ISSN: 2754-4893

Journal of Dental Science Research Reviews & Reports

SCIENTIFIC Research and Community

Review Article

Open Access

The Silent Push: Understanding the Tongue Thrusting

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Received: November 05, 2025; **Accepted:** November 12, 2025; **Published:** November 22, 2025

Introduction

The development and preservation of periodontal health are significantly influenced by oral habits [1]. Habits including tongue thrusting, mouth breathing, bruxism, and incorrect teeth brushing methods can all lead to the development and advancement of periodontal diseases [2]. If these parafunctional behaviors are not treated, they may cause tissue damage, inflammation, and eventually attachment loss by applying aberrant stresses to the periodontal structures [3]. For early diagnosis, prevention, and successful periodontal therapy, it is essential to comprehend the effects of these behaviors.

Different Types of Oral Habits

Tongue Thrusting

The habit of thrusting the tongue against or between the teeth during swallowing or at rest can cause proclamation of anterior teeth, anterior open bite and spacing, which may complicate periodontal health [4].

Thumb or Finger Sucking

Placement and sucking of thumb or fingers beyond infancy. It can lead to proclination of anterior teeth, open bite, gingival recession, and spacing [5].

Mouth Breathing

Habitual breathing through the mouth due to nasal obstruction or habit It can lead to dry mouth, reduced salivary protection, gingival inflammation [6].

Lip Biting or Lip Sucking

Habitual biting or sucking of the lower lip. This can lead to proclained maxillary incisors, retro lined mandibular incisors, gingival trauma and deep bite formation [7].

Tongue Thrusting

An orofacial myofunctional disease called tongue thrusting, sometimes referred to as atypical swallow or reverse swallow, is characterized by the tongue pressing against or between the teeth during speaking, swallowing, or relaxing. Although this pattern is medically normal in babies, it usually goes away by early childhood [8]. The presence of one oral habit may induce the other. In periodontology, it is recognized as a parafunctional behavior that contributes to tooth movement and periodontal disease [9].

The genesis, clinical features, diagnosis, history, categorization, anattomy, physiology, and effects on development and health will all be covered in this review article.

History

Since ancient times, oral habits in children, such as tongue thrusting and thumb sucking, have been recorded. When Sigmund Freud first connected these actions to psychological development in the oral stage, he proposed that early childhood emotional and psychological requirements were connected to activities like thumb sucking [10]. Behaviorists like Watson and Skinner concentrated on how habitual behaviors are not only innate but also learnt and reinforced [11].

Graber TM investigated the effects of oral behaviors such as thumb thrusting and thumb sucking on malocclusion and craniofacial development later in the 20th century [12].

Subtly, JD conducted groundbreaking research on cephalometric alterations linked to oral habits and thumb sucking. Clinical implications of oral habits in the development of dentition were described by Moyer RE and Proffit WR [13].

History of Tongue Thrusting

Since ancient times, tongue-related swallowing abnormalities have been identified through descriptions of aberrant speech or oral posture, even if they are not specifically characterized. However, it wasn't until the 20th century that the term "tongue thrust" and its orthodontic relevance became widely recognized [14].

James E. Garliner, a speech pathologist, coined the phrase "tongue thrust" and defined it as a "reverse swallowing pattern" that is frequently seen in children and certain adults. Garliner became the first interdisciplinary researcher to link tongue thrusting to malocclusion, open bites, and speech issues [14]. One of the most significant studies on tongue thrusting and oral habits was carried out by Joseph D. Subtelny in 1955. Using cephalometric radiographs, he assessed the connection between dentofacial

morphology, swallowing patterns, and oral habits. His research showed that incisor proclamation, anterior open bite, and incisor eruption failure may all be brought on by or made worse by repeated tongue thrusting [13].

Scholars such as Proffit WR, Graber TM, and Moyers RE investigated the causal link between malocclusion and tongue thrusting [14].

Classification

Useful vs. Harmful (James, 1923)

- **Useful Habits:** Necessary for normal function correct tongue posture, proper respiration, natural swallowing.
- **Harmful Habits:** Can disrupt oral development mouth breathing, tongue thrusting, etc.

Pressure, non Pressure, or Biting (Morris & Bohanna, 1969)

- **Pressure Habits:** Apply force on teeth/structures (e.g., thumb sucking, tongue thrusting, lip sucking).
- **Non pressure Habits:** Do not exert tooth pressure (e.g., mouth breathing).
- **Biting Habits:** Involve chewing or bit¬ing (e.g., nail or pencil biting, cheek biting)

Empty vs. Meaningful (Klein, 1971)

- **Empty Habits:** Involuntary, without deep psychological causes (e.g., absent minded nail or lip biting).
- **Meaningful Habits:** Rooted in emotional or psychological need (e.g., compulsive thumb sucking)

Compulsive vs. Non Compulsive (Finn, 1987)

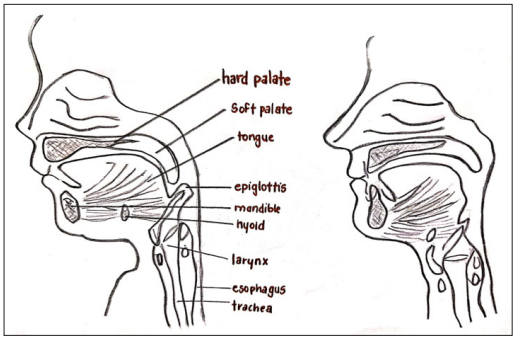
- **Compulsive:** Deeply rooted, anxiety driven, resistant to change (e.g., chronic bruxism).
- **Non Compulsive:** Easily dropped or outgrown (e.g., temporary thumb sucking)

Functional, Muscular, Combined, Postural (Kingsley/Morris)

- **Functional Habits:** Relate to physiological functions (e.g., mouth breathing).
- **Muscular Habits:** Muscle-driven actions (e.g., tongue thrusting, cheek/lip biting).
- **Combined Muscular:** Involving multiple actions (e.g., thumb and finger sucking).
- **Postural Habits:** Relate to body/head posture (e.g., chin propping, pillow habits)

Anatomy and Physiology of Normal Swallow

Swallowing and eating are complicated processes that involve both reflexive and volitional actions. According to the location of the boluse activities of over 30 nerves and muscles, the swallowing process is typically separated into oral, pharyngeal, and esophageal stage [15].

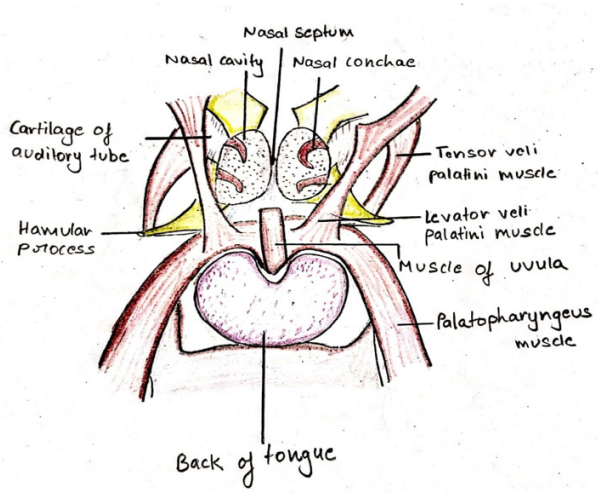


Anatomy and Function of Structures in the Oral Phase of Swallowing [16-21].

Structure	Description/Anatomy	Function	Innervation	Blood Supply
Oral Cavity Proper	Space between upper and lower dental arches	Site of food processing and bolus formation	—	—
Boundaries of Oral Cavity	Anterior/Lateral: dental archesSuperior: palateInferior: tonguePosterior: oropharynx	—	—	—
Lips	Form a muscular sphincter (orbicularis oris); external skin and internal mucosa	Control entrance and exit of food	Facial nerve (CN VII)	Labial branches of facial and infraorbital arteries
Cheeks	Lateral oral walls; continuous with lips; contain buccinator muscles and buccal fat pads	Maintain food between teeth during chewing	Buccal branch of facial nerve	Buccal artery
Hard Palate	Bony anterior 2/3 of palate	Forms roof of oral cavity	—	Greater palatine artery
Soft Palate	Mobile posterior 1/3 of palate; suspended by palatine aponeurosis; ends in uvula	Separates oral and nasal cavities; active in swallowing and speech	See muscles below	Lesser palatine artery
Fauces	Junction between oral cavity and pharynx; bounded by soft palate, arches, and tongue root	Passage for bolus into pharynx	—	—

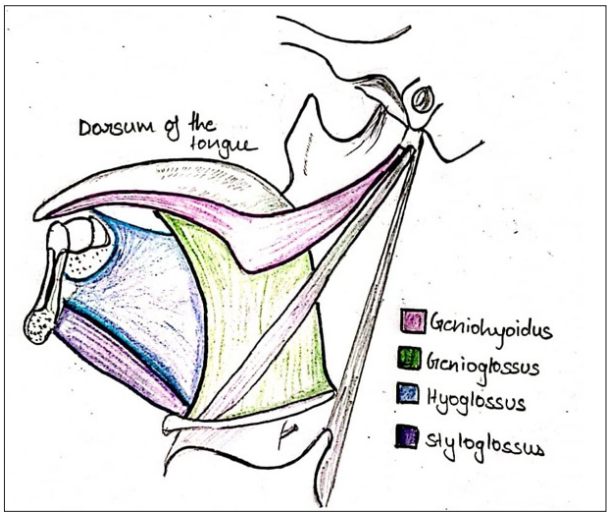
Soft Palate Muscles

Muscle	Origin/Insertion	Function	Innervation
Levator veli palatini	Petrous part of temporal bone & pharyngotympanic tube → palatine aponeurosis	Elevates soft palate during swallowing	Vagus nerve (CN X)
Tensor veli palatini	Medial pterygoid plate, sphenoid spine, pharyngotympanic tube → aponeurosis (via hamulus)	Tenses soft palate; opens auditory tube	Mandibular nerve (CN V3)
Palatopharyngeus	Hard palate & aponeurosis → pharyngeal wall	Elevates pharynx/larynx; depresses soft palate	Vagus nerve (CN X)
Palatoglossus	Palatine aponeurosis → lateral tongue	Elevates posterior tongue; approximates soft palate	Vagus nerve (CN X)
Musculus uvulae	Posterior soft palate → uvula	Shortens and lifts uvula	Vagus nerve (CN X)



Tongue Anatomy

Category	Muscles/Regions	Function	Innervation	Blood Supply
Intrinsic Muscles	Superior longitudinal, inferior longitudinal, vertical, transverse	Shape control	Hypoglossal nerve (CN XII)	Lingual artery
Extrinsic Muscles	Genioglossus, hyoglossus, styloglossus, palatoglossus	Position control	All: CN XII except Palatoglossus (CN X)	Lingual artery
Sensory (Anterior 2/3)	General: Trigeminal (CN V3)	Sensation	CN V3	—
Sensory (Posterior 1/3)	General: Glossopharyngeal (CN IX)	Sensation	CN IX	—



Physiology

Oral Preparatory Phase

A voluntary activity gets a bolus ready for ingestion. Food is broken down by mastication and combined with saliva for solids; for liquids, the bolus is pressed up against the hard palate. Food is manipulated and contained by the cooperation of the tongue, teeth, cheeks, jaw (mastication muscles like trigeminal V_3), and buccinator (facial nerve, CN VII [22].

Oral Propulsive (Transit) Phase

Squeezing the bolus back into the oropharynx, the tongue raises its tip to the hard palate and then pushes posteriorly in succession. In healthy people, this transit usually lasts around one second. Till the pharyngeal reflex starts, the upper esophageal sphincter (UES) stays closed [23].

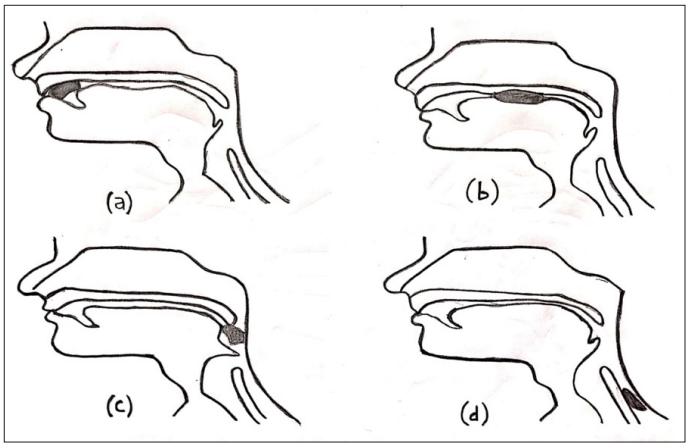
Pharyngeal Phase

When the bolus reaches the palatoglossal arch, sensory afferent fibers from cranial nerves IX and X are activated, sending signals to the brainstem's swallowing center, initiating the involuntary pharyngeal phase.8 The following coordinated motions are used: The nasopharynx is sealed by soft palate elevation (tensor and levator palatini). The airway is shielded by epiglottic closure and laryngeal elevation.

Constrictor muscle pharyngeal peristalsis drives the bolus in the direction of the UES, which instinctively opens to permit passage [24].

Esophageal Phase

The bolus is propelled through the esophagus and into the stomach by primary peristaltic waves during this completely automatic phase. The bolus passes through the esophagus via peristaltic contractions (~3–4 cm/s for 5–6 seconds) following the closure of the UES [23].



Etiology of Tongue Thrusting [25-28].

Category	Examples / Mechanisms
Maturational	Retained infantile swallow reflex; delayed transition to mature swallowing pattern
Habitual	Thumb sucking, prolonged bottle feeding, non nutritive sucking
Anatomic	Macroglossia, narrow palate, dental spacing, open bite
Airway-related	Mouth breathing from enlarged tonsils, allergies, nasal obstruction
Genetic/Neuro	Hypertonic lips/tongue, neuromuscular coordination variants
Other	Dentally induced tenderness, psychogenic habits, rare neurologic/orofacial trauma

Classification of Tongue Thrusting

Classification of tongue thrust by james s. Braner and Holt [29].

Type I Non-Deforming Tongue Thrust

Type II Deforming Anterior Tongue Thrust

Sub Group 1: Anterior open bite
Sub Group 2: Associated procumbency of anterior teeth
Sub Group 3: Associated posterior cross bite

Type III Deforming Lateral Tongue Thrust

Sub Group 1: Posterior open bite
Sub Group 2: Posterior cross bite
Sub Group 3: Deep overbite

Type IV Deforming Anterior and Lateral Tongue Thrust

Sub Group 1: Anterior and posterior open bite
Sub Group 2: Proclamation of anterior teeth
Sub Group 3: Posterior crossbite.

Moyers' Classification [30].

Simple Tongue Thrust

Simple tongue thrust is frequently characterized by an anterior open bite and contraction of the lip and mentalis muscles. In these circumstances, the teeth usually stay in contact while swallowing.

Complex Tongue Thrust

The teeth in complex tongue thrust stay apart when swallowing, and the ailment is frequently linked to allergies, chronic Naso respiratory disorders, and mouth breathing.

Retained Infantile Swallow

A prominent anterior open bite, severe perioral muscle contractions, and masticatory difficulties are frequently associated with retained infantile swallow, which is defined by the maintenance of the newborn swallowing pattern after tooth eruption.

Clinical Features

Tongue thrusting, also known as reverse swallowing or orofacial myofunctional disease, manifests as a unique set of extraoral, intraoral, and functional symptoms.

Extraoral Features

- Lip Incompetence- The inability to maintain closed lips at rest, which causes a significant interlabial gap, is a common sign of lip incompetence in those who thrust their tongues [31,32].
- Hyperactive Mentalis Muscle- During speech or swallowing, compensatory overactivity of the mentalis muscle is frequently seen as the lower facial muscles contract to help close the lips [31].
- Mouth Breathing- In about 38% of cases, mouth breathing is a common observation in these patients [31].
- Increased Lower Facial Height- Increased anterior facial height can result from prolonged open-mouth posture and orofacial imbalance, which makes the lower third of the face appear longer [32].

Intraoral Features

- **Anterior Open Bite:** A common dental symptom is an anterior open bite, which is brought on by the tongue repeatedly pressing up against the incisors [31].

- **Proclined Upper Incisors and Increased Overjet:** Constant tongue pressure during rest and swallowing causes proclination and severe overjet in the anterior teeth, especially the maxillary incisors [31].
- **Dental Spacing and High-Arched Palate:** Due to changed tongue pressure and inappropriate maxillary expansion, prolonged tongue thrusting can cause anterior tooth spacing and the formation of a narrow, high-arched palate [32].
- **Inefficient Swallowing:** Patients frequently exhibit jerky or disorganized swallowing motions, where the tongue advances rather than rises to the palate as it would during a typical swallow [33].

Periodontal Changes

- **Gingival Inflammation:** Food stagnation and plaque retention, particularly in the front region, might be encouraged by open bites and a weak oral seal, raising the risk of localized gingivitis [34].
- **Labial Gingival Recession:** Proclination of the anterior teeth and repeated tongue pressure can cause gingival recession along the labial surfaces, especially in the maxillary arch [34].
- **Increased Plaque and Calculus Formation:** Due to poor salivary cleansing and disrupted oral airflow, patients who have mouth breathing and defective tongue posture are more likely to develop calculus and plaque [34].

Diagnosis

- Clinical History & Visual Assessment The diagnosis usually starts with a thorough oral history that includes behaviors that contribute to abnormal swallowing patterns, such as extended thumb-sucking, pacifier use, and chronic mouth breathing [4].

Standardized Rating Tools

- In research involving pediatric populations, the Tongue push Rating Scale (TTRS) has shown good content validity and great inter- and intra-rater agreement, making it a validated and reliable tool for measuring the severity of tongue push during swallowing [35].

Simplified Clinical Test-Payne Technique

- Patients are instructed to swallow a little volume of water while maintaining a relaxed lip posture (such as smiling) as part of a practical in-office test [36].

Diagnostic Considerations for Periodontal Assessment

Patients suspected of tongue thrusting should have a thorough periodontal examination, which should include:

- Probing pocket depth measurement to evaluate the subgingival periodontal condition, particularly in the area closest to the anterior incisors where tongue pressure is highest [37].
- Gingival recession assessment focusing on the mandibular and maxillary incisor labial surfaces, where tongue thrusters most commonly experience recession [38].
- Inspection for interdental spacing or diastema especially in the frontal area because of persistent tongue pressure [39].
- Assessment for gingival enlargement particularly in the anterior regions, where disturbed mouth seal and airflow patterns may cause irritation and plaque retention [40].

Impact of Tongue Thrusting on Health and Development

The forward positioning of the tongue during swallowing or rest is known as tongue thrusting, and if it is not treated, it can have a serious negative impact on oral and general health. Because of the constant pressure on the teeth and alveolar bone, it causes dental problems like anterior open bite, incisor protrusion, and narrowed palates [37]. Furthermore, it can affect speech, resulting in articulation problems like lisps, particularly when it comes to sounds like /s/ and /z/ [41]. In addition to affecting craniofacial development and quality of life, tongue thrusting is associated with orofacial muscular imbalance, irregular swallowing habits, and even sleep-disordered breathing in children [42]. In order to avoid long-term consequences, early diagnosis and interdisciplinary management are essential [43].

Conclusion

Often disregarded as a harmless behavior, tongue thrusting can have a major impact on periodontal health by causing gingival recession, malocclusion, and increased tooth movement. To avoid long-term periodontal problems, this issue must be identified and treated early. Correcting tongue posture, lowering damaging stresses on the periodontium, and promoting improved oral health can all be achieved with a multidisciplinary approach that includes speech therapists, orthodontists, and dentists.

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