A review of the original Combination Technique and philosophy

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Introduction

_During the 1960s_, when the Begg lightwire and the Tweed edgewise were the mainstream techniques of orthodontic therapy, Dr. Maxwell Fogel and Dr. Jack Magill introduced their “Combination Technique” (Fogel & Magill, 1969).

The Combination Technique’s philosophy was based on combining the positive and significant attributes of Begg lightwire and Tweed edgewise techniques to produce a system that corrected malocclusions quickly and easily for the orthodontist, with much less pain and a shorter period of time for the patient, while producing American Board of Orthodontics quality, standards and results.

_Outline of the Combination Technique

**Stage I: Light-wire phase (Tipping)**
1. Reduce protrusion
2. Un-crowd incisors
3. Open the bite (restore vertical dimension)
4. Class I molars and cuspids
5. Begin closing extraction spaces
6. Upright mandibular incisors
7. Cephalometric X-ray to check uprighting of the mandibular incisors

**Stage II: Bracket alignment phase (Leveling)**
1. Level and align maxillary and mandibular arches
2. Closure of extraction spaces
3. Preliminary uprighting of cuspids and bicuspids
4. Preliminary correction of rotations
5. Preliminary correction of axial positions

**Stage III: Edgewise phase (Uprighting)**
1. Detailed axial positioning of all teeth
2. Lingual root torque for labial axial inclination of the maxillary incisors
3. Root paralleling in extraction areas
4. Desired uprighting of molars
5. Artistic positioning of incisor segments
6. Complete correction of rotations
7. Residual space closure

_Retention_
Two years — indefinite

_Overview of the Combination Technique philosophy_

The Combination Technique incorporated three stages of appliance therapy:

**Stage I**
The initial stage was called the light-wire or tipping phase, employing 0.014, 0.016 and 0.018 round wires, which required approximately four to eight months to achieve desired results. This first phase employed Dr. Raymond Begg’s concept of light, continuous forces to uncrowd anterior teeth, open the bite (restore vertical dimension), reduce the protrusion, begin closing extraction spaces and uprighting mandibular incisors, all without straining the posterior anchorage unit. The Begg philosophy and mechno-therapy produced light, physiologic forces through the use of one-point contact, free-slidng, non-binding and continuously moving teeth that were connected to the archwire (Begg, 1961).

Drs. Fogel and Magill created this appliance by
uniting the light-wire vertical insert pin (Fig. 1a) with the widely spaced twin edgewise bracket (Fig. 2b) into a single appliance unit (Fig. 1c). The joining together of these two attachments enabled the development of a system for controlled light-wire therapy in the first stage of the Combination Technique. (All figures are from Fogel and Magill’s “The Combination Technique in Orthodontic Practice.”) 

During Stage I (light-wire and tipping), a single light archwire with multiple loops and hooks was snapped into the vertical insert pins to produce simple tipping of the incisors, placing them in harmony with and upright over the apical base (Fig. 2a, 2b). This included correction of overjet, overbite and jaw relationships by means of controlled anchorage through the use of differential inter- and intra-arch elastic forces.

Stage II
The second stage was the called the leveling phase, employing a multi-stranded light wire, which was later replaced by 0.014, 0.016 and 0.018 round flexible wires, ligated into the edgewise brackets, requiring approximately three to four months to achieve the desired results. This second phase included leveling and aligning maxillary and mandibular arches, closing extraction spaces, uprighting cuspids and bicuspids and correcting rotations of all teeth.

During Stage II (bracket alignment and leveling), a multi-stranded light-wire (Fig. 3a, 3b) was used to create controlled general alignment of all teeth, including leveling, correction of rotations, preliminary correction of axial positions, continued overbite correction and establishment of general arch form. Stage II prepared the brackets for the edgewise phase.

Stage III
The third stage was the called the edgewise phase, employing 0.016 x 0.016 square wires, followed by 0.017 x 0.025 rectangular wires, also ligated into the edgewise brackets and taking approximately six to 12
months to achieve results. This third phase included detailed positioning, proper uprighting and ideal axial inclinations of all teeth. The Combination Technique was excellent for treating extraction cases and difficult malocclusions, as well as being very capable of obtaining outstanding results in non-extraction cases.

During Stage III (edgewise), the rectangular archwire (Fig. 4a–4c) was used to achieve ideal arch form and detailed axial positioning of both the crowns and roots of all teeth. This included: (a) root paralleling of teeth adjacent to the extraction areas, (b) uprighting of molar teeth, (c) artistic positioning of the incisor segments, (d) continued overbite correction if necessary, (e) final closing of residual extraction spaces, and (f) lingual root torque for labial axial inclination of the maxillary incisors.

Torquing auxiliary
During the correction of many severe malocclusions, the maxillary incisors required root torque as a result of lingual crown tipping. In order to accomplish incisor root torquing, an auxiliary wire was employed similar to that used by Dr. Begg during Stage III. The torquing auxiliary (Fig. 5) was an 0.014 wire constructed with two loops in the same plane as the archwire, which when snapped into the insert pins placed the loops onto the maxillary central incisors slightly sub-gingival. After snapping the torquing auxiliary into the insert pins anteriorly (Fig. 6), it was cinched behind the molar tubes posteriorly.

This torquing auxiliary was used in addition to the main edgewise wire, which had been ligated into the horizontal slot of the widely spaced twin edgewise bracket to carry out the desired objectives of Stage III as well as providing anchorage and stability during the torquing procedure. The torquing auxiliary forces produced approximately one degree of lingual root movement per month. This was substantiated by cephalometric and visual examination.

Example of the Combination Technique in a severe malocclusion

Treatment of a Class II, Division I severe maxillary protrusion and deep overbite is shown, using maxillary first and mandibular second bicuspid extractions (Fig. 7a–7j).

Incisor coverage biteplate (Fig. 8a–8c) was required as a preliminary step as a result of the severe
deep anterior overbite. This created initial bite opening and avoided shearing of brackets, tearing of bands and occlusal interferences.

Combination Technique mechanics

Stage I — Single strand light-wire stage (Figs. 9a–9c).
The objectives of Stage I were to achieve: (a) reduction of the protrusion (edge-to-edge incisor relation), (b) bite opening (molar uprighting and incisor intrusion), (c) incisor uncrowding and (d) Class I cuspid and molar relationships.

Stage II — Leveling with a multi-strand light-wire stage (Figs. 10a–10c).
The objectives of Stage II were to achieve: (a) leveling and aligning of all brackets for edgewise archwire placement, (b) preliminary uprighting of cuspids and bicuspids, (c) correction of rotations and labiolingual malpositions, (d) continued bite opening, and (e) arch symmetry.

The advantages of the multiple leveling appliance when compared to the single strand wire included a longer range of action, better resistance for distortion, increased flexibility, gentler forces and less fatigue.

Stage III — Edgewise stage (Figs. 11a–11c).
The objectives of Stage III were to achieve: (a) a stable anchorage for Class II elastics, (b) correct axial inclinations, (c) root paralleling in extraction areas, (d) uprighting of the molars and bicuspids, (e) ideal arch form, (f) continued overbite correction and (f)
Combination Technique

Summary

Historically, Dr. Maxwell Fogel and Dr. Jack Magill believed that the unification of the Begg light-wire and the Tweed edgewise philosophies produced an ideal milieu for (a) universal action and controlled tooth movement in all directions; (b) automatic, self-acting appliances, with a long span of action, a few adjustment periods; and (c) simple, uniform design, painless and compatible with the tissues surrounding the teeth.

According to Drs. Fogel and Magill (1972), anchorage was the focal point in successful treatment; gentle, free tipping movements of the canines in a distal direction into the extraction spaces imposed less stress on the anchor units than did bodily distal of the solidly embedded teeth. For many years, tipping movements for anchorage preservation was looked upon with great skepticism.

The widely spaced twin edgewise bracket, as suggested by Dr. Brainerd Swain in 1949, was used to solve the problem of paralleling roots when closing extraction spaces. As Dr. Cecil Steiner succinctly stated: “A single arch wire of uniform standard design and size cannot serve with equal efficiency for the various purposes necessary,” (Fogel & Magill, 1972). It follows that different types of appliance units require appropriate construction and design so that a variety of wire sizes may be used for proficient and controlled performances effecting an assortment of significant assignments.

Drs. Fogel and Magill combined the twin edgewise bracket with a vertically placed insert pin to produce a natural union as a receptacle for both pliable light-wires and rectangular wires simultaneously. The Combination Technique’s single appliance receptacle offered the ability to achieve the desired treatment procedures and objectives. Their goal was to produce a technique that would correct average as well as severe malocclusions with better results in less time and with greater ease.

This original Combination Technique incorporated a system for moving teeth whereby the teeth remained in place as a result of the equilibrium that existed among the oral musculature including the lips, tongue and the muscles of mastication. Axial correction of root angulations was no longer a problem. Positioning the mandibular incisors over the basal bone enhanced anchorage potentialities and helped to achieve a more functional and stable occlusion. Any force that disrupted this equilibrium created an environment for the teeth to move. When a very light resilient wire is ligated into a crowded dentition, the wire attempts returning to the original...
shape. If the wire is tied tightly to the teeth, forces are transmitted reciprocally between the individual teeth in the arch.

Any extraneous forces are controlled as a result of the anchorage unit.

During the late 1970s, Fogel and Magill introduced a second-generation combination bracket, which featured a double self-ligating attachment bracket to facilitate wire insertion.

It was called the “Modular Self-Locking Appliance System: Variation of the Combination Technique.” The success of this bracket was hindered by the deficiencies in the metallurgy technology.

The locking mechanism fatigued after several adjustments. The availability of light memory wires had not yet appeared, necessitating more frequent wire changes.

Still, the concept was sound. The Combination Technique was used well into the 1990s and was modified by many of its proponents. During the 1990s, most orthodontists employed some form of light-wire edgewise technique with pre-angled and pre-torqued brackets.

Ligatureless Edgewise brackets first appeared in the 1930s with the Russell Lock appliance (Sathler et al., 2011), which was an attempt to improve the clinical effectiveness for moving teeth while reducing the time required to ligate a wire into the brackets.

Numerous articles regarding self-ligating orthodontic brackets can be found in the literature (Self-ligating brackets, 2012), with more than 20 original patents for new self-ligating brackets; some have gone by the wayside and some have lasted the test of time. Sathler et al. (2011) provided an excellent review of the literature regarding self-ligating brackets used in orthodontics.

It is interesting to note that many articles describe self-ligating brackets as either the new buzzword or as a faster and more efficient method of tooth movement in orthodontic treatment.

However, in reality the self-ligating bracket has prevailed since the 1930s. It has been more than 50 years since Dr. Raymond Begg introduced his “Light Arch Wire Technique” in the late 1950s (Begg, 1961), and Fogel and Magill introduced their Combination Technique in the late 1960s (Fogel & Magill, 1969), yet seldom are they cited in articles, reference lists or bibliographic lists for self-ligating brackets.

As John F. Kennedy (1963) so adroitly stated, “A man may die, nations may rise and fall, but an idea lives on ... we must find time to stop and thank the people who make a difference in our lives.”

References
15) Self-ligating brackets. (2012). http://scholar.google.com/scholar?q=Self-ligating+orthodontic+brackets&hl=en &as_sdt=0&as_vis=1&oi=scholart&as_xd=1&ei=AB1TT8ieMeW4LW8YQ&ved=0CEIQgQMwAA

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