The Role of Orthodontics in Periodontics and Restorative Dentistry

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Orthodontics is a useful treatment modality for both restorative dentistry and periodontal therapy. Altering tooth position has been valuable in enabling and simplifying restorative dentistry. Tooth movements, such as retraction, crossbite correction, and mesial or distal movements, serve to position the dentition for full-coverage fixed replacement, for dentures in the opposing arch, or implant replacements.

Two specific movements, uprighting and extrusion, are particularly helpful in alteration of the osseous crest to aid the treatment of periodontal disease. Without these treatment modalities, many cases could not successfully deal with the aberrations in the crestal levels. This article reviews the rationale and techniques involved in uprighting and extrusion.

Uprighting
Ritchey and Orban have said

Abstract
Uprighting and extrusion are two movements that are used to aid in the treatment of difficult periodontal and restorative problems. Simple appliances can be used to alter tooth position, enhancing either the periodontal therapy, restorative dentistry, or both. Treatment time can be limited to 3 to 6 months.

Learning Objectives
After reading this article the reader should be able to:
• describe the role of orthodontics in periodontics and restorative dentistry.
• discuss the mechanics of uprighting molars and the mechanics of orthodontic extrusion.
• describe the effects of orthodontic extrusion and uprighting on the alveolar crest.

that the crestal level will follow a line drawn between adjacent cementoenamel junctions (CEJs). Molars with an edentulous area mesial to them will tend to migrate mesially. During this migration, the mesial CEJ will move apically, creating what looks like an osseous defect. This is only a physiologic reaction to an alteration of tooth position. But, if left in this position, it is more difficult to keep the tooth free of bacterial plaque, and a periodontal defect can readily occur (Figure 1). A series of orthodontic procedures will both reorient the CEJs and level the osseous crest. At times, it will seem as if there is bone regeneration in the defect. This is not usual, except for a small portion at the base of the defect.

The pocket is reduced, however, because the osseous crest follows the tooth in its movement. The procedure is simple and does not take long to accomplish. Uprighting a single molar should take 3 to 4 months, while 4 to 5 months are

Figure 1—This molar has a mesially inclined crest and superimposed periodontal disease.
necessary to upright 2 molars. Proper anchorage and protection of the occlusion during orthodontics is essential.

Mechanics of Uprighting

There are three components used to upright molars or bicuspid and each of these has a different purpose. The components are: biteplane, uprighting spring, and open coil spring.

A maxillary biteplane serves to control occlusal forces during the uprighting movements. Lower anterior teeth should articulate with the platform palatal to the maxillary incisors. The posterior molars should be disarticulated no more than 1 to 1.5 mm. If a larger opening is present, the tongue will tend to close the space and hinder movement. Disarticulation of the occlusion permits the tooth to erupt and move distally in an unimpeded fashion. Without a biteplane, the length of time it will take to move the tooth will increase from 3 or 4 months to 7 or 8. In addition, residual defects are often found in cases where the occlusion has not been protected.

An uprighting spring serves to rotate the roots mesially and erupt the teeth. This type of spring is available commercially or can be made by the dentist. Without the uprighting spring, in many cases sufficient eruption will not occur and residual defects will remain (Figure 2).

Open coil springs are used to move the teeth distally. A space of 6.5 to 7.0 mm is necessary for proper contour of a pontic or implant replacement. If there is a large edentulous space mesial to the tooth or teeth that requires uprighting, it is not necessary to use the open coil spring.

Case Reports

Case 1

A 28-year-old man presented with a mesially inclined mandibular left molar. Brackets were bonded to the cuspid and second bicuspid. A buccal tube, with a slot for the uprighting spring, was placed on the second molar (Figure 3A). A sectional arch wire (.016) was placed between the cuspid and second bicuspid. An .018 uprighting spring was placed into the slot on the molar and hooked to the sectional arch wire (Figure 3B). This first phase appliance was left in place for 4 to 6 weeks. A second phase appliance was then placed that included an open coil spring that moved the molar distally and opened adequate space for a pontic (Figure 3C).

At the conclusion of tooth movement, the area was provisionalized to maintain tooth position. Periodontal surgery was performed to provide adequate tooth length for restorative dentistry. Figures 3D and 3E show that the osseous crest followed the molar in its extrusive and distal movements.

Case 2

A 32-year-old man presented who wanted additional teeth in the
posterior of his mandible. Both right and left mandibular third molars were tipped mesially (Figure 4A). A full arch wire (.014) was placed in the mandible and a biteplane was placed in the maxilla (Figure 4B).

During eruption of the right third molar, the tooth rotated lingually. The band was removed and lingual hooks were spot-welded to the band. Interarch elastics were used to rotate the tooth labially (Figures 4C and 4D). After 6 months of tooth movement, the right molar was finally in correct alignment. Because the edentulous span was adequate, an open coil spring was not used (Figure 4E). The left molar was first uprighted and then moved mesially to close the space (Figures 4F and 4G).

Ten years after the mandibular right bridge was placed, the third molar decayed beyond repair and was extracted (Figure 4H). The patient still wanted additional teeth posteriorly. Fortunately, osseointegrated implants had become available as a treatment modality. Two fixtures were placed and are still in use after 4 years (Figure 4I).

**Cases 3 and 4**

The figures in cases 3 and 4 represent steep osseous lesions that can be treated by means of ortho-
odontic therapy. No regenerative surgery was performed for these patients because the topographies of the lesions were not conducive to regenerative attempts. Alteration of the osseous crest was accomplished by tooth movement alone (Figures 5A through 5D).

Extrusion

Orthodontic extrusion is used when there is a hemiseptal or, in some cases, where there are two bony walls remaining with adjacent teeth present. It can also be used when a terminal tooth cannot be distalized for uprighting. This procedure to alter the osseous crest by extrusion was described by Ingber in 1974. There are several ways to accomplish this through the use of arch wires, interarch elastics, or infracoronalar appliances (Figures 6A through 6E).

Case 5

The patient was a 48-year-old man who presented with generalized periodontal disease. During a surgical procedure, the lesion between the first and second bicuspid on the maxillary right side could not be treated with conventional resective or regenerative techniques. The lesion was hemiseptal (Figures 7A through 7C). A .014 arch wire was placed to ex-
trude the first bicuspid (Figure 6E). The tooth was in final position 4 months after initiation of orthodontic therapy (Figure 7D). It was necessary to perform periodontal surgery to remove residual osseous defects subsequent to extrusive tooth movement (Figures 7E and 7F). The amount of occlusal reduction required endodontic therapy on the first bicuspid. The first and second bicuspid were splinted together (Figure 7G).

Case 6

The patient was a 52-year-old woman who presented with an isolated lesion on the mandibular right first molar (Figure 8A). Extrusive tooth movement was the treatment of choice to level the osseous crest. Resective techniques would necessitate removing supporting bone, and regenerative techniques are not predictable with the type of hemiseptal lesion that this patient had. Interarch elastics were used to extrude the molar. At the conclusion of tooth movement, the molar was retained for 6 months with a wire and acrylic splint to the bicuspid. It was later restored with a full crown (Figure 8B).
Tooth Movement for Periodontal and Restorative Purposes

In some cases, orthodontics can be used to improve tooth position in restorative dentistry. Orthodontics can also be used to alter the osseous crest, thus improving the periodontal prognosis.

Case 7

A 34-year-old woman presented with advanced bone loss in the maxillary right second molar region. On examination of the area, it was noted that the first molar was tipped mesially (Figure 9A). The second molar was extracted and the first molar was moved distally. This procedure was necessary to create adequate space for a bicuspid tooth located both mesially to the first molar, and between the first and second molars (Figures 9B through 9D).

Discussion

It is essential to use at least the maxillary biteplane and uprighting spring for optimal results in leveling the osseous crest. It cannot be determined whether a tooth will move shortly after the adjustment visit or at any time subsequent to that. If the arches are not disarticulated, there will be an intrusive force and occlusal trauma will occur. Residual defects will then be present. Occlusal equilibration can be successful in maintaining the disarticulation only if it is performed at least every 10 days. Because this can become burdensome to the dentist and patient, the biteplane is recommended.

The uprighting spring (with occlusal clearance) aids not only in rotating the roots mesially, but also in extruding the tooth. This latter movement is very important. Concurrent with mesial leveling of the osseous crest, there is an apical movement of the distal CEJ and osseous crest. Therefore, without extrusion, there would be a residual distal defect.

The patient in case 2 requested additional teeth posteriorly. This case was completed in 1977. Today, with the high predictability of implant dentistry, the third molar would be extracted and osseointegrated implants would be placed. It would be quite unnecessary for the patient to undergo 6 months of tooth movement, and the placement of a tooth so far posteriorly.

Orthodontic extrusion will level a hemiseptal defect adjacent to a root. Concurrent with this leveling will be the coronal movement of the osseous crest on other portions of the tooth. This creates reverse architecture on the extruded tooth. Osseous resection (osteectomy) is required to correct these aberrations in the crest (case 5).

Conclusion

Orthodontics is an integral part of periodontics and restorative dentistry. The cases presented illustrate that periodontal therapy and/or restorative dentistry could not have been successfully completed without tooth movement.

References

6. Wagenberg BD, Eskow RN, Langer B: Orthodontics: a solution for the