occlusal interference
- Temporomandibular joint problems

Additionally, a mesially tipped mandibular molar if allowed continuing drifting is eventually “pounded” into the mandible. Great pressure is exerted on the alveolar bone along the mesial aspect of the root. Bone resorption, increased mobility, and finally loss of the tooth will take place [19]. If these teeth are used as abutment for fixed partial dentures it will lead to failure of prosthesis.

Orthodontic uprighting with fixed therapy is costly and has discomfort and pain that dental patients usually experience when having braces installed comparing to this limited orthodontic by Essix appliance. Thus we designed hybrid Essix appliance using our basic knowledge of forces for uprighting the tooth along with maintaining the aesthetic during the treatment period. In this case report, the objective in tooth 47 uprighting is ideal positioning of this tooth which will eventually gain more ideal space at 46 position for a fixed crown implant prosthesis, additionally, for saving the space after implant placement at 36 position before the second stage surgery.

Placement of an implant requires a site with proper bone height and width and without local concavity. The ideal position will provide an optimal periodontal environment for the molar. Mesial movement and tipping of tooth 47 may initiate a vicious cycle of traumatic occlusion, functional interferences space problems in conjunction with implant insertion and periodontal problems. After the tipped molar is uprighted by Hybrid appliance, the functional and periodontal situation can be improved along with maintaining the available space at 36 position during the treatment period.

Additionally, This newly designed appliance was cheap, and comfortable, and was successful in this case for uprighting mesially tilted molar which give the dentist generally the following benefits: abutment preparations are simplified and parallel paths of insertion is enhanced; mesial periodontal lesions are eliminated or reduced

without periodontal surgery; and crown-root ration is improved.

4. Conclusion

For the patient in this case report, who presented with a missing mandibular first molar and mesially inclined mandibular second molar at the right side, limited orthodontic treatment by hybrid removable Essix appliance improved the occlusal function of the tilted molar and developed the proper sized prosthesis for single implant. Additionally, this newly designed appliance eliminated gingival folding and plaque retention area and was aesthetic, cheap, and comfortable, and was successful for uprighting mesially tilted molar to an accepted angle 25 degree. An interdisciplinary approach using periodontal, orthodontic, and prosthodontic treatments can create a more predictable and maintainable situation.

Acknowledgments

I would like to thank Dr. Saeed Banabilh and Dr. Rabia Bilal from Orthodontic department and Dr. Islam Saad from Periodontic department College of Dentistry, Qassim University for their consultations.

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