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RESEARCH ARTICLE

TONGUE THRUSTING ORAL HABIT - A REVIEW

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Abstract

Tongue thrusting is a condition in which the tongue is observed thrusting between, and the tooth do not close in centric during deglutition. Tongue thrust is an oral habit pattern related to persistence of the infantile swallow pattern during childhood and adolescence and thereby produces protrusion of anterior tooth segment and open bite. Such habits are considered to be normal in children upto the age of 4-5 year. However if these habits persist beyond the eruption of permanent teeth it could lead to various deleterious effect on the teeth. Thus identifying and treating tongue thrusting habit at an early age prevent the development of malocclusion in the future.

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Introduction:-

A repetitive act of behavior is denoted as a habit¹. Oral habits are nothing more than doing repetitive act surrounding oral tissues. Oral habits may be a part of normal development, a symptom with a deep rooted psychological basis that may be the result of abnormal facial growth²

The oral habits can interfere with the growth and normal development of the jaws, favoring the onset of malocclusion and changes in normal swallowing and speech patterns depending on factors such as duration, frequency, intensity, and facial pattern³.

Various oral habits that affect the child's normal growth and well being are mouth breathing, thumb sucking, tongue thrusting, lip biting, or lip sucking and bruxism etc. Among these tongue thrusting is one of the commonly seen one. Thus in light of the above knowledge a humble effort has been made to briefly explain the tongue thrusting and its impact on occlusion.

Tongue thrusting is a condition in which the tongue is observed thrusting between, and the teeth do not close in centric occlusion during deglutition.

Definitions

Braucer (1965) A tongue thrust is said to be present if the tongue is observed thrusting between & the teeth do not close in centric occlusion during deglutition.⁴

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Tulley (1969) Tongue thrust is the forward movement of the tongue tip between the teeth to meet the lower lip during deglutition & in sounds of speech, so that the tongue becomes interdental⁵

Barber (1975) Tongue thrust is an oral habit pattern related to persistence of an infantile swallow pattern during childhood & adolescence & thereby produces an open bite & protrusion of anterior tooth segment.⁴

Incidence And Prevalance

In Infant:

The infantile swallow appears to be a normal characteristic at birth and the tongue thrust characteristic of the infantile swallow decreases between 12 and 15 months as the primary molars erupt. Therefore it has been found that the percentage of tongue thrust patterns among the newly born infants is 97.2% (James Lewis (1965)⁶. While between ages 3 and 5, prevalence can decrease from 55% to 35%.

General Population:

The tongue thrusting habit is known to cause the functional imbalance in the oral cavity, thus possibly causing the development of malocclusion. In India, among the oral habits the highest prevalence rate was registered for tongue thrusting habit i.e 28.8% (PradeepVishnoi et al in 2017)⁷. While it was found that the children at the age group of 5 – 6 years had 82% of tongue thrust patterns (Bell and Hale et al in 1963).

I.Classification of tongue thrust by james s. Braner and Holt

Type I

Associated posterior cross bite⁸

Type II

Deforming anterior tongue thrust

Sub group 1:

anterior open bite

Sub group 2 :

associated procumbency of anterior teeth

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:

Proclination of anterior teeth

Sub group 3:

Posterior crossbite

II. Tongue thrust can also be classified as

1. Simple tongue thrust.

Tongue thrust with a teeth together swallow. It is usually associated with the history of digit sucking

2. Complex tongue thrust.

Tongue thrust with a teeth apart swallow. It is usually associated with chronic nasorespiratory distress mouth breathing, tonsillitis and pharyngitis.

3. Lateral tongue thrust

Tongue thrusting on to the lateral aspect

Etology Of Tongue Thrusting

Fletcher has proposed the following factors as being the cause for tongue thrusting.

1. Genetic or heredity factor:

They are specific anatomic or neuromuscular variations in the orofacial region that can precipitate tongue thrust. E.g. hypertonic orbicularis oris⁹

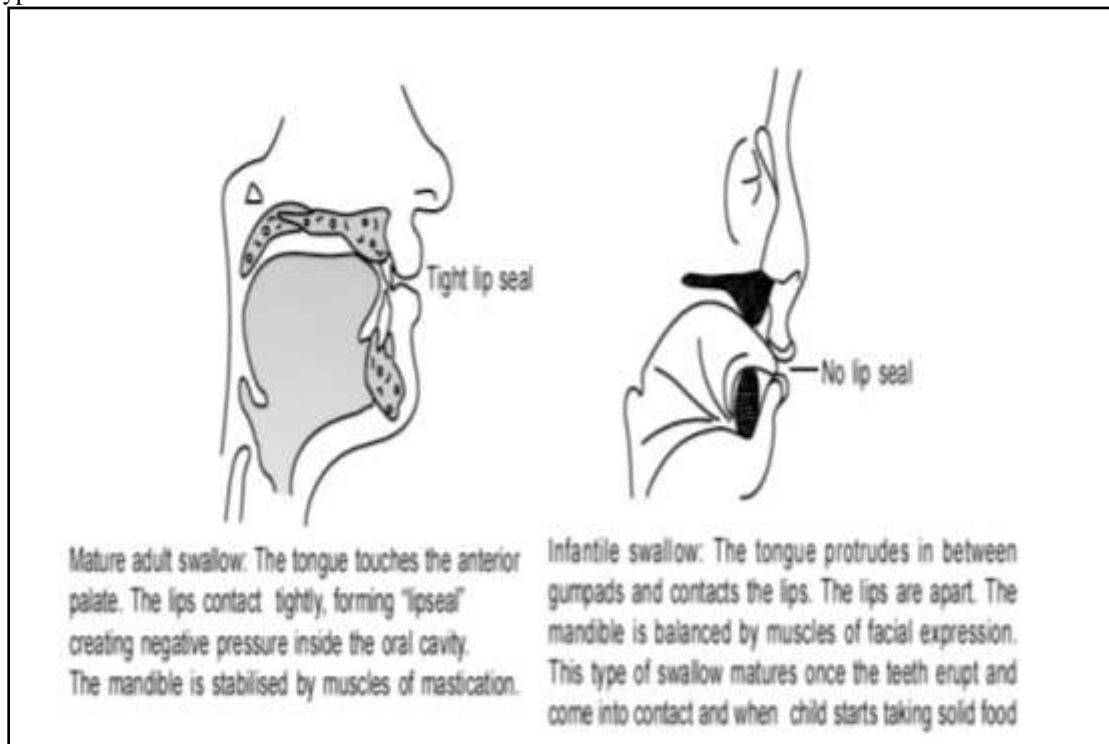


Figure 1:- Mature adult and Infantile swallow.

a). Retained infantile swallow: There is a considerable amount of evidence which suggests that tongue thrust is merely retention of the infantile suckling mechanism. The infantile swallow changes to a mature swallow once the posterior deciduous teeth start erupting. Sometimes the maturation is delayed and thus infantile swallow persists for a longer duration of time. The tongue thrust resulting from the retained infantile swallow has poorest prognosis.

b). Functional adaptability: The tongue can protrude when the incisors are missing. Following the loss of deciduous teeth and prior to full eruption of the permanent incisors, there exists a natural opening for the tongue. The tip of the tongue may protrude into the open area during swallowing. This may disappear with the eruption of permanent central incisors. The same may happen in the posterior region during transition of deciduous to permanent dentition.

3. Learned behavior (habit):

Tongue thrust can be acquired as a habit. Some of the predisposing factors that can lead to tongue thrusting:

1. Prolonged tonsillar and upper respiratory tract infections
2. Improper bottle feeding
2. Prolonged thumb sucking

4. Infections

Upper respiratory tract infections such as mouth breathing, chronic tonsillitis, allergies, push the tongue forward due to pain and decrease in the amount of space which brings about a tongue thrust swallow it may also be present due to the physiological need to maintain an adequate airway

5. Feeding practices

Feeding practices: Prolonged bottle feeding and improper swallowing pattern has been attributed as one of the etiological factors of tongue thrusting.

6. Mechanical restriction

i) Macroglossia: Large tongue limits the space in oral cavity and forces a forward thrust

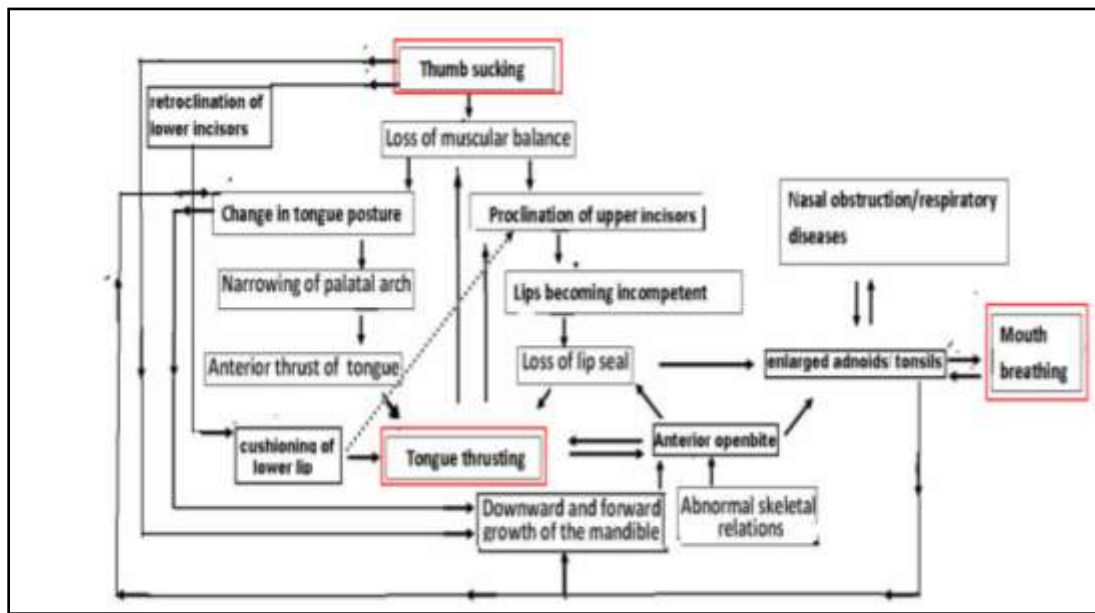
ii) Enlarged tonsils and adenoids: Reduces space available for tongue movement

iii) Constricted dental arches

IV) Neurological disturbances

V) Hyposensitive palate

Children who are forced to discontinue other oral habits like thumb sucking may develop tongue thrust. The simplified way to understand the correlation different oral habits and its effects is seen in the flowchart 1.



Flowchart 1: Correlation of various habits and its effects.

Clinical Features

The clinical features of tongue thrusting habit can be divided into 2 categories, namely extra-oral features and intra-oral features.¹⁰

1. Extra Oral Finding

- i. **Lip posture:** The gap between upper and lower lip is more than normal (greater lip separation) both at rest and in function. In patients with tongue thrust during swallowing, there is lack of compensatory lip activity.
- ii. **Mandibular movements:** The movement of the lower jaw is more erratic during the process of swallowing. There is no correlation between the movements of the tongue tip and the mandible; rather there is more inconsistency between the two.
- iii. **Speech disorders:** It has been observed that various speech disorders such as sibilant distortions, lisping, problems in articulation of /s/, /n/, /t/, /d/, /l/, /th/, /z/, /v/ sounds are likely to occur with tongue thrust children.
- iv. **Facial form:** Tongue thrusting infants are found to have increase in anterior face height.

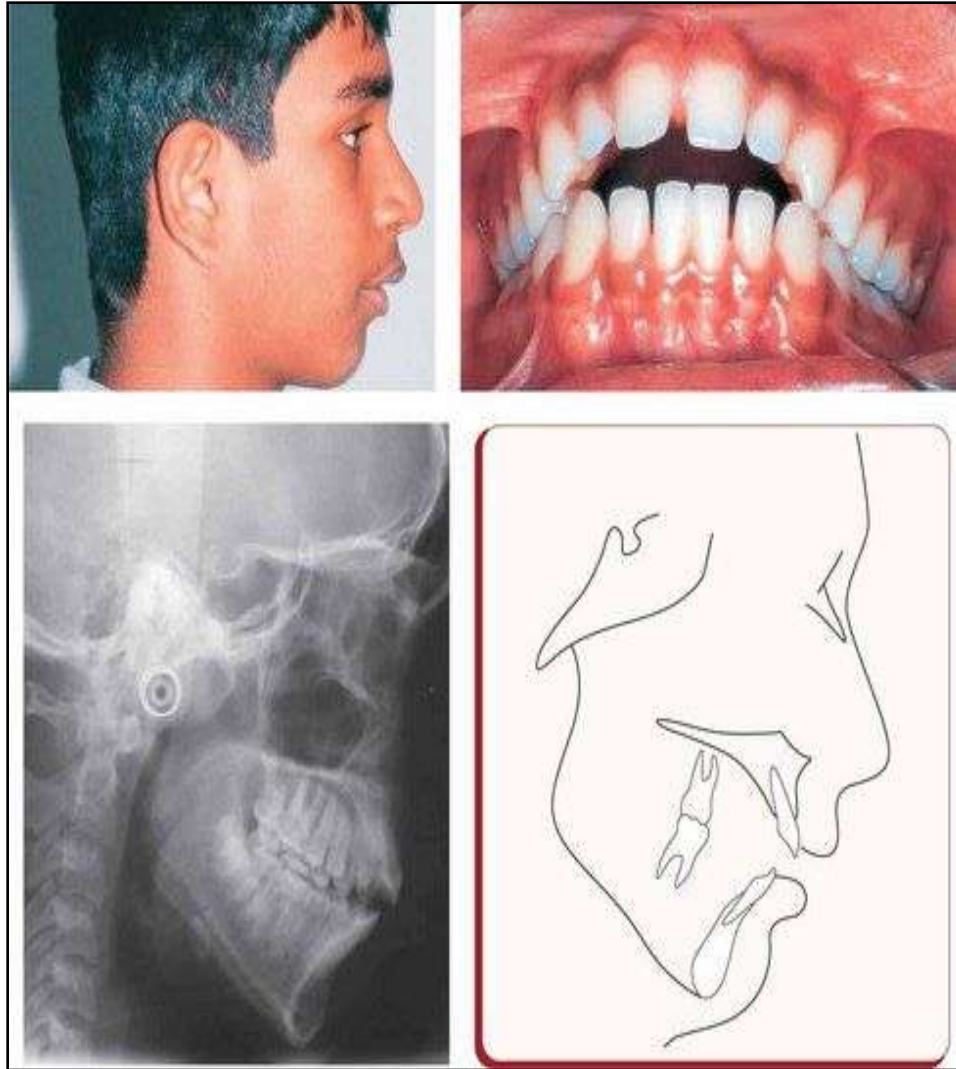


Figure 2:- Extra oral features of tongue thrust.

Intra Oral Findings:

1. **Tongue movements:** The sequences of swallowing are seen to be rough and inconsistent among the tongue thrust children group.
2. **Tongue posture:** In the tongue thrust individuals, the tip of tongue at rest is lower.
3. **Malocclusion**

A) Maxillary features:

1. Maxillary anterior proclination leading to increase in overjet
2. Generalized spacing between the teeth; and
3. Constriction of maxillary arches

B)Mandibular features:

1. Depending on type of tongue thrust, retroclination or proclination of mandibular teeth

C. Intermaxillary relationship:

1. Depending on posture of tongue, anterior or posterior open bite.
2. Posterior cross bite.



Figure 3:- Anterior open bite due to tongue thrust.

Clinical Features Of Various Types Of Tongue Thrust

1. Simple tongue thrust (anterior tongue thrust)

The term 'anterior tongue thrust' or 'open bite anterior tongue thrust' is defined as simple tongue thrust.

Features of anterior tongue thrust:

1. Usually a long face (dolichocephalic)
2. Increased in vertical distance between the anterior nasal spine (ANS) and the menton (Me) points (lower anterior facial height)
3. Not able to maintain lip seal or mouth together when at rest

Intra oral features

1. Flared upper anteriors, proclined and spacing, leading to increased overjet.
2. Depending upon tongue thrust type, retroclined or proclined lower anteriors is observed.
3. Anterior open bite and posterior cross-bites are seen.



Figure 4:- Simple tongue thrust features.

2. Complex tongue thrust (anterior and posterior tongue thrust)

The complex tongue thrust or 'anterior and posterior tongue thrust' is defined as tongue thrust in which teeth are apart during swallow. This happens usually because of chronic naso-respiratory distress, mouth breathing, tonsillitis and pharyngitis.

The following features are seen

1. Protruded bimaxillary
2. Swallow with teeth apart
3. Diffuse or absence of anterior open bite
4. Temporal muscle constriction is absent during swallowing.



Figure 5:- Complex tongue thrust.

Table 1:- Different Between Simple And Complex.

Simple	Complex
1. Open bite is well defined with definite beginning and ending.	1. Open bite is diffuse, ill defined.
2. Mandible is stabilized by muscles of mastication	2. Mandible is stabilized by muscles of lips and cheeks (facial muscles)
3. Facial muscle contraction during swallowing is not seen	3. Facial muscle contraction can be seen during swallowing
4. Proper, secure, posterior occlusal fit.	4. No proper posterior occlusal fit.
5. Usually will have a previous history of thumb sucking.	5. Usually will have history of tonsillitis or airway obstruction.
6. Treatment is simple with less relapse tendency.	6. Treatment is difficult with , more relapse tendency.
7. Occlusal equilibration may be needed.	7. Occlusal equilibration is mandatory.

Lateral Tongue Thrust (Posterior Tongue Thrust)

This type of lateral tongue thrust can be unilateral or bilateral and it depends upon the type of tongue thrust as well.



Figure 6:- Lateral tongue thrust.

Diagnosis**History**

1. Swallowing pattern of parents and siblings need to be checked for any hereditary etiologic factor.
2. Upper respiratory infection or sucking habits needs to be checked
3. Overall abilities, interest and motivation of tongue thrust children during the past and present time should be noted.

Examination

1. The swallowing habit, which seems to be distorted or perverted, should be detected and corrected at the earliest to help in normal development of the palate and dentition
2. When the lip is rest apart, note the posture of the tongue while the mandible is in postural position. It can also be noted in the lateral cephalogram of the mandibular posture.
3. The tongue should be observed properly during various swallowing procedures such as during unconscious swallow; swallow of saliva, water and while chewing.
4. The tongue thrust should be observed carefully in order to determine if the thrusting type is simple, lateral or complex tongue thrust.

The following clinical features should be checked during swallowing

i) Simple tongue thrust

1. Normal tooth contact in posterior region
2. Anterior open bite
3. Lips contraction, mentalis muscle and mandibular elevators.

ii) Lateral tongue thrust

1. Posterior open bite with tongue thrusting laterally
2. Observe the role of the tongue during mastication and speech
3. Intrinsic and extrinsic muscle action of tongue is to be checked.
4. Presence of grimace during swallowing is ascertained.
5. Function of posterior pharyngeal wall and soft palate is noted.

iii) Complex tongue thrust

Generalized open bite with absence of contraction of lip and muscle and teeth contact in occlusion.

Management

The treatment of tongue thrust can be divided into various steps:

1. Myofunctional therapy

Orofacialmyofunctional therapy includes exercises of the cervical and facial muscles for the improvement of proprioception, tone, and mobility.¹¹

Orofacialmyofunctional exercises for tongue thrust:

A) lip exercises:**1.Lip closure and competency exercise:**

Lip should be tightly closing together and the child holds a piece of cardboard or ice cream stick between the upper and lower lip for 5 seconds and repeated 5–10 times. This exercise will improve lip competency.

2. Lip puffing exercise:

The child is asked to force air in-between the lips and teeth and puffing out the lips as much as possible (Fig. 7).



Figure 7:- Lip puffing exercise.

3) Ballooning exercise:

The child is asked to blow into a balloon till its full volume, followed by letting the air release and then repeating again.



Figure 8:- Ballooning exercise.

4.Lip-stretching exercise

The patient draw out the upper lip in a down and out motion till maximal capacity. This is replicate 10 times. This exercise improves the tone of the upper lip.

6.Exercise by wind instruments

The use of wind instruments like trumpet nourish the lip muscles and help in enclose the action of the tongue within a definite area. The blood contribute to that part of the lips coming in contact with the mouthpiece improves due to a stimulating effect. The position of the tongue during the usage of the wind instrument is high in the palate and it stimulates tissues of the lower lip while reducing tension in the upper lip. When a child plays other wind instruments like the flute, the upper, and lower lips are engaged, thereby improving the strength and tone.¹²

B.Tongue exercises

1)Tongue spot

The child is asked to locate the spot behind the upper incisors on the palate. Hold the tongue at the postion for 10 seconds and repeat 10 times.

2)Tongue click

Placing the tongue against the roof of the mouth (at the spot) snap it down, to make a clicking or popping noise.

3)Swallowing thin liquid

The child is asked to take some water in the mouth, at the same time holding the tongue at the spot and Hold for 5 seconds and swallow.

4)4S exercise

4S stands for spot, salivate, squeeze, and swallow. The tongue is taken to the "Spot", behind the maxillary incisors, patient is asked to hold the tongue there as he salivates, followed by squeezing the spot and then swallowing with the teeth brought together while maintaining the tongue at the position. It is advisable to follow this swallowing exercise at least 40 times a day to imbibe this new swallowing pattern¹³

5)Tongue-sideways movement exercise

This exercise involves protruding the tongue out and moving it in extreme right and left directions for 10 seconds in each direction and repeated 10 times on each side.

6)Tongue-rolling exercise

In this exercise, the child is required to roll the tongue by folding its edges toward the midline such that it resembles a taco shell. In this rolled position the child has to protrude the tongue outto the maximum extent possible while holding it for 10 seconds and repeated 10 times.

7)Orthodontic elastics and swallow

This exercise is done with either no. 5 or 6 elastics. The child can place the elastics at the tip of the tongue followed by raising the tongue to touch the spot on the palate. This exercise is to be repeated several times. While continuing to hold the elastic at the spot, the child should salivate, followed by swallowing

8)Hold of tongue blades and push the tongue

In this exercise, the child is expected to keep two tongue blades or ice cream sticks on the incisal edge of lower anterior teeth with 2–3 cm of the blade extending inside the mouth. Then, the child is required to try and lift the tongue blades against the resistance of the firmly held blades (Figure 9 and 10).



Figure 9:- Hold of tongue blades.



Figure 10:- Tongue push exercise.

9)Tongue retraction

In this exercise, the patient is required to touch the back of his tongue against the palate while holding it in this least of 3 seconds. This exercise is to be repeated 5 times at any given instant.

10)Tongue-pull exercise

Gently pull tongue outside and hold it with help of hands by applying light pressure. Variations: pull your tongue up, or down, left, right

12)Monkey face exercise

Ask child to put their tip of tongue over front teeth under upper lips and tip of the tongue covers front teeth below the upper lip. Hold it for 10 seconds. This is a fun exercise and strengthens muscles(Figure 11).



Figure 11:- Monkey face exercise.

14)Orthodontic rubber band exercise

First place an orthodontic rubber band on the tip of the tongue and the tip of the tongue place against the roof behind the upper front teeth. The patient should occlude the teeth in a regular bite. Do not bite forward keep the lips apart and swallow while keeping your lips apart and teeth closed . Two sets of 30 swallow practices are suggested for every day.

15)Lingual immaturity exercises

In this exercise, the patient has to protrude out the tongue and move it in different directions and speed. First, the patient learns to move the tongue in various directions and practices holding it steady. The next level is to move it in circular motions anticlockwise and clockwise, 10 times each. While performing circular motions the tip of tongue should sweep the vermilion border of the lips. The child can do this exercise with the help of a mirror. The difficulty of this exercise can be increased by turning the lips outward/toward the buccal surface and performing circular motions with the tongue.¹⁴

16)Other tongue exercises

i)Vibrating toothbrush

A vibrating toothbrush can be used for brushing teeth. The vibration stimulates tongue movement and acts as a strong sensory input.

ii)Teeth counting exercise

Ask children to count teeth with the use of the tongue. This helps by movements of the tongue in all the directions and challenging yet funny exercise for children (Figure 12).



Figure 12:- Teeth counting exercise.

Appliances To Guide The Correct Positioning Of Tongue.

Pre orthodontic trainer or Tongue trainer: This appliance support in the correct positioning of the tongue with the help of tongue tags. The tongue guards prevent the tongue thrusting when in place. It can also used to correct mouth breathing habit.



Figure 13:- Tongue trainer.

Mechanotherapy

Both removable and fixed appliances can be fabricated. The appliance readjust the tongue so that the dorsum of tongue approximates the palatal vault and the tip of the tongue contacts palatal rugae during deglutition.

Removable appliance therapy:

Removable appliances use for tongue thrusting :

1.Oral screen

1)ORAL SCREEN:

Oral screen is a myofunctional appliance, introduced by Newell in 1912¹⁵. It is a thin sheet of acrylic processed over the occluded, waxed, working casts extending deep into the vestibular sulcus, both labially and buccally, which acts as a screen between the teeth and surrounding musculature.



Figure 14:- Oral screen.

Modification of oral screen

1. Oral screen with breathing holes – Kraus has recommended the use of breathing holes to prevent the breathing difficulties as breathing are more psychological than a real.

2. Oral screen with an embedded metal ring to be used as a muscle exerciser.
3. Double oral screen: a smaller lingual screen is attached to the oral screen with 0.9 mm stainless steel wire that runs through the bite in the lateral incisor region. It is useful in cases where there is simultaneous tongue thrusting and mouth breathing
4. Hotz modification – it has a projection of acrylic or wire to keep the tongue away.
5. Modified or rehak : oral screen is combined with a nipple like projections which protrudes anteriorly which is to be retained by the lips. The natural sucking movements of the patient are used to enhance the effect of the screen.
6. Commercially manufactured polyamide or thermoplastics sheet are also available for (fabrication of oral screen) use in orthodontics.

2.Hawley ‘S Appliance With Tongue Crib

Armamentarium Used:

0.40 guaze wire is used for the fabrication of adamsclasp , labial bow and a crib. Separating media is applied on the cast and is allowed to dry. It is followed by fabrication of acrylic plate using sprinkle on technique. Finishing and polishing of appliance is done



Figure 15:- Hawley ‘s appliance with tongue crib.

Advantages Of Removable Appliances

1. The removable nature of the appliances makes it possible for the patient to maintain good oral hygiene during orthodontic therapy¹⁶
2. Most malocclusion requiring tipping type of the tooth movement can be readily carried out using removable appliances.
3. Many tooth movement like tipping, overbite reduction can be undertaken

Disadvantages Of Removable Appliances

1. As the appliances can be removed patient co operation is vitally important for the success of the treatment.¹⁶
2. Removable appliances are capable of only tipping tooth movement
3. Multiple rotation are difficult to treat using removable appliances.

B.Fixed appliance therapy:

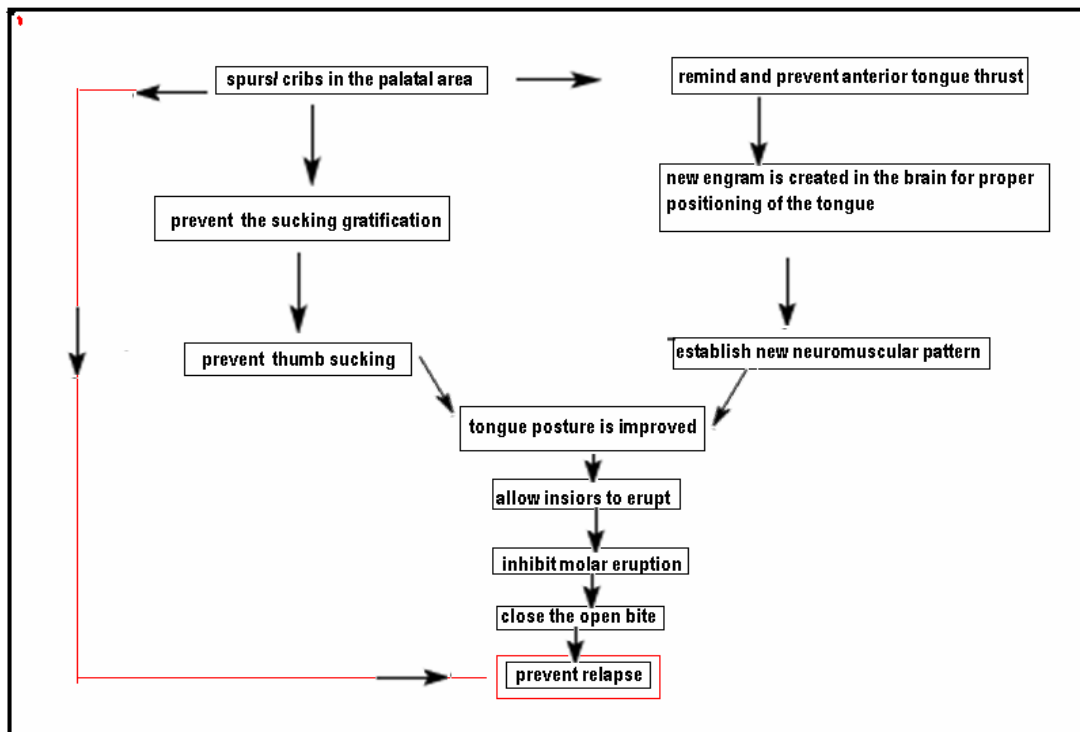
Some of the fixed appliances used in tongue thrusting are:



Figure 16:- Fixed Tongue Crib.

Choice of appliances for tongue crib

1. A well adapted soldered lingual arch wire having sharp spurs, short can now be inserted; protectively the tongue is withdrawn from the abnormal position and placed properly during swallowing
2. Oral screen can be used for cooperative patients.
3. In cooperative patients removable appliances with tongue spike or spur can be used.
4. A fixed crib may be used along with fixed corrective appliance. The flow chart shows the mechanism of this appliances and how they interrupt thumb sucking and tongue thrusting habit.



Flow chart 2:- Mechanism action of habit breaking appliance.

2. Tongue crib with quad helix

Appliance Design: To correct the tongue thrusting habit and resolve the transverse, vertical, and functional deficiencies we used quad helix, made of 0.036 inches stainless steel wire soldered to bands on the first permanent molars¹⁷.



Figure 17:- a) Tongue crib with quad helix b) tongue crib with expansion screw

3. Modified Nance palatal arch appliance

Nance palatal arch appliances in which acrylic button can be used to place the tongue in the correct position.¹⁸



Figure 18:- Nance palatal arch appliances.

4. Modified blue glass appliances

Appliance Design:

The components of modified blue glass appliance were molar bands, stainless steel wire, lingual sheath and a hexagonal shaped acrylic roller.¹⁹

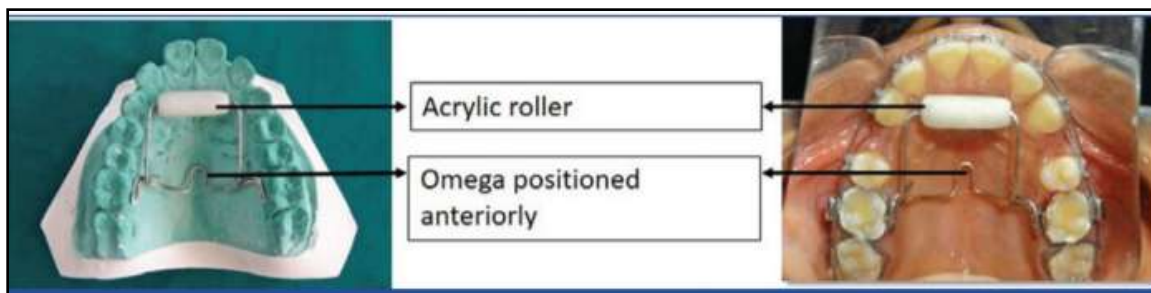


Figure 19:- Modified blue glass appliances.

6. Modified lingual arch with tongue crib

The modified lingual arch with tongue crib was soldered onto the molar bands, it was placed inside the patient's mouth and checked for any discomfort and interference



Figure 20:- Modified Lingual Arch with Tongue Crib.

7. Hybrid Appliance Design

Applied Design:

Hybrid Habit Correcting Appliance (HHCA)(Figure 21) incorporates a tongue bead, a palatal crib and a U-loop which is attached to the molar bands on either sides²⁰



Figure 21:- Hybrid appliance design.

Conclusion:-

The habit of tongue thrusting might lead to long lasting, detrimental effects on a child's life, if not treated in the correct time. As it is rightly said that 'Prevention is better than cure', therefore there is a strong need for the parents to understand the necessity of curbing this harmful deleterious oral habit and also motivate the child. The dentist should also pay more attention to diagnose and rectify this oral habit at the appropriate age in order to improve the overall living of the child in both functional as well as aesthetic aspects.

References:-

1. Shahraki N, Yassaei S, Moghadam MG. Abnormal oral habits: A review. Journal of Dentistry and Oral Hygiene. 2012 May 31;4(2):12-5.
2. Srinath SK, Satish R. Management of thumb sucking habit in a 8 year old child–A case report. International Journal of Science and Research2015. 2013;4(3)
3. Kumari AV, Vivek K, Reddy V, Anitha S. Breaking the Tongue Thrusting Habit: When Compliance Is Essential-A Case Report. World Journal of Research and Review.;5(1):262775.

4. McDonald and Avery's Dentistry for the Child and Adolescent. Edition 9th Chapter 27 ;576-577
5. Yadav A, Kulshreshtha R, Mathur P. Few controversies in orthodontics-Evidence based studies. Indian Journal of Orthodontics and Dentofacial Research. 2018 Jul;4(3):129-37
6. Lewis JA, Counihan RF. Tongue-thrust in infancy. Journal of Speech and Hearing Disorders. 1965 Aug;30(3):280-2.
7. Vishnoi P, Kambalyal P, Shyagali TR, Bhayya DP, Trivedi R, Jingar J. Age-wise and gender-wise prevalence of oral habits in 7–16-year-old school children of Mewar ethnicity, India. Indian Journal of Dental Sciences. 2017 Jul 1;9(3):184..
8. Brauer. JS, Holt TV. Tongue thrust classification. The Angle Orthodontist. 1965 Apr;35(2):106-12.
9. Anand SS, Ravindran V, Kanthaswamy AC. Management of Oral Habits in Children-A review International Journal of Scientific Development and Research (IJS DR). March 2021 IJS DR Volume 6 Issue 3
10. TondonShobha. Text book of Pedodontic. Edition 2nd Chapter-39: 492-493.
11. Homem MA, Vieira-Andrade RG, Falci SG, Ramos-Jorge ML, Marques LS. Effectiveness of orofacialmyofunctional therapy in orthodontic patients: A systematic review. Dental press journal of orthodontics. 2014 Jul;19:94-9..
12. Strayer ER. Musical instruments as an aid in the treatment of muscle defects and perversions. *Angle Orthod.* 1938;9:18–27
13. Khemka S, Thosar N, Baliga S. Oral gymnastics-Way to a harmonious dentition. International Journal of Contemporary Dental and Medical Reviews. 2015.
14. Gil H, Fougeront N. Treatment of tongue dysfunction: rehabilitation for prescribers' practice. Journal of Dentofacial Anomalies and Orthodontics. 2018 Dec 1;21(4):504
15. Balaji textbook of orthodontics edition 5th chapter 24 : 359- 364
16. Ashith MV, Hegde S, Umar D, Amin V, Ajitesh KV. Modified quad helix: a case report. International Journal Scientific Study. 2015 Jan 1;2(10):158-62.
17. Treatment of Proclined Anterior Teeth with Tongue Thrusting Habit Using Double Oral Screen: A Case Report.
18. Gawali PN, Jadhav GJ, Shigli AB, Hegde RJ, Garje PK. Modified Nance Palatal Arch: A Novel Appliance. Journal of the International Clinical Dental Research Organization. 2020 Jul 1;12(2):191.
19. Mithun K, Manohar MR, Shamnur N, Shivaprakash G, Naik P. Treatment of Tongue Thrusting Habit Using Modified Blue Grass Appliance: A Case Report. Journal of Clinical & Diagnostic Research. 2018 Jun 1;12(6)..
20. Raj S, Chandra P. Modified Lingual Arch with Tongue Crib. Journal of Contemporary Orthodontics. 2020 Apr;4(2).