



## The Definition, Symptoms, Mechanism and Clinical Pathway of Tongue Hooked by Labial Appliance Syndrome

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### Abstract

**Objective:** It is claimed that Orthodontic pain is reported in almost 70% of orthodontics cases while tongue habit is an important reason for some kinds of severe malocclusion. In this article, we reported a new and acute syndrome, the Tongue Hooked by Labial Appliance Syndrome (THLAS), which is also called Xiaomian Wu' Syndrome.

**Methods:** We collected samples of the patient who's tongue were hooked by labial appliances and turned to us for help. We recorded the symptoms of the patients, analyzed the mechanism of this syndrome, summarized our clinical pathway, reviewed the history of present illness and discuss the cause and prevention of this syndrome.

**Results:** The pain and discomfort could be obviously found in patients. The symptoms of THLAS included not only the pain of hooked tongue but also the exhausted of TMJ and the serious discomfort of swallowing and breath. The bad tongue habit was the main reason of THLAS. The predictable complications of THLAS were serious and a neuromuscular feedback loop was formed.

**Conclusion:** THLAS was a vital and emergent syndrome in which a neuromuscular feedback loop was formed. The orthodontic pain of tongue was not the privilege for appliances used in lingual side. The orthodontist in charge, nurse or assistant dentist should teach patients the right way to keep their oral hygiene and give up bad tongue habits. This study offered a further understanding of the new and vital syndrome and released the clinical pathway to treat it.

**Keywords:** Orthodontic Pain; Lingual Appliance; Tongue; Tongue Habit; Tongue Hooked By Labial Appliance

### Introduction

While the technology and materials have an explosive development in the orthodontic field [1-3], but almost 70% of orthodontic patients still reported pain during orthodontic treatment [4]. Pain intensity increases with time from 4 to 24-48 hours and drops to normal levels at 7 days [5,6]. A number of factors influence the level of patient's pain and discomfort during orthodontic treatment, such as age, type of bracket and so on. Some studies claim that lingual appliance causes speech issue and discomfort in patients, and try to make the lingual appliance more comfortable with the help of CAD/CAM [7,8]. However, whether labial brackets are always more comfortable and safer than the lingual appliance or not that requires further study.

Most orthodontists believe that the success of each orthodontic therapy relies on four vital components: the diagnostic and clinical

skills of the orthodontist, favorable biologic characteristics of the patient, patients' willingness to cooperate and the use of an appropriate and effective orthodontic appliance [4]. But some of patients' habits were neglected not only by patients but sometimes also by orthodontists ourselves, because there are too many kinds of habits to be carefully considered at every time. A lot of habits and their effects on craniofacial development have been well discussed by our pioneer, such as the relationship between tongue habit and open-bite [9,10] and posterior cross-bite [11].

In this article, we reported a new and acute tongue syndrome, Tongue Hooked by Labial Appliance Syndrome (THLAS), which is also called Xiaomian Wu' syndrome. And we definite it as that tongue was hooked by labial appliance such as brackets, tubes, arch-wires or other appliance and that formed a vicious neuromuscular feedback loop between the hooked tongue and

TMJ and other related organs, which caused pain in the patients and potential vital complications. We aimed to characterize the symptom, find out the cause and prevention method, analysis the mechanism and offer a clinical pathway in detail for this syndrome.

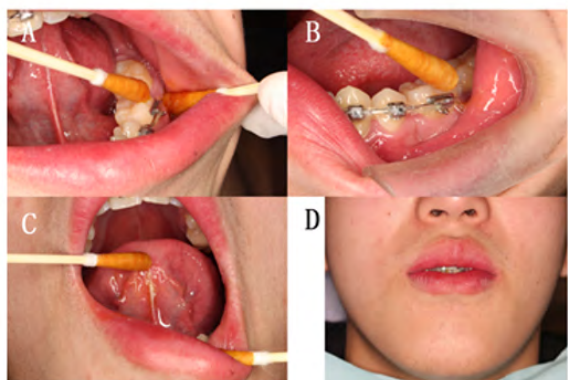
**Material and Method**

**Sample collection**

Two patients were under orthodontic treatment and turned to us for help in such a emergent situation. Case 1, a 15-year-old girl complained that her tongue was hooped in her mandibular brackets for more than two hours (Figure 1). She was crying. After check, we found that her tongue frenulum was hooked by the hook on D3 bracket. She kept her mouth open and frequently bit her tongue suddenly and unawares. Case 2, a boy of 18 years old who complained that his tongue was hooded by the tube on the lower left molar with a lisp (Figure 1). Tears in his eyes could be found. He could not close his mouth with a dry lips and tongue. We could find his pain and discomfort from his face. While we didn't want to make a positive or negative effect of advertising on any bracket system, so we covered every bracket with mosaic in this paper.



Case 1

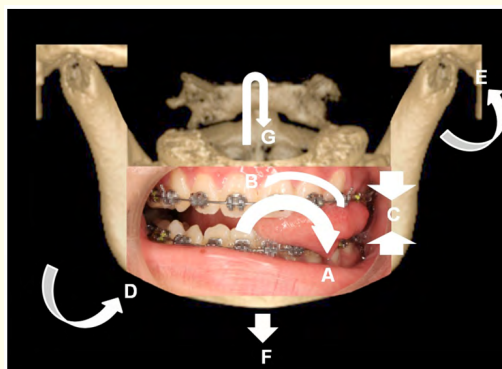


Case 2

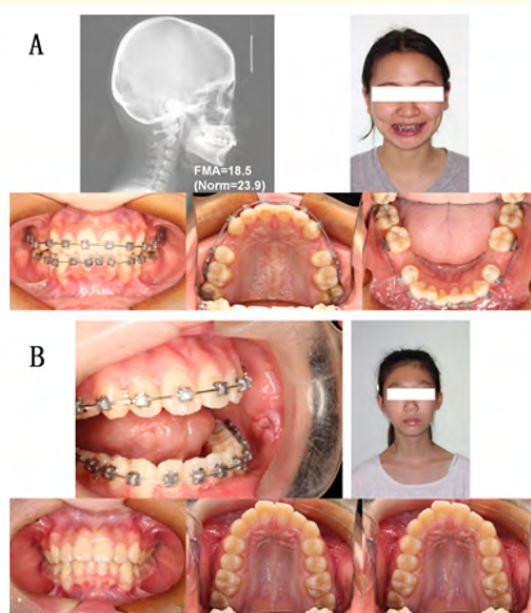
**Figure 1:** Case 1: A 15-year-old girl who's tongue was hooked by the hook on her D3 labial bracket. A: Her tongue was hooking on the hook; B: She was relaxed when her tongue was released from the hook.

Case 2: A boy of 18 years old who's lingual frenulum was hooked by the tube on his low-left first molar. A and B: Where his lingual frenulum was hooked; C: Disinfection of the lingual frenulum was performed after it was release from the tube; D: The patient looked better when his tongue was released. (While we didn't want to make a positive or negative effect of advertising on any bracket system, so we cover every bracket with mosaic in this paper).

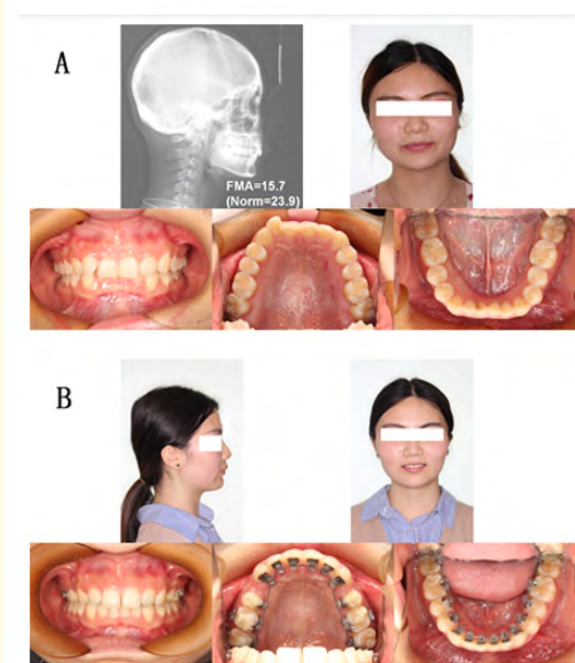
We also collected patients who claimed orthodontic pain with labial appliance (Figure 3) and patient who had never claim orthodontic pain with lingual orthodontic appliance (Figure 4).



**Figure 2:** Mechanism of Tongue Hooked by Labial Appliance Syndrome (Xiaomian Wu's Syndrome). The mimic Mechanism of THLAS, in which a vicious neuromuscular feedback loop is formed between the hooked tongue, TMJ and other related organs. (A: Reaction force from the hook; B: Force from lingual muscles; C: Force from jugomaxillary muscle; D: Force from the muscles related to mouth opening and temporomandibular joint (TMJ) movement; E: Force from the muscles related to mouth closing and TMJ movement; F: Force from respiratory muscles; G: Force from swallowing-related muscles). (While we didn't want to make a positive or negative effect of advertising on any bracket system, so we cover every bracket with mosaic in this paper)



**Figure 3:** Patients, who are having orthodontic treatment with labial bracket appliance, are suffering the pain of ulcer on their buccal mucosa. A Case 3: A 22-year-old girl, who has a low value of FMA, a highly-development masticatory muscle and a narrow buccal corridor, was undergoing orthodontic treatment and reported the discomfort on her buccal mucosa. B Case 4: A girl of 12 years old was having orthodontic treatment with labial appliance and was suffering a huge ulcer on her buccal mucosa, and her buccal corridor is quiet narrow that could be found in her images before treatment. (While we didn't want to make a positive or negative effect of advertising on any bracket system, so we cover every bracket with mosaic in this paper).



**Figure 4:** Case 5: Patient, who has a low value FMA, a highly-development masticatory muscle and a narrow buccal corridor was having orthodontic treatment with lingual orthodontic appliance and satisfied with the outcome. There was not any orthodontic pain or discomfort could be found or reported by the patient herself. (While we didn't want to make a positive or negative effect of advertising on any brackets system, so we cover every bracket with mosaic in this paper).

### History of present illness and medical history

We recorded the history of present illness of the patients who's tongue were hooked by labial appliance. All of them reported that they plaid their tongue or used their tongue to remove residue food from their brackets.

And we analyzed the hard and soft tissue character of patients who claimed orthodontic pain with labial appliance. Case 3 (Figure 3): A 22-year-old girl had a low value of FMA, a highly-development masticatory muscle and a narrow buccal corridor. She reported the discomfort on her buccal mucosa while she was undergoing orthodontic treatment. Case 4 (Figure 3): A girl of 12 years old, who's buccal corridor was quiet narrow, was having orthodontic treatment with labial appliance and was suffering a huge ulcer on her buccal mucosa.

Besides, we recorded the experience of the patient who had the same hard and soft tissue character and was having orthodontic

treatment with lingual orthodontic appliance. Case 5 (Figure 3): She was a 25-year-old girl and also had a low value FMA, a highly-development masticatory muscle and a narrow buccal corridor; but she satisfied with the outcome. There most importance was that there was not any orthodontic pain or discomfort could be found or reported by the patient herself.

## Results

### Symptom and diagnosis of tongue hooked by labial appliance syndrome (Xiaomian Wu' Syndrome)

The characters of THLAS Syndrome could be summarized as the following. First, the patients felt painful and serious discomfort of their hooked tongue, TMJ and breath. Sometimes, tears could be found in patients' eyes and they became dysphoric and worry. Second, the patients' tongues extended and crossed over the occlusive face of their dentition and were hooked in labial appliance such as brackets or tubes. The muscle of the tongue is tense and might be bleeding. Third, lips and tongue were dry. Fourth, patient's TMJ was exhausted and tied. Fifth, the patient's breathing and swallowing made the pain of the tongue more serious.

### Mechanism analyze of tongue hooked by labial appliance syndrome

Sometime, patients' report about orthodontics pain or their discomfort which were caused by the orthodontics appliance in lingual side, but once the tongue was hooked by labial appliance, the situation and mechanism was quite different. A vicious neuromuscular feedback loop between the hooked tongue, and TMJ and respiratory muscle or swallowing-related muscle was formed (Figure 2). When the tongue was hooked by the labial appliance such as brackets or tubes, the tongue was crossing over the occlusive face of the patient's dentition, so the patient could not close his/her mouth, or his/her tongue would be bitten by the patient himself. And, the patient had to keep their mouth open for hours till the tongue was released. But, it was difficult for most people to keep his/her mouth open for hours, and the patient might fell exhausted about his/her TMJ and he/she would bite his tongue frequently. What's more, every time the patient breathed or swallowed, his/her tongue was dragged back by respiratory muscle or swallowing-related muscle and the pain and discomfort in the tongue might be more serious.

While most parts of the tongue were smooth, the lingual frenulum might become the most easily structure to be hooked. And the lingual frenulum didn't contain big blood-vessel, so if the tongue is hooked in this part, serious bleeding might not happen.

### Clinical pathway of tongue hooked by labial appliance syndrome

The most vital and predictable complication of THLAS was severe lingual haemorrhages which could be lethal [12]. So, when we made up our clinical protocol, this complication was well considered. 1. Diagnosis. The diagnosis for THLAS was quiet obviously. From the symptom, it was easy to give the diagnosis. 2. Check. Was there severe bleeding or no? If, there was not severe lingual haemorrhages could be found, the orthodontist should get ready to do the operation as quickly as we could and the medicine should be prepared, such as iodoform, 70% of medical alcohol and pieces of gauze. If severe lingual haemorrhages could be found, addition medicine was needed such as local anesthetics, and emergence medical equipment and drug, and the help of a maxillofacial surgeon was also necessary and important. 3. Informed consent. While this new kind of patient was in such an emergent situation and could be found in orthodontics, we should briefly tell the patient and their parents the predicable complications and other unpredictable risk, and get the permission from the patient or their parents in oral or in signature. 4. Release the tongue. Checked the situation of tongues first. After we made sure there was not serious bleeding or any obvious cut in the tongue, a piece of gauze was used to hold and further extend the tongue to the appliance till the lingual frenulum could be release from the hook in the brackets or tubes. 5. Disinfection. The wound of the tongue should be disinfected by iodoform and 70% of medical alcohol. 6. Signature. Doctor should get the signature from patient to confirm the operation had done and there was not serious complication occurred.

### Discussion

#### Cause and prevention of tongue hooked by labial appliance syndrome

The tongue habit was the main reason for the THLAS, while it was easy to be neglect by patient and orthodontists. The two patients turned to us for help, who all reported that they were playing their tongue before their tongue got hooked. And one of them told us that before that she just had her lunch. So, the important methods to prevent THLAS were not only by that the orthodontist in charge to inform patients about the potential risk of playing their tongue and the risk to use their tongue to remove residue food from their brackets, but also by that the parents, nurse or assistant dentist should carefully teach the patient the right ways to keep their oral hygiene.

It was unnecessary to hold the idea that labial bracket appliances were always more comfortable for patients than lingual bracket

systems. In clinical daily practice, we found that patients, who had a big volume of oral cavity, a low value of FMA or mandibular angle, a highly-development masticatory muscle and/or a narrow buccal corridor, were more appropriate to have lingual brackets appliance (Figure 4) than labial appliance (Figure 3).

#### Pain evaluation of tongue hooked by labial appliance syndrome

When a patient' tongue was hooked, he/she was in a serious emergent situation. Although it was difficult to conduct questionnaires to evaluate how pain he/she was, but we could obviously find that it was extremely painful and uncomfortable from the following facets. First, when the patients got into our office, the girl was crying out and the boy had tears in his eyes too. What's more, after our operation they still could not calmed down which could be inferred from letters of confirmation written by the patients to confirm that we had helped them to release their tongue successfully without severe complication. In both letters, we could find spelling mistakes in simple sentences (Letter no shown).

### Conclusion

1. The orthodontic pain of tongue is not the privilege for appliances used in lingual side.
2. The definition and symptoms of Tongue Hooked by Labial Appliance Syndrome (Xiaomian Wu's Syndrome were described in detail, the mechanism and clinical pathway of THLAS was well analyzed and the cause and prevention method were much discussed.
3. The orthodontist in charge, nurse or assistant dentist should teach patients the right way to keep their oral hygiene and give up bad tongue habits.

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