Conservative Restoration of Interproximal Caries During Active Orthodontic Treatment

Introduction

Oral health maintenance during orthodontics is essential for achieving desirable clinical outcomes. Common problems, such as caries, pulpitis, periapical pathology and periodontal disease, require correction or at least stabilization prior to commencing active orthodontic treatment. However, it may be difficult to access small carious lesions in a crowded dentition. On the other hand, large carious lesions with pulp involvement and periapical pathology often require endodontic treatment and temporary restorations before the start of orthodontic treatment. Tooth fractures or pathology detected during active treatment may require adjunctive care during the course of orthodontic therapy.

Class II, III and IV restorations may involve important functional areas on occlusal or incisal surfaces. It is important to monitor restored teeth in centric occlusion and functional excursions, both before treatment and as it progresses. Bracket repositioning, detailing and/or occlusal adjustment may be necessary to control occlusal trauma.

Conservative management of caries is frequently encountered during active orthodontic treatment. Interproximal space is created to facilitate conventional restoration of small to moderate carious lesions.[1] Attempting to restore interproximal lesions without opening space invites operative errors that may inadvertently weaken a marginal ridge or incisal angle. Once the integrity of a functional structure is compromised, it may collapse, risking serious damage to a tooth. This report describes a relatively simple, yet conservative approach to restore interproximal caries during active orthodontic treatment (*Fig. 1*).

Fig. 1:
As shown, the length of the open coil spring is the distance between the brackets plus 2-2.5 times the bracket width.

Clinical technique

Indication: Orthodontic patients with caries on anterior or posterior proximal surfaces

Application: Poor access to interproximal lesions is improved by orthodontically opening interdental spaces (*Fig. 2*), but simultaneous opening of multiple spaces is unpredictable (*Fig. 3*). Restoring inaccessible

Dr. Sheau Ling Lin,
Lecturer, Beethoven Orthodontic Course (Left)
Dr. Chris Chang,
Founder, Beethoven Orthodontic Center
Publisher, International Journal of Orthodontics & Implantology (Center)
Dr. W. Eugene Roberts,
Editor-in-chief, International Journal of Orthodontics & Implantology (Right)

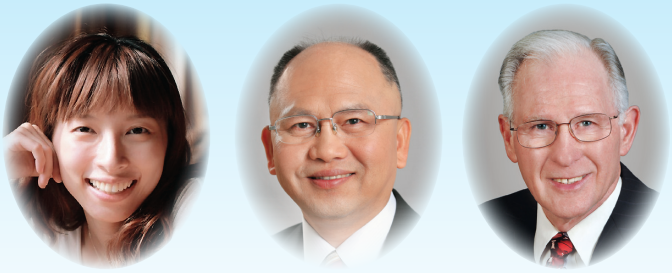

Fig. 2:
To reactivate the spring, a ball of flowable resin is polymerized on the archwire to increase the range of activation.

Fig. 3:
Three consecutive open-coil springs on an archwire is not recommended, because the space opening is unpredictable and may result in periodontal compromise.

interproximal lesions should be the first priority at the start of orthodontic treatment. Selective space opening during active treatment facilitates the predictable restoration of lesions noted later (*Fig. 4*).

Procedure: An open coil spring is used to separate the affected teeth. The length of the open coil

Fig. 4:
An open coil spring was inserted between the central incisors to open space for restoration of interproximal caries.

should be the distance between the brackets, plus 2-2.5 times the bracket width (*Fig. 1*). After 1-2 months, the teeth usually separate about 1.5-2mm, which is adequate for most operative procedures (*Fig. 5*). If the interdental space is inadequate at a follow-up visit, activate the open coil spring with a pusher and polymerize a resin ball (*1.5-2mm in diameter*) on the archwire to re-activate the spring (*Fig. 2*). Follow-up at about 1 month interval is recommended until an adequate space is achieved.

Fig. 5:
Two months after the coil spring was placed, the interproximal space was opened about 2mm.

Fig. 6:
Following the restorative procedure, the space is closed with an elastic chain. Alternatively, coil springs can be placed distal to the central incisors, if there are additional restorative needs on those surfaces.

Multiple Lesions: Be patient, do not exceed more than 2 open coil springs in a quadrant, or more than 3 in an entire arch. It is challenging to properly place multiple interdental springs, and the direction of the forces is difficult to control (*Fig. 3*). Furthermore, excessive space opening may distort the arch and damage the periodontium.

Case Illustration

A 21 year old female with mild maxillary crowding was scheduled to commence orthodontic treatment, but there were proximal caries on the mesial surfaces of maxillary incisors. An open coil spring was placed between the brackets of the maxillary central incisors at the initial bonding appointment (*Fig. 4*). In two months, the space was opened about 2mm (*Fig. 5*). The archwire was removed, and the patient was referred to her general dentist to restore the caries. After the restorative procedure (*Fig. 6*), open coil springs were inserted between the maxillary lateral incisors and central incisors bilaterally (*Fig. 7*), to open additional spaces to restore interproximal caries.

The coil springs placed distally to the central incisors helped close the midline diastema, as they opened spaces between the central and lateral incisors (*Fig. 7*).

Discussion

Restoring interproximal carious lesions, from the a labial or lingual with a G.V. Black preparation,[1] requires removal of a large amount of tooth structure to accomplish the proper retention and resistance forms.[2] Space opening provides more direct access for caries removal, resulting in a more conservative restoration. It may be advantageous to restore interproximal caries early in orthodontic treatment, rather than before it starts.

Contemporary caries management can be accomplished with "*box*," "*slot*," or "*tunnel*" preparations.[3] A box preparation results in extensive loss of tooth structure on the lingual or labial surface. The slot procedure reduces the amount of tooth structure removed, but the point of access may weaken the marginal ridge or incisal angle.

Fig. 7:
Coil springs are positioned between the central and lateral incisors bilaterally, to open space for additional restorative procedures.

Furthermore, it is difficult to properly finish the margins of a slot preparation, which may predispose the patient to food impaction, secondary caries and periodontal problems. Tunnel restorations are designed to preserve the functional structures, but it is a very technique-sensitive procedure. There is more risk to the pulp, and it is difficult to fill the preparation with restorative material. In addition, finishing the margins of the restoration is challenging, so the procedure is usually restricted to interproximal caries on the distal surface of posterior teeth. Opening a space considerably facilitates the tunnel procedure because it provides more direct visualization.

Use of open coil springs to separate carious interproximal surfaces is a wise decision, particularly if the teeth are to be aligned anyway. Opening the proximal areas allows the dentist to have direct visual access to the lesions. Small to moderate caries are easily restored in a conservative manner, and functionally sensitive areas are protected. The margins of the restoration are readily finished and the profile is meticulously constructed to produce ideal form and function.

Conclusion

Orthodontically separating teeth with small to moderate proximal caries facilitates restorative procedures, by providing direct visual access. Conservative operative procedures preserve the integrity of marginal ridges and incisal angles. The selective opening of interdental space is a reliable interdisciplinary procedure for facilitating conservative restorative procedures.

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