The Modified Grassline Technique: A Case Report

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The Modified Grassline Technique: A Case Report

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LEARNING OBJECTIVES
After participating in this CE activity, the individual will learn:
• A technique for the conservative orthodontic movement of periodontally involved teeth.
• Factors to be considered before orthodontic treatment of compromised teeth.

ABOUT THE AUTHORS
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Disclosure: Dr. Volker reports no disclosures.

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INTRODUCTION
Grassline threads were used for the noninvasive intermittent movement of malposed teeth from the 1940s to the 1980s. Derived from the ramie plant, grassline is a heavily twisted fiber that shrinks when exposed to fluids. Unfortunately, grassline is no longer commercially available. Recently, Lohmiller demonstrated a modified version of the technique whereby heavily twisted 100% cotton crochet thread of varying sizes and composite “holds,” which function similarly to orthodontic brackets, can be used as a suitable substitute.

Once thought to be a contraindication to orthodontic therapy, periodontal disease is no longer a barrier to comprehensive treatment, although special considerations must be employed. The determination of primary versus secondary trauma to the patient’s dentition must also be addressed. Primary trauma results in periodontal damage from excessive occlusal loading on a healthy periodontium, such as a “high” restoration left unresolved. Secondary occlusal trauma occurs when nonexcessive masticatory forces result in periodontally-compromised teeth being put into occlusal over-function. Since these teeth no longer possess the alveolar structural support to withstand what was once normal loading, routine function becomes a damaging force. This loading can come from the opposing dentition as well as soft tissue, particularly the habitual thrusting of the tongue on the lingual surfaces of anterior teeth. Pathologic movements of these teeth can easily occur. As such, retention management after the completion of treatment is of paramount importance.

The inherent advantage of grassline and the modified cotton thread technique is that they deliver force intermittently. When exposed to oral fluids, there is a finite shrinkage to the cotton threads, approximately 3% to 10% depending on its thickness and processing treatment. As a result, movement of the treated teeth occurs incrementally, as these teeth are held at their new position until the next tie sequence is to be performed. This utilization of an intermittent force as opposed to a continuous force, such as that found in elastics or springs, provides advantages for the periodontally involved dentition. It has been shown that the use of intermittent orthodontic forces resulted in less root resorption than oc-
 occurred with continuous forces in periodontally compromised teeth.\textsuperscript{10-12}

The following case report discusses the application of a modified grassline technique to the periodontally compromised patient.

**CASE REPORT**
A 55-year-old white female with no significant contributory medical history presented with a chief complaint of, “I have big spaces between my lower front teeth” (Figures 1a to 3). The patient reported that she had orthodontic treatment as an adolescent and admitted to habitual tongue thrusting. Additionally, she claimed to be a nocturnal bruxer and had worn a maxillary nightguard intermittently for the past 20 years.

An orthodontic examination revealed a bilateral Class II, division II occlusal relationship, with a 40% vertical overbite, 2 mm horizontal overjet, and no maxillary midline discrepancy.

Incisal wear was noted on the lower anterior incisors and wear facets were noted on posterior teeth. Additionally, large fractured buccal portions of teeth Nos. 3, 19, and 30 were observed. A periodontal assessment revealed clinical plaque and calculus, as well as 2 to 3 mm pocketing of anterior teeth with bleeding upon probing. Radiographs revealed 40\% to 60\% bone loss of mandibular anterior teeth with a widened periodontal ligament interproximally (funneling) (Figure 4).

The patient was made fully aware that realignment of the mandibular anterior teeth without subsequent treatment of the maxillary teeth would result in an increased overjet. The patient was unwilling to undergo comprehensive orthodontic treatment which would involve possible extraoral anchorage and/or bilateral bicuspid extraction. In addition, the patient was made aware that further labial tipping of the mandibular anterior teeth from tongue thrusting would lead to further periodontal compromise, including an increased loss of keratinized gingival attachment as well as buccal bone.

The proposed course of orthodontic treatment was to use the crochet thread to bring the mandibular anterior teeth into alignment. Retention would then be provided by a fixed lingual splint to prevent orthodontic relapse and to negate the effects of secondary occlusal trauma and tongue thrusting.

Full-mouth scaling and root planing was performed to
maximize periodontal health prior to tooth movement. Temporary microhybrid composite (Herculite Ultra [Kerr]) occlusal “buildups” on teeth Nos. 3, 19, and 30 were completed to aid in bite stabilization. Full-coverage restorations were planned for these teeth following orthodontic treatment.

Using a total-etch bonding protocol, microhybrid composite “holds” were appropriately positioned on teeth Nos. 22 to 27. The holds function similarly to conventional orthodontic brackets in that they help to direct forces resulting from the contraction of the crochet thread as well as prevent slippage of the thread gingivally or incisally.

Essentially, a ball of uncured composite was placed on the facial surface of an involved tooth. A bracket height gauge was used to make a properly positioned indentation in the composite and held in position against the tooth during curing. Rough edges and excess composite impeding placement of the thread were subsequently removed. A typodont representation of the technique is shown in Figures 5a to 5d.

The 100% cotton heavily twisted crochet thread (Mez) was tied around the indicated teeth in the manner prescribed by Wank1 (Figures 6a to 6j). The initial ties were completed with size 20 thread, as the larger the thread size,
the greater the shrinkage, and subsequently, the greater the amount of tooth movement. Every 7 to 10 days, the ties were replaced, and the positioning of ties depended on the movement needed (Figures 7 and 8). As interdental spacing decreased and teeth moved into a more optimal position, smaller threads were tied as less movement was needed. Thread placement was also managed to allow for ideal interproximal closure (Figures 9 and 10). After 12 weeks of treatment, which consisted of 10 thread changes, the desired positioning was obtained (Figure 11).

A 0.010” x 0.020” stainless steel annealed ribbon-wire was bonded utilizing a total-etch technique and microhybrid composite (Herculite Ultra) as a fixed lingual retainer from teeth Nos. 22 to 27 (Figure 12). Periodic observation of these teeth is planned to determine if functional or parafunctional forces cause any movement from the final position. Should this occur, circumferential splinting would be provided. A postoperative radiograph reveals resolution of funneling of the periodontal ligament and evidence of bone apposition (Figure 13).

**CONCLUSION**

Several methods of applying interim forces are available for orthodontic therapy. Examples include clear aligners (eg, Invisalign) and modified removable elastic acrylic combos...
The Modified Grassline Technique: A Case Report

(pseudo intermittent forces). However, they generally have a higher laboratory cost associated with their use compared to the thread technique described here. Other advantages, as well as disadvantages of the technique, are described in the Table.

The use of the modified grassline technique can be a safe and effective treatment modality, particularly for those patients who are compromised periodontally.

Acknowledgement
The authors would like to express their gratitude to Mr. Frank Pavel, assistant director of the Medical Library at Coler-Goldwater Specialty Hospital and Nursing Home, and Dr. Fred Cook, professor, School of Polymer, Textile & Fiber Engineering at the Georgia Institute of Technology, for their help in the preparation of this article.

REFERENCES

Table. Advantages and Disadvantages of the Modified Grassline Technique

<table>
<thead>
<tr>
<th>ADVANTAGES</th>
<th>DISADVANTAGES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intermittent forces</td>
<td>Technique sensitive</td>
</tr>
<tr>
<td>Cost</td>
<td>Ties must be changed every 7 to 10 days</td>
</tr>
<tr>
<td>Aesthetically more pleasing than metal brackets</td>
<td>Thread may untie or tear</td>
</tr>
<tr>
<td>Decreased trauma to oral tissues compared to brackets</td>
<td>Not as effective in patients with healthy periodontium</td>
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</table>
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1. Advantages of the modified grassline technique include:
   a. Intermittent forces.
   b. Cost.
   c. Aesthetically more pleasing than metal brackets.
   d. All of the above.

2. What are common sequelae of pathologic labial tipping of the mandibular anterior teeth?
   a. Loss of gingival attachment.
   b. Loss of buccal bone.
   c. Loss of lingual bone.
   d. Both a and b.

3. How often does the grassline tie get replaced?
   a. Every 2 months.
   b. Every month.
   c. Every 7 to 10 days.
   d. Every other day.

4. Secondary occlusal trauma results from:
   a. Nonexcessive masticatory forces resulting in periodontally compromised teeth being placed into occlusal over function.
   b. Nonexcessive masticatory forces resulting in nonperiodontally compromised teeth being put into occlusal over function.
   c. Excessive occlusal loading on a healthy periodontium.
   d. Nonexcessive occlusal loading on a healthy periodontium.

5. Which orthodontic modalities employ an intermittent force?
   a. Spring.
   b. Elastics.
   c. Grassline.
   d. Both a and b.

6. What is an inherent advantage of using intermittent orthodontic forces over the use of continuous orthodontic forces?
   a. Reduced occlusal loading on opposing dentition.
   b. Increased likelihood of root resorption.
   c. Reduced likelihood of root resorption.
   d. Reduced total treatment time.

7. Why are composite “holds” placed on the teeth during treatment?
   a. To aid in direction of forces.
   b. To function as a torque multiplier.
   c. To prevent incisal or gingival slippage of the thread during movement.
   d. Both a and c.

8. Using a larger cotton thread size will result in:
   a. Decreased movement.
   b. Increased movement.
   c. Increased fracture resistance of composite “holds.”
   d. Both a and c.
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