



Tongue Tamers® PLUS

System for Rapid Open Bite Closure

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Introduction

The aim of this article is to discuss a new system to treat severe skeletal open bite malocclusion using a new, miniaturized tongue trainer (Tongue Tamers PLUS) device. In the first part, the author will focus on clinical evaluation of Tongue Tamers PLUS, the second part is devoted to tongue thrusting, open bite aetiology and its treatment.

Clinical evaluation of Tongue Tamers PLUS

Methods

Clinical applications of the first generation of the tongue tamer devices with nine rounded protrusions, initially manufactured as one-piece, were evaluated over a two year period in the private orthodontic clinic of the author. Improvements were noted and implemented to develop a second generation tongue tamer plus.

The new Tongue Tamers PLUS were made as a four-piece unit including a body with six tie-wing undercuts for crossbite elastics, brazed to the bonding pad for greater flexibility, and 80-gauge mesh for higher bond strength against lingual shearing forces.

For each orthodontic patient, 12 Tongue Tamers PLUS were bonded, including six positioned on the palatal aspects of the gingival middle-third of the upper six anterior teeth from canine to canine, and six were placed on the lingual middle-third of the lower anterior teeth from canine to canine.

Tongue Tamers PLUS were the central device of a four component system to treat severe anterior, and lateral tongue positioning. The second component of the system included tongue tamers plus bonded at the same time as a Siamese twin, active self-ligating appliance that employed the third component of new initial NiTi Arch wires for light force control. These specialized archwires with a higher vertical dimension than horizontal dimension (for example .018" x .014") acted closer to the center of resistance of the root for earlier moments of incisor torque, and were incorporated with

curve of Spee for the lower arches, and reverse compensating curve on the upper arches to further facilitate incisor re-eruption.

The fourth component of the system included a vertical box elastic from the upper lateral incisors to the lower canines (1/4", 4.5 oz) that was additionally applied on the labial aspects for light incisor re-eruption in conjunction with the Tongue Tamers PLUS.

Clinical results and conclusion

Tongue Tamers PLUS were found to be highly effective in restricting anterior tongue positioning for rapid open bite closure (ROC). No clinically significant root resorption as noted that appeared to be related to the light forces applied. Therefore tongue tamers are recommended for rapid open bite closure since they cause the tongue to be retracted during treatment to permit anterior dental re-eruption.

Multi-directional forces of anterior tongue positioning (tongue thrusting)

The tongue affects the alignment of the dentition because it has one of the strongest sets of muscles in the human body capable of reflex.¹ Malocclusions involving open bites are classified as two types, anterior open bite located in the area of the anterior canine-to-canine area, and lateral open bites located at the premolars and molars. In open bite malocclusions, the tongue attempts to seal the oral cavity for effective swallowing (suction-effect) in an unnatural, anterior position. In addition, the tongue thrusts both superiorly and inferiorly. This results in progressive opening of the bite preventing eruption of the upper and lower incisors. It is significant that both the upper and lower incisors are not only intruded, but also proclined often by the unnatural anterior tongue position between the incisors. Several factors have been associated with open bites.

Aetiology of open bite includes:

1. Primary anterior, superior and inferior tongue positioning in conjunction with lateral tongue thrusting.
2. Allergies, asthma, nasal obstruction from for example nasal septum deviation as a result of chronically inflamed turbinates, chronically enlarged tonsils and adenoids, etc.
3. Primary, habitual mouth breathing (or 2°), associated often with anterior, superior and inferior tongue positioning.
4. Skeletal downward and backward growth of the mandible (dolichocephalic).
5. Muscle hypoactivity (an extreme pathological example is observed in muscular dystrophy patients).
6. Dental delay of incisor eruption and over-eruption of the molars.
7. Habits such as thumb-sucking, finger-sucking, blanket-sucking, over-retention of soothers after the age of 6.

Several appliances have been developed to control the anterior tongue positioning including the traditional cemented tongue-cribs soldered to molar bands, and bondable tongue habit-breakers type brackets on the palatal of the upper incisors. These were often bulky, uncomfortable and cumbersome for patients.

What is Tongue Tamers PLUS?

The first tongue tamer was developed in 2014 with nine-reminder protrusions rounded at the tips to prevent anterior tongue positioning. It was manufactured as a one-piece bracket and tested clinically for two years by the author in his private orthodontic clinic in Toronto, Canada. This first generation tongue tamer was found to be effective in controlling the tongue for ROC. As a result, new modifications were then implemented by the author to improve the first generation tongue tamer plus.

The second generation Tongue Tamers PLUS was made as a four-piece unit including:

1. Bracket body with nine rounded protrusions and six new, tie-wing undercuts.
2. Braze (for flexibility) to a bonding pad.
3. Separate 80-gauge mesh for greater shear resistance and bond strength.

The separate application of 80-gauge bonding mesh is used to improve bond strength during shearing forces on the lingual. Tongue Tamers PLUS are miniaturized in size similar to bondable buttons to be comfortable for patients and to facilitate oral hygiene. In addition, tie-wing like undercuts are designed into six of the nine protrusions to secure the placement of crossbite elastics. This is required commonly in lateral open bite treatment that is associated with severe skeletal maxillary constriction (**Figs. 2a & b**).



Figs. 2a & b

Lateral open bites commonly associated with skeletal maxillary constriction frequently have an ENT aetiology, producing secondary mouth breathing and a chronic imbalance between a lower tongue position and buccinator muscle activity (facial muscles).

Figs. 3a & b

The recommended positions of the Tongue Tamers PLUS are mildly more gingival for the upper incisors (a).



Figs. 4a & b

Tongue Tamers PLUS with anterior box elastic, and Sensation® M Active Self-Ligating Brackets shown, are found to be a highly effective and efficient system for rapid open bite closure (ROC) of severe skeletal anterior and lateral open bites.



Where should Tongue Tamers PLUS be placed?

Clinically, Tongue Tamers PLUS are bonded on the middle-third regions of the upper and lower canine-to-canine regions (**Figs. 3a & b**). The Tongue Tamers PLUS position recommended for the upper anteriors is just gingival to the middle third to prepare for the corrected upper incisors to approach contact with the lower incisors during rapid open bite closure. This provides a total of 12 Tongue Tamers PLUS on the day of first bonding of a full Siamese twin, active self-ligating appliance recommended with new .018" x .014" NiTi, Arch wires. In addition, for each open bite treatment, Tongue Tamers PLUS are applied in conjunction with anterior box elastics (1/4", 4.5 oz, see Fig. 6b) from the labial aspects of the upper lateral incisors to the lower canines to facilitate a rapid open

bite closure (**Figs. 4a & b**). This completes a system composed of four-components for rapid open bite closure.

Why apply Tongue Tamers PLUS?

Normal swallowing takes place approximately 600 times/day or more (including during chewing and speaking) the tongue is generally positioned in the palate. However, in anterior open bites the tongue fills the open bite space through anterior tongue positioning (previously referred to as tongue thrusting). Tongue Tamers PLUS are applied for both Rapid Open Bite Closure and for Rapid Lateral Open Bite Closure (**Figs. 4a & b**). They are used in conjunction with active self-ligating appliances due to the low resistance shown in vitro to permit free and controlled movement of the upper and lower anteriors. Once the incisors begin to develop a positive overbite relationship the tongue generally begins to retract posteriorly into a more natural tongue position assuming

the aetiology of the open bite has been additionally controlled (for example, nasal obstruction).

When should Tongue Tamers PLUS be placed?

Tongue Tamers PLUS are recommended at all ages including for both early interceptive treatment in children (**Figs. 5a-f**) and in adults. The ideal recommended time of placement is at the time of placement of active self-ligating brackets (that are regularly positioned on the labial aspects). Tongue Tamers PLUS and active self-ligating brackets work ideally and synergistically with specialized Arch wires that have a higher vertical dimension than horizontal dimension (for example .018" x .014") to be closer to the center of resistance for earlier incisor moments of torque and control required for open bite correction. The archwires incorporate curve of



Fig. 5a



Fig. 5b

Figs. 5a & b

A 9-year-old patient demonstrating that the anterior tongue positioning is additionally directed inferiorly resulting in the proclination of the lower incisors, supporting the indication that Tongue Tamers PLUS need to be placed in both the upper and lower arches.

Figs. 5c & d

The radiographs reveal that anterior tongue positioning (c) is often associated with nasal obstruction related to enlarged and chronically inflamed turbinates (d), secondary mouth breathing, and molar over-eruption.



Fig. 5c



Fig. 5d

Figs. 5e & f

Lip harmony and balance were shown after ROC using the four-component system of Tongue Tamers PLUS, anterior box elastics, Sensation M Active Self-Ligating Brackets, and specialized archwires for torque control.



Fig. 5e



Fig. 5f

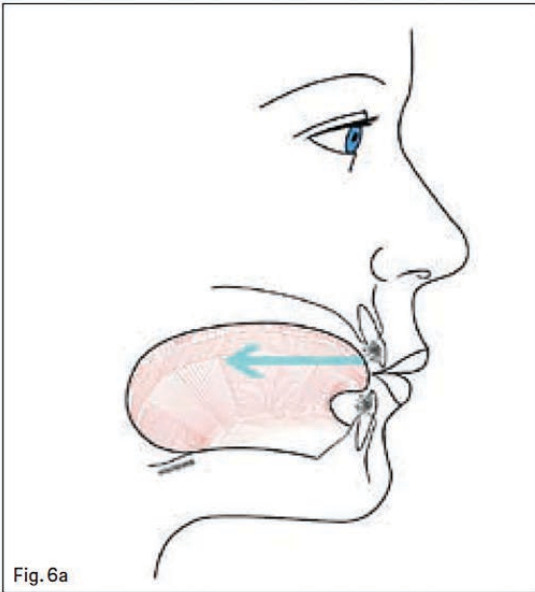


Fig. 6a



Fig. 6b

Figs. 6a & b

The retraction reflex mechanism shown with Tongue Tamers PLUS (a). Application of anterior box elastics and Sensation M Active Self-Ligating Brackets (b).

Spee for the lower arches and reverse compensating curve on the upper arches to further facilitate incisor re-intrusion. Tongue Tamers PLUS incisor re-extrusion is further facilitated by the alignment of the anterior teeth, where a labial box elastic can be placed that also restrains the tongue (see Fig. 6b). No clinically significant root resorption was found with the use of this light force system that reduces the unnatural and multi-directional anterior, superior, inferior and lateral tongue forces.

How does Tongue Tamers PLUS work?

The basic mechanism of action is that the Tongue Tamers PLUS produces a negative conditioning reflex response for anterior tongue positioning.² This is similar to a hot-stove effect (Fig. 6a). However, due to the rounded ends of the nine protrusions the tongue is not lacerated, nor is the operator's glove or skin. The feeling against the finger is one of coarse sandpaper as simply a reminder for the tongue to stay retracted away from the open bite. This permits the Tongue Tamers PLUS to work effectively in conjunction with the anterior box elastics (5/16", 4.5 oz) for rapid open bite closure (ROC) shown in Figure 6b. In lateral open bite patients where the Tongue Tamers PLUS are placed at the premolars and molars crossbite elastics are applied, that are generally heavy 1/4", 4.5 oz, to further prevent lateral tongue positioning while maxillary expansion is completed simultaneously. In addition, it is important that the patient is instructed to exercise swallowing with the tongue in the roof of the mouth from the day of Tongue Tamers PLUS placement.

Special procedures with Tongue Tamers PLUS and overcorrection of open bites

As anterior open bites are corrected it is important to observe the gingival protrusions of the Tongue Tamers PLUS for the possible need of reduction with a high-speed to prevent dental interferences. The objective is to over-correct the open bite to be greater than 30% overbite for long-term retention. The reason is that open bites are often associated with patients growing with the mandible in a downward and backward direction. It is additionally recommended that upper and lower brackets from canine-to-canine be bonded 1 mm toward the gingival than the customary average height positions to facilitate open bite clo-

sure. This is particularly important at the upper lateral incisors that are the smallest of the incisor teeth and affected most by the unnatural, anterior tongue positioning forces.

Conclusions:

Advantages of Tongue Tamers PLUS applications

A system of four components was developed and tested to produce rapid open bite closure. This included the use of new tongue tamers, anterior box elastics with active self-ligating brackets with new arch wires to provide freedom of movement of the system including the upper and lower archwires with its proven low resistance, in vitro.

In conclusion:

1. Metal Tongue Tamers PLUS are highly effective and efficient chairside for ROC.
2. Efficiency is gained by ready-made, bondable Tongue Tamers PLUS, that do not wear, are miniaturized for patient comfort and facilitate oral hygiene.
3. Tongue Tamers PLUS are placed on all 12 anterior dental units from the upper canine-to-canine, and lower canine-to-canine since the tongue was observed and found to be positioned anteriorly, superiorly and inferiorly.

Tongue Tamers PLUS are applied in conjunction with anterior box elastics (5/16", 4.5oz) and ideally with new, low profile active self-ligating brackets with NiTi clips for light, continuous forces for the periodontal membrane, completely frost-coated for aesthetics, and with progressively lower forces from molars to incisors. Active self-ligating brackets make use of reduced resistance found in vitro and active seating of Arch wires for earlier moments of torque that are closer to the center of resistance of the incisors to improve control (future publication).

1. Ramford SP, Major MA. Occlusion. Philadelphia, US: W.B. Saunders Company; 1971; 42, 89-91.

2. Cooper S. Muscle spindles in the intrinsic muscles of the human tongue. J Physiol (London)