

New Implant Abutment Design for Vertical Orthodontic Movement: A Case Report

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SUMMARY

Introduction: The use of orthodontic movement has traditionally been applied to treat malocclusions and to enhance the aesthetic appearance of the dentition. Orthodontic therapy has also been used to alter the periodontal attachment for periodontal and restorative therapy. This ability to predictably alter the periodontium non-surgically can dramatically improve the harmony and dimensions of the hard and soft tissue topography of the surrounding teeth, provided that inflammation is controlled. Orthodontic forced eruption has been used successfully in the management of the periodontal attachment apparatus for the past 30 years. Ingber described this technique in 1974, for treatment of one-wall and two-wall bony defects that were difficult to treat with periodontal therapy alone. It was noted that when light force was applied, both the bone and the soft tissue of the extruded tooth migrated coronally along with the tooth. In 2003, Zachrisson reported that during the elimination of an intraosseous defect by orthodontic extrusion, the relationship between the cemento-enamel junction (CEJ) and the alveolar crest was maintained. This demonstrated that the crestal bone followed the tooth as it was coronally moved.

Interestingly, it is reported in the literature that intrusive movement maintains soft and hard tissue position throughout the process, while extrusive movement allows coronal migration of the dentogingival complex. The concept suggested in this paper is to first intrude the tooth to gain interocclusal space for future extrusive movement. Then after a period of stabilization, the tooth is extruded into the original position utilizing an osseointegrated implant as an anchorage device to allow coronal migration of the dentogingival complex. The purpose of this presentation is to introduce a new approach to reestablish a missing papilla between a tooth and an implant, utilizing an implant as an anchorage device for the orthodontic movement of the adjacent natural tooth.

Method: A Case Report

A 68-year-old female presented to the Ashman Department of Periodontology and Implant Dentistry at NYUCD. The patient’s chief complaint was the presence of black triangle between tooth # 5 (previously placed dental implant) and #6 (natural tooth). The periapical radiograph revealed an inferiorly placed implant in relation to the CEJ of the adjacent tooth. When a large vertical discrepancy exists between dental implant and natural tooth, it poses a greater risk of developing interproximal bone loss which results in a large black triangle. The treatment option presented to patient was to use orthodontic forced eruption to gain more interproximal bone, which ultimately reduces the size of the black triangle.

The conventional forced eruption method involves solely the extrusion of a natural tooth followed by selective grinding of the occlusal surfaces to avoid heavy occlusal contacts, using the adjacent teeth as an anchorage. In this study, an implant supported crown was used as an absolute anchorage device. The ISOM (Implant Supported Orthodontic Movement) attached on the implant supported crown is a device designed specifically for this study to help achieve more predictable intrusive and extrusive movement. The device is available in different connection and arm lengths which allow for individual patient customization. The

device is composed of two pieces bridged together: one-piece fitting onto a natural tooth, with the bracket bonded by a composite, and the other piece fitting directly onto an implant platform. The piece that fits onto the implant platform is customized for the patient by measuring the height of the soft tissue between the implant platform and the free gingival tissue. The bridge connecting the two pieces contains a screw which is adjusted at each appointment. To exert an intrusive force, the screw is rotated in a clockwise fashion, while extrusive force can be achieved by a counterclockwise rotation. The intrusive/extrusive forces exerted by the ISOM device is approximately 50 gm for every half a turn. This optimal force for intrusive and extrusive movements helps avoid root resorption of the natural tooth.

Step-by-Step Procedure:

The detailed technical plan can be divided into four stages; intrusion, stabilization, extrusion and stabilization. Before the actual treatment started, pre-existing periodontal pockets were treated by scaling and root planning in order to have a healthy environment for intrusion and extrusion. Then, the crown from the implant abutment was removed and the custom crown was placed. The ISOM device was then applied for use which marked the first time it had been used on a patient. The ISOM device was adjusted so that there would not be any interference with the opposing arch. One piece of the device was then bonded to the tooth and the other part connected to the implant platform. The portion that connected to the implant platform was screwed down to a final torque of approximately 35 Ncm. The following four phases were implemented after the ISOM device had been stabilized in the patient:

1. Intrusion

The ISOM device was activated by turning its screw clockwise by half a turn. The patient was then sent home and seen again after two weeks. On the next visit, the device was activated further in order to increase the intrusive force. The activation was maintained until the desired amount of intrusion was achieved. This amount of intrusion was measured radiographically and clinically. For example, if the distance from the crest of bone to the contact area was 8 mm, the minimum amount of intrusion should be 3 mm. Furthermore, at all follow-up visits, both a photograph and a periapical radiograph were taken to measure the amount of intrusion.

2. Stabilization

In stage II, the tooth was stabilized in its final intruded position to prevent any relapse that may occur during the following 12 weeks.

3. Extrusion

After the stabilization phase, the ISOM device was activated counter clockwise in order to produce an extrusive force of about 50 gm. This initiated tooth extrusion and continued until the tooth reached its original position.

4. Stabilization

This was the second stabilization phase, which lasted for 12 weeks, after which the ISOM device was removed from the patient.

Clinical and Radiographic Outcomes: The outcome was measured clinically and radiographically. Clinically, authors used the incisal edge of the custom implant crown as a reference using a Jemt score. The measurement was determined as the distance between the edge of the interproximal soft tissue to incisal edge of custom implant crown. Radiographically, the authors measured the distance between the crestal bone and the incisal edge of the custom implant crown. The patient returned for a follow-up one year post-operation. The patient was pleased with the esthetic and functional results. Both soft and hard tissues appeared stable.

Results: The interproximal papillae between implant #5 and tooth #6 had increased by 3 mm. Using the Jemt Papilla Scale, the interproximal papillae had changed from score 1 to score 2.

Conclusion: One of the advantages of this device over other traditional orthodontic appliances is the minimal visibility of the appliance by allowing for the adaptation of a provisional restoration partially covering the device. Despite the controversy regarding the biology after tooth intrusion and the lack of literature describing intrusion next to an implant, the current technique may be utilized in the future as a predictable way of regenerating interdental papillae. However, further research and cases are required to determine if this can become a predictable clinical procedure used in this case report.



Fig 1. Pre-op lateral view showing “black triangle”



Fig 2. Pre-op peri-apical X-ray between # 5 and 6



Fig 3. ISOM device assembly

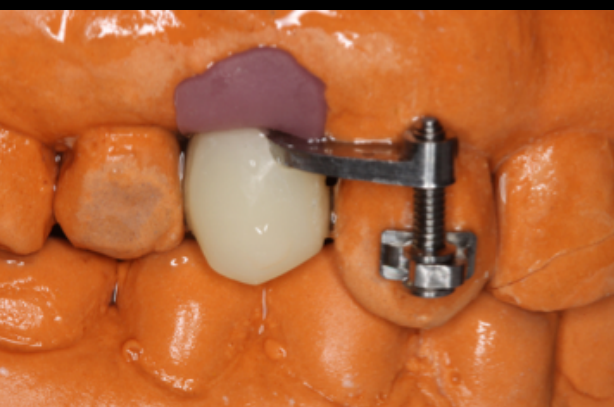


Fig 4. ISOM device tried and fitted on the master cast



Fig 5. Occlusal view of ISOM device on the master cast



Fig 6. ISOM device fitted in patient’s tooth



Fig 7. Peri-apical X-ray while activated



Fig 8. Final post-operative lateral view



Fig 9. Clinical image of 1-year post-operative (lateral view)



Fig 10. Clinical image of 1-year post-operative (occlusal view)

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