Horizontal uprighting spring

ABSTRACT

In orthodontic treatment, there is difficulty in finishing stage in teeth that need uprighting to obtain root parallelism. Horizontal uprighting spring is used to upright teeth (clockwise or counterclockwise) to avoid uptighting problems in the late finishing stage such as rebonding brackets and to overcome the lack of vertical slot in the bracket. Horizontal uprighting spring is fabricated in the 0.012-inch stainless steel wire. Moreover, the type of tooth movement and the moment/force ratio can be determined by the spring length and hooking point.

Keywords: Horizontal uprighting spring, root parallelism, upright teeth

INTRODUCTION

In orthodontic treatment, there is difficulty in finishing stage in teeth that need uprighting to obtain root parallelism. Despite the widespread use of Begg's uprighting springs,[1,2] vertical slot brackets can be utilized in using the spring.

Uprighting spring was used by Begg in 1956,[1] where brackets with vertical slot and size of 0.018 and 0.020 inch were used.

There is a modified method for teeth uprighting based on Binder's technique, where the vertical arm is doubled to prevent unfavorable movement in the wire using 0.014-inch Australian wire, called Jain's technique.[3]

Fabrication

Horizontal uprighting spring is used to upright teeth and overcome the lack of vertical slot in horizontal slot brackets.

The spring consists of (1) a horizontal arm, (2) a helix, (3) a vertical arm, and (4) a hook [Figure 1].

First, we take 0.012-inch stainless steel (SS) wire of 5 cm, bind the wire at 90°, make the helix, and finally form a hook.

The spring is formed according to the moment, whether we want it clockwise or counterclockwise:

1. If we need a counterclockwise moment, the spring is formed as shown in Figure 2a
2. If we need a clockwise moment, the spring is formed as shown in Figure 2b.

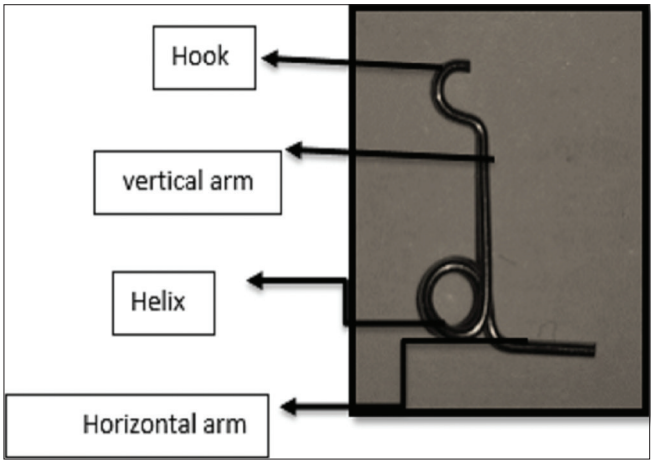

Figure 1: The spring consists of: 1- a horizontal arm, 2- a helix, 3- a vertical arm, 4- a hook

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In 0.022 × 0.08-inch brackets, horizontal slot is 0.028-inch sized, so 0.016 SS wire is used as the main archwire, and the spring is made from a 0.012-inch SS wire, so both the wires fill all the horizontal dimensions of the bracket (0.016 + 0.012 = 0.028 inch). The spring applies forces on both bracket sides to do uprighting movement.

This case demonstrates new technique for rotating tooth. We often need to correct some teeth rotations in finishing stage in orthodontic treatment. This was done usually by either rebonding the bracket or by applying wire bending on the arch. But in this case, we introduced a new spring that can apply the desired rotating effect without the need to rebond the bracket or apply any wire bending which is somehow difficult to do precisely. Biomechanically, cantilever is a segment of a wire that one of its ends is engaged into a bracket or a tube or in acryl, but the other end is tied to a hook of by a ligature wire, so all cantilevers have one contact point, and they all are statically determined. According to that, the force system can be defined by the applied force and the distance between hooking point and the point where the wire is fully engaged in the bracket.

The distance is measured vertically on active force, so moment and force are generated in the point where the wire is engaged in the bracket. However, at the hooking point, only a force is generated[4] [Figures 3 and 4].

The spring was applied on a patient in the orthodontic department in Tishreen University. The chief complaint was anterior teeth crowding. The 0.022-inch brackets were bonded, and alignment and leveling were achieved. A panoramic radiograph has been made to clarify root positions, and adjacency between central and lateral incisors was noticed, as shown in Figure 5a and b.

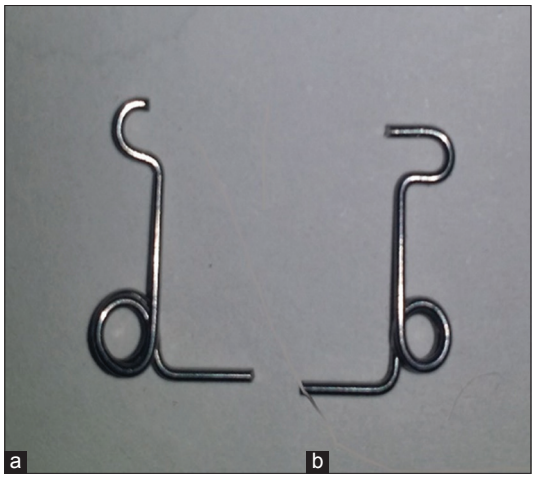

Figure 2: (a) If we need a counterclockwise moment. (b) If we need a clockwise moment

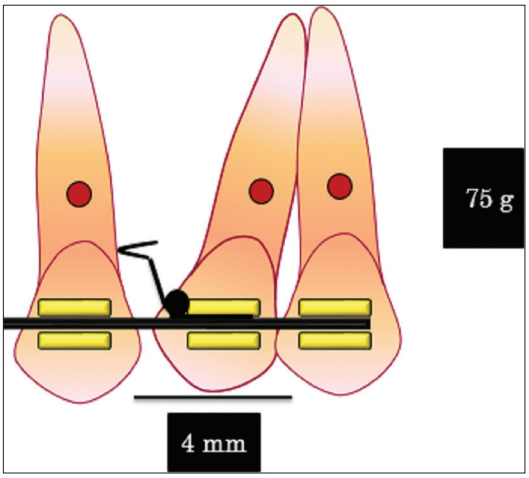

Figure 3: Root mesial inclination and winged spring

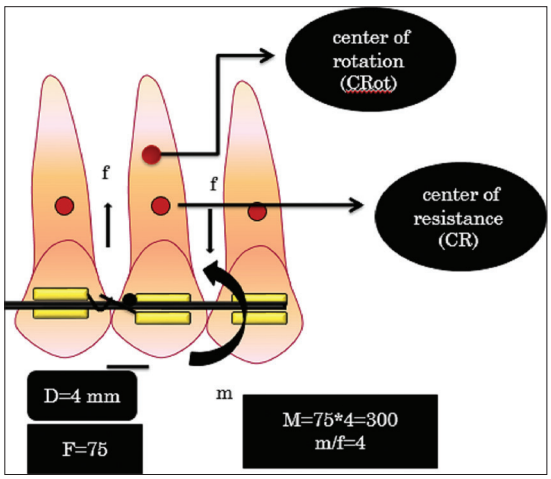

Figure 4: With distance (*d* = 4 mm) and force (*f* = 75 g), a moment of m = 300 GMm is generated (m = *f* × *d*), and M/F = 4, so the movement is (uncontrolled tipping)

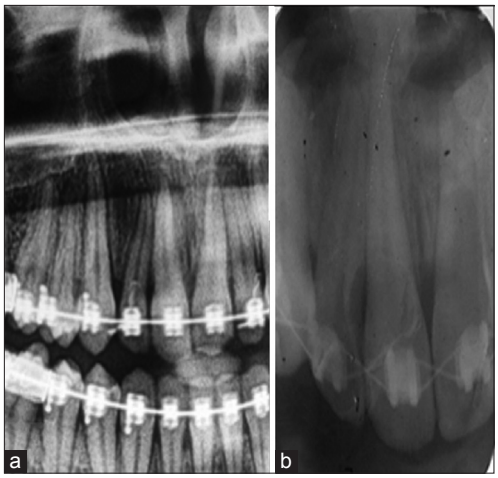

Figure 5: (a) Panoramic radiograph has been made to clarify root positions and adjacency between central and lateral incisors. (b) Periapical radiograph

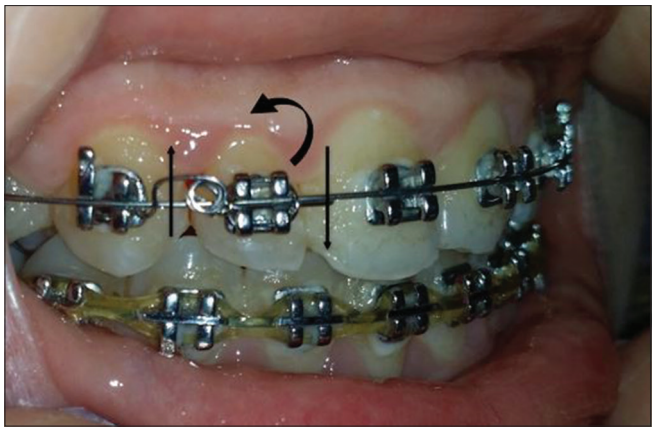

Figure 6: The spring's effect as an intrusion force is generated at the hooking point, and as a reaction, an extrusion force is generated at the lateral incisor's bracket the equals the intrusion

Figure 7: The patient was seen after a month, and the inclination of the lateral incisor in the bracket's slot was noticed

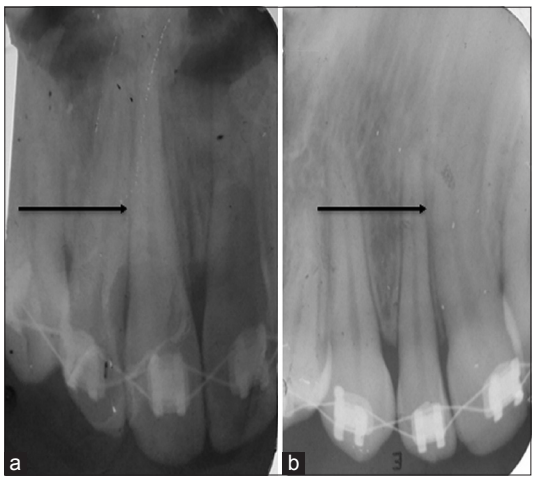

Figure 8: The radiographic evaluation of teeth position before (a) and after (b) applying the spring

The spring had been made from the 0.012-inch SS wire and then was applied to upright the lateral incisor by a counterclockwise momentum [Figure 6].

The patient was seen after a month, and the inclination of the lateral incisor in the bracket's slot was noticed [Figure 7]. Figure 8 represents the radiographic evaluation of tooth position before and after applying the spring, as we can see the counterclockwise inclination in lateral incisor's root and the expansion in the space between central and lateral incisors' roots, bearing in mind the spring was applied for only 1 month, so if applied for a longer period, we may have a greater uprighting.

DISCUSSION

When the hook is pulled to the main archwire, an intrusion force is generated, and this force is measured by dynamometer. Moreover, since cantilever is statically determined according to the Newton's first law, an extrusion force is generated that counters the intrusion force with the same magnitude and without generating any moment in hooking point to the hook.

Moreover, a counterclockwise moment is generated to correct roots' position where the spring is set in the bracket's slot. M/F ratio, which determines movement type, corresponds with the distance (d). Distance (d) equals spring length, so the spring length determines dental movement type.[4,5] With (distance; d = 4 mm, force; f = 75 g), moment (m = 300 GMm) is generated because ($m = f \times d$), and M/F = 4, so the movement is uncontrolled tipping which inclines the root distally and the crown mesially [Figure 4]. M/F ratio can be increased by lengthening spring, so we get better rotation, decrease unfavorable extrusion, and decrease load/deflection ratio.[6,7]

CONCLUSION

A simple and quick method to fabricate uprighting spring has been described here. This can find use to enhance uprighting (quality and quantity). Horizontal uprighting spring is used to upright teeth (clockwise or counterclockwise) to avoid uptighting problems in the late finishing stage such as rebonding brackets and to overcome the lack of vertical slot in the bracket. Moreover, we can by controlling the spring's length and the hooking point affect the movement type and M/F ratio.

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Conflicts of interest
There are no conflicts of interest.

REFERENCES

1. Begg PR. Begg Orthodontic Theory and Technique. Philadelphia: W.B. Saunders Company; 1965.

2. Yen PK. A lingual Begg lightwire technique. J Clin Orthod 1986;20:786-91.
3. Kesling PC. Dynamics of the tip-edge bracket. Am J Orthod Dentofacial Orthop 1989;96:16-25.
4. Burstone CJ, Choy K. The Biomechanical Foundation of Clinical Orthodontics. ed: Hanover Park, IL: Quintessence Publishing Co., Inc.; 2015. p. 369-75.
5. Cattaneo PM, Dalstra M, Melsen B. Moment-to-force ratio, center of rotation, and force level: A finite element study predicting their interdependency for simulated orthodontic loading regimens. Am J Orthod Dentofacial Orthop 2008;133:681-9.
6. Burstone CJ, Pryputniewicz RJ. Holographic determination of centers of rotation produced by orthodontic forces. Am J Orthod 1980;77:396-409.
7. Fiorelli G, Melsen B, Modica C. The design of custom orthodontic mechanics. Clin Orthod Res 2000;3:210-9.