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Thumb Sucking Management in Children

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of Orthodontic

In Partial Fulfillment for the Bachelor of Dental Surgery

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Certification of the Supervisor

I certify that this project entitled "**Thumb Sucking Management In Children**" was prepared by the fifth-year student **Noorhan Hayder Jaafer** under my supervision at the College of Dentistry/University of Baghdad in partial fulfilment of the graduation requirements for the Bachelor Degree in Dentistry.

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Dedication

To those who have always there for me who never leave me even at my worst who have always been the reason of my success to my mother, father and to the biggest supporter my backbone my sister, As well as to all my friends and to everyone who stood by my side, thank you for your constant encouragement and support.

Noorhan...

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List of abbreviations:

Acronym/Abbreviations	Meaning
1st molar	First molar
2nd molar	Second molar
BPA	BisPhenol A
FDA	Food and Drug Administration
NNS	Non-Nutritive Sucking
RURS	Rossum's Universal Robots
SNA angle	Sella-Nasion to A point Angle
SNB angle	Sella-Nasion to B Point Angle
TGuard Aero	Thumb Guard Aero
U.S	United States

Introduction

Oral health is paramount in dentistry. During many decades, research projects have been focusing on oral health with the vast majority of these research topics were being on children. Oral health is essential for normal growth of the face and well-being. Many studies have linked abnormal growth of the jaws and dentition to bad oral habits in children. There are different types of bad oral habits, and the most common is thumb sucking which is about 33% of oral habits (**Jacobson, 1987; Jabur and Nisayif, 2007; Meghalhaes *et al.*, 2012**). However, it has been considered thumb sucking as a normal habit during infancy and it does not have a negative effect on oral health or facial form if this habit is stopped in early age (**Byrd *et al.*, 2006; Dimberg *et al.*, 2013**). Although some studies encourage to stopped the habit at the age of 4 years old (**Hegde and Xavier, 2009**), others permit thumb sucking till the child is getting older (**Byrd *et al.*, 2006**).

There is substantial debate over whether finger sucking is a learnt or natural behaviour (**Jacobson, 1987**). However, if thumb sucking continues, negative consequences would be reflected (**Nasir and Nasir, 2015**). Prolonged thumb sucking has been shown to have deleterious effects on the occlusion of children and adolescents. Primary, mixed, and secondary dentition can all be affected. The effect on the dentition and maxillofacial structures varies between individuals (**Warren *et al.*, 2002; Feștilă *et al.*, 2014; Hatala, 2017**). This condition has negative effects on aesthetics as well as functional issues such as poor speech, chewing, and swallowing (**Kharat *et al.*, 2014**). Malocclusion can be managed in variety of ways by many treatment protocols, including parental and patient advice, the use of a dental appliance, or behaviour modification techniques (**Ling *et al.*, 2018; Neha *et al.*, 2021**).

Aim of the study

- 1- Aim of this study was to explore the effects of thumb sucking on oral health.
- 2- To inspect the appropriate time for intervention.
- 3- The best treatment approach.

Chapter 1: Review of Literature

1.1 Definition

Thumb sucking habit can be defined as a repeated placing of the thumb chronically in varying depths into the mouth (**Gellin, 1978**). It is considered normal during infancy as it gives the sense of warmth and secure, but if this habit persists then it will have deleterious effect on the dento-facial structure and may require orthodontic intervention (**Nasir and Nasir, 2015; Dima et al., 2017; Kumar et al., 2019**).

1.2 Sucking reflex

Sucking is the first harmonious primitive reflex of muscles activity that occurs during infancy, which meets the requirements of both nutritive, as well as psychology in early years of life (**Phulari, 2017**). Sucking is a reflex that occurs during the stage of oral development and is noticed as early as the 29th week of pregnancy and stops about 1-3 ½ years of child life (**Shwetha et al., 2017**). In addition to seek the nutritional need or hunger, the child feels protected and pleased from sucking their tongue or lips (**Phulari, 2017**).

1.2.1 Types of sucking

There are essentially two forms of sucking (**Silva and Manton, 2014**):

1.2.1.1 Nutritive sucking

Related to the process of feeding that provides the basic nutritional requirements for the infant (breast feeding, bottle feeding) (**Carrascoza et al., 2014; Hasan, 2021**):

1- Sucking during breastfeeding

Breastfeeding is linked to many nutritional, psychological, and immunological benefits to the infant in its first year of life (**Butte et al., 2002; Owen et al., 2005; Kramer and Kakuma, 2012**). In addition, the act of breastfeeding influences in a positive way the development of an infant's oral

cavity such as enhancing the shape of the hard palate which results in proper alignment of teeth and fewer problems with malocclusions. Infant sucking stimulates the lactate glands that enhance the flow of milk (**Barbara and Thomaz, 2012**). During breastfeeding, the gum pads are separated, the tongue and lower lip are in constant contact. And there is a rapid protrusive movement of the mandible and alternative contraction and relaxation of buccinator muscle (**Phulari, 2017**).

2- Sucking during bottle-feeding

Unlike breastfeeding bottle feeding lacks mother's warmth (**Singh, 2007**).

There are two types of nipples (**Phulari, 2017**):

1- Non-physiologic/Conventional nipple

In non-physiologic nipple, the milk flows faster than in breastfeeding (**Chen and Xia, 2015**), and releases directly into the throat because the end of the nipple directed against the posterior pharyngeal wall. During bottle feeding, the mandibular movements reduce, the mouth is held wide open and the tongue produces pumping action on the nipple, this will make lip sealing more difficult with increased demand on buccinator muscle mechanism, and more unfavourable pressure exerted on the muscle for opening movement (**Phulari, 2017**), (**Figure 1**).



Figure 1: Conventional/Nonphysiologic nipple (Singh, 2007).

2- Physiologic Nipple

It closely resembles the act of suckling in nature. Because the flat nipple base is flexible and fits the curvature of the lips, lip seal is improved. To squeeze milk, the child must use his tongue and lower jaw. The peristaltic motion of the tongue and cheeks causes milk to trickle down. Nuk sauger nipple is an example of physiologic nipple (Phulari, 2017), (Figure 2).

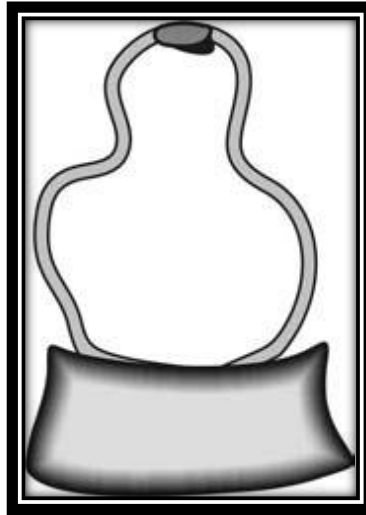


Figure 2: Physiologic nipple (Shivakumar, 2015).

1.2.1.2 Non-nutritive Sucking (NNS)

It is an acquired habit developed by infant in response to the demand for nutrition and to satisfy their emotional needs (Silva and Manton, 2014). NNS habits include thumb, pacifier and finger sucking, and it may persist till 2 years of age then terminate normally with transition to mature swallowing (Subtelny and Subtelny, 1973; Shah *et al.*, 2021).

1.3 Theories to explain the occurrence of NNS thumb sucking habit

1.3.1 Freudian theory (psychoanalytic theory) (Sigmund Freud, 1905)

This theory, believes that oral cavity is function as an oro-erotic zone and the source of pleasure to the infant which obtain satisfy requirement of contact or safety from sucking their thumb or other objects, especially during the first year of infant life and it is considered normal for an infant to perform this habit (Phulari, 2017). If the child is prevented from this act may cause emotional uneasiness in the youngster, leading to the development of any other habit (Johnson and Larson, 1993; Sharma, 2005).

1.3.2 Oral Gratification Theory Sheldon (1932)

When the child does not get enough satisfaction during the period of breast feeding, it will continue as a symptom of an emotional conflict/disturbance in the form of digit sucking (**Phulari, 2017**).

1.3.3 Benjamin theory (1962): Infants' roots or placement reflexes

According to this theory, lead to the development of thumb sucking behaviours. The infant's head moves towards an object that touches his cheeks, which is known as the rooting reflex. The mother presses her breast to the infant's face, as she does during feeding, and the child moves to suckle the milk. This reaction usually lasts until the child is around 7-8 months old (**Gale and Ayer, 1969; Sharma, 2005**).

1.3.4 Learning theory (Davidson, 1967)

Thumb sucking, according to Palermo (1956), is the result of a continuous stimulus-and-reward reaction that will eventually fade unless it becomes an attention-getting method. According to learning theorists, thumb sucking is a learned pattern with no psychological basis. This theory links that sucking habit is derived from the adaptive response. Infant usually uses thumb sucking as a sign of his need for safety or feeding requirements (**Sharma, 2005; Toseska-spasova et al., 2019**).

1.3.5 Oral derive theory (Sears and Wise, 1982)

This theory, suggests that thumb or digit sucking is not due to emotional disturbance but it is due to prolong breast feeding which established very strong oral devices for sucking (**Phulari, 2017**).

1.4 Causes of thumb sucking

1- Normal primitive response that appears early during infancy (**Ferrante, 2015**).

2- This habit provides the sense of self-comfort and safety to the child (Ferrante, 2015), especially in stressful situations (Shahraki *et al*, 2012), emotional distraction (Bayardo *et al.*, 1996), cruel behaviour with child or punishment (Bayardo *et al.*, 1996) or imitation of others (Bayardo *et al.*, 1996). It has been reported that sucking is a typical tendency among children whose working parents (Vijayalakshmi, 2019).

3- Also some children use their finger as a teething device during the period of eruption of primary tooth (Bahreman, 2013).

5- Socioeconomic status

According to (Vijayalakshmi, 2019)

- A child of a poor socioeconomic group had to nurse hard for a long time to receive the nutrition they needed, eventually exhausting the sucking impulse. This theory explains why industrialized areas have a higher rate of thumb sucking than rural ones

- Siblings' number, with increasing the number of siblings the care given by the parents to the children cannot be equalized causing emotional distraction.

- Feeding requirements in poor socioeconomic status family cannot be enough to meet the child requirements.

- Type of feeding (breast or bottle feeding): If a newborn is breastfed for less than 6 months, there is a fourfold chance that an infant may develop a non-nutritive. The link between nursing for a brief period and the development of sucking behaviours appears to be a result of these children's frustration and need for contact.

1.5 Classification of thumb sucking

Thumb sucking is classified by

1.5.1 Cook (1958)

α -group: Palate was pushed vertically and only minor buccal wall contractions were seen.

β-group: Strong buccal wall contractions and a negative oral cavity pressure cause posterior crossbite.

γ-group: Positive and negative pressure alternated; had the least effect on anterior occlusion (Shahnawaz et al., 2015).

1.5.2 Subtenly classification (1973)

Thumb sucking is classified into four types which are grouped from A-D (Subtenly and Subtenly, 1973)

1- Type A: It is the most common type, about 50% of cases. The thumb is placed into the mouth beyond the knuckle. The thumb takes a significant portion of the palatal vault pressing against the palatal mucosa and alveolar tissue. The contact of the thumb with the maxillary and mandible anterior is maintained.

2- Type B: There is no touching between the thumb and palatal vault as the thumb is placed in the mouth and the contact between the thumb and upper and lower anterior teeth is maintained, It is represented by 13-15%.

3- Type C: It is similar to type A as the thumb is inserted into the mouth beyond the first finger joint in contact with the palatal vault and thumb contact is maintained with upper anterior teeth only. It is represented by 18%.

4- Type D: Only the tip of the thumb or thumb nail is being inserted into the mouth and represented by 6%.

1.5.3 Clinical classification of thumb sucking

Based on clinical observation, thumb sucking is classified into 2 types (Vijayalakshmi, 2019):

1.5.3.1 Normal thumb sucking

This includes the period of preschool infant, this stage lasts from the time a kid is born until around the age of three, depending on the child's social development. During this stage, most infants exhibit some thumb sucking,

especially around the time of weaning. And it is considered normal. Phase 1 (Vijayalakshmi, 2019).

1.5.3.2 Abnormal thumb sucking

- **Physiological thumb sucking:** This stage continues from 3 to 6 years of age, this persists and forceful sucking becomes obvious, during this period. It merits more serious consideration because the likelihood signals clinically substantial anxiety, and now is the time to address dental issues associated with digit sucking. Occur during the school age. Phase 2 (Vijayalakshmi, 2019).

- **Habitual:** Thumb sucking that continues after a child's fourth year is an issue for dentists. During this phase, a thumb sucking habit may require psychological therapy as well as an integrated approach from the dentist. This stage continues to teenage child. Phase 3 (Shahraki *et al.*, 2012; Vijayalakshmi, 2019).

1.6 Clinical features of thumb Sucking

The effect of thumb sucking could be noticed on (Ramesh *et al.*, 2016):

1.6.1 Finger defects

Thumb appears clean reddened and smaller than normal and it is called dish pan thumb, fibrous roughened callus due to frequent placement and removal of the thumb in the mouth and groove on the thumb may be seen (Ramesh *et al.*, 2016) (Figure 3).

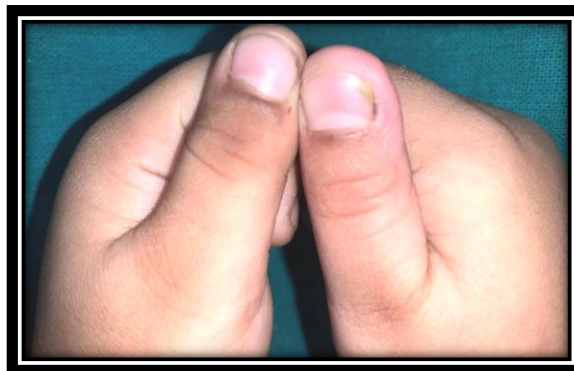


Figure 3: Callous on the right thumb observed (Srinath and Satish, 2015).

1.6.2 Lips

Upper lip is hypotonic while the lower lip is hyperactive, the upper lip appears shorter than normal, and during swallowing the lips are incompetent (**Ramesh *et al.*, 2016**).

1.6.3 Facial form

Due to protrusion of maxillary anterior and retrusion of mandibular anterior teeth the facial profile appears straight or convex with saddle nose (caused by the pressure of thumb during sucking) (**Kamdar and Al-Shahrani, 2015**), Increased lower face height (**Grippaudo *et al.*, 2013**).

1.6.4 Dento-facial effect

Can be seen on the maxilla, mandible and inter-arch relationship (**Silva and Manton, 2014**).

1.6.4.1 Effects on maxilla (Figure 4)

- 1- Proclination and spacing of upper incisors (**Littlewood, 2019**).
- 2- Narrow maxillary arch cause posterior cross bite (**Vinay *et al.*, 2013**; **Miyarsih *et al.*, 2020**).
- 3- Deep palate (high palatal vault) (**Chhabra and Chhabra, 2020**).
- 4- Atypical root resorption of primary central incisors (**Silva and Manton, 2014**).
- 5- Increased crown length of upper anterior (**Silva and Manton, 2014**).
- 6- "Increase in maxillary arch length" (**Kato *et al.*, 2009**; **Shetty *et al.*, 2015**).
- 7- Increased SNA angle (**Phulari, 2017**).
- 8- Counter-clockwise rotation of occlusal plane (**Phulari, 2017**).

1.6.4.2 Effects on mandible (Figure 4)

- 1- Retroclination of lower incisors (**Little wood, 2019**).
- 2- The clinical crown length of lower anterior teeth decreased (**Ramesh *et al*, 2016**).
- 3- Inter molar distance of the mandible increased (**Ramesh *et al.*, 2016**).
- 4- Retrusion of the mandible (**Ramesh *et al.*, 2016**).

5- Decrease SNB angle (Phulari, 2017).



Figure 4: The effects of a persistent digit-sucking habit on the occlusion: the upper incisors have been proclined and the lower incisors retroclined (Littlewood, 2019).

1.6.4.3 Effects on inter-arch relationship

- 1- Asymmetric anterior open bite (Cobourne and Dibiase, 2015), (Figure 5).
- 2- Asymmetric increased overjet (Yemitan *et al.*, 2010; Pădure *et al.*, 2012), (Figure 6).
- 3- Decreased over bite (Mistry *et al.*, 2010).
- 4- Posterior cross bite (Miyarish *et al.*, 2020).
- 5- "Unilateral or bilateral Class II malocclusion" (Lopes *et al.*, 2016).



Figure 5: Anterior open bite due to a thumb sucking habit. Note the asymmetry of the open bite and the crossbite tendency posteriorly (Gill, 2011).



Figure 6: An asymmetrical increase in overjet in a patient with a habit of sucking one finger on the right hand (Littlewood, 2019).

1.6.5 Speech defect

Such as mispronouncing T sound and D sound, lisping, and thrusting out the tongue while talking (**Kumari et al., 2017**).

1.6.6 Tongue

Lower tongue position and the chances for tongue thrust increase with flaring of upper anterior teeth and lack of lip seal (**Phulari, 2017**).

1.7 Factors effect on oral habit

Oral habit depends on three main factors to produce its effects which include:

1.7.1 Duration

Chronic placement of the thumb inside the mouth exceeds 6 hours a day with pressure acting against the teeth or during sleep which have significant malocclusion (**Tanny et al., 2018**).

1.7.2 Frequency

It means how many times the patient places his finger inside the mouth during the day (**Lin et al., 2013**).

1.7.3 Intensity

It is the magnitude of force directed toward the teeth and jaws during suckling (**Bahreman, 2013**).

These three factors are called trident of habit factors, it depends upon the following factors (**Graber, 1972; Sridhar, 2015**):

- 1- Position of the finger in the oral cavity.
- 2- Contractions of orofacial muscle.
- 3- Position of the mandible during suckling.
- 4- Morphology of the skeletal structures.
- 5- Four- six continuous hours of finger force being placed inside the mouth per day, is the less time needed to cause tooth movement.

1.8 Diagnosis of thumb sucking habit

The accurate diagnosis is done by taking a thorough history to determine the frequency, duration, and intensity of the thumb sucking, the pattern of feeding and if there is any other habits like hair pulling. The clinical examination of the child's finger is essential to look for blisters associated with the affected thumb since intense sucking can induce this, the end of the affected finger appears clean, sucking pads or calluses can appear as a result of hyperkeratosis, and abnormal finger shape. Oral examination associated with anterior open bite, proclination of upper incisor and retroclination of the lower incisors due to the thumb's placement behind the upper incisors can also help in diagnosis (**Borrie *et al.*, 2013; Majorana *et al.*, 2015**).

1.9 Management of thumb/finger sucking habit

No treatment is required before the eruption of incisors and if digit sucking habit stopped between the ages 4-5 years, self-correction of malocclusion can be expected but this depends on the severity of malocclusion and other associated factors like the presence of other habits or anatomical variation in the perioral soft tissue (**McDonald, 2010**). If this habit continues beyond the age of 6 years or into mixed dentition or permanent dentition, there is an increased risk for the development of malocclusion which is cannot be corrected by it is self (**Luzzi *et al.*, 2011; Ramesh *et al.*, 2014; Muhammad *et al.*, 2020**).

The treatment can be broadly divided into the following:

1.9.1 Preventive therapy

Early elimination of digit sucking habits is the best and one of the most important treatment options, this is done by feeding the child in natural way by breast feeding, and feeding him whenever the child is hungry. Also prenatal dental education is necessary for the parents (**Marwah, 2014; Majorana *et al.*, 2015**).

1.9.2 Psychological therapy

Most children between the ages of 4 and 8 years who are concerned about their habits merely require reassurance and once this has been accomplished, positive reinforcement and friendly reminders are the most effective remedies. The child should be made aware of the habit, which can be done by emphasizing the benefits of quitting the practice. Negative tactics such as nagging, humiliating, and insulting should be avoided at all costs (**Vijayalakshmi, 2019**). It includes various aids to distract the child's mind away from digit sucking toward toys and games and motivation the child to collaborate and willing to stop the habits. The parents should be counselled to provide more love and care to their children (**Silva and Manton, 2016**). Consultation with a specialist to determine if there is underlying psychological disturbances (**Majorana *et al.*, 2015**).

1.9.3 Reminder therapy

Applied to children who want to discontinue the habit and need some kind of reminder to assist them stop it completely (**Avery and McDonald, 2010**).

19.3.1 Chemical method

This includes uses of nasty flavoured or hot, bitter, sour tasting or foul odour preparation as chemicals fixed on the finger being sucked such as cayenne pepper dissolved in volatile medium, quinine, asafetida (**Vijayalakshmi, 2019**), one of a commercially available product is Femite

(Denatonium benzoate) which is bitter in taste and applied to the child nail or skin while he is sleeping and let dry for 10 minutes (**Krishnappa *et al.*, 2016**).

1.9.3.2 Mechanical method

Another way is by mechanical restraints to prevent direct contact of the finger with the oral cavity (**Bahreman, 2013**). Such as

1.9.3.2.1 Adhesive bandage

Can be applied to the involved finger to prevent thumb sucking or some modification of the child's pajamas can help (**Bahreman, 2013**).

But some of the methods presented above have reported disadvantages. Clinical experiences have disclosed that a bitter solution usually has a little effect (**Alemran, 2000**). The application of adhesive tape may cause sweating or infection and may also have the risk of reducing blood circulation to the thumb (**Shetty *et al.*, 2010**), while the items worn on the hand can easily be removed involuntarily while sleeping. Alteration of the child's pajamas to prevent the movement of hand to mouth usually increases the child's annoyance and wakefulness (**Morley, 1994**).

1.9.3.2.2 Another effective way is by using "RURS' elbow guard" (Figure7)

which is mostly used for mentally retarded patient facing difficulties while making intraoral impression for orthodontic appliance, this extra-oral appliance has advantages as it applies to the elbow joint and produce a sounds and limit the hand movement with the acceptable range of motion, it does not has any effect on speech and chewing activities and does not affect oral hygiene negatively. Unlike fixed intraoral appliances which require co-operation from the patient to maintain oral hygiene, it is easier and less expensive than intraoral habit breaker appliances (**Bengi *et al.*, 2007; Anand *et al.*, 2021**).



Figure 7: Left hand of the patient with RURS' elbow guard in place (Shetty R M *et al.*, 2010).

1.9.3.2.3 TGuard Aero

This product consists of bracelet that can be removed with scissor only and it is available in three sizes: small size for children aged 3 and 4 years, a medium size for ages 5 and 6 years, and a large size for ages 7 years and older. TGuards are made in the U.S. from a Food and Drug Administration (FDA)-listed, medical-grade material, which is bisphenol A (BPA) and phthalate-free. (Soxman, 2021) (Figure 8).



Figure 8: TGuard for thumb (Mink *et al.*, 2003).

1.9.3.2.4 Ace bandage approach

It entails the use of an at-home program called ace bandage to help youngsters with nocturnal finger sucking behaviours. The program entails wrapping an elastic bandage over the elbow every night. As the youngster tires

and falls asleep, the bandage exerts pressure on the digit, causing it to slide out of the mouth (Vijayalakshmi, 2019).

1.9.3.2.5 Use of long sleeve gown at night

This is useful for children who sincerely want to give up the habit and only perform while sleeping. Their night suit's arms have been lengthened so that they can't reach their thumb at night (Vijayalakshmi, 2019).

1.9.3.2.6 Thumb home concept

The concept of a thumb-home is the most recent. A tiny sack is tied around the child's wrist during sleep. It is conveyed to the youngster that, just like a child sleeps in his or her home, the thumb does as well. As a result, the child is prevented from sucking his thumb while sleeping (Vijayalakshmi, 2019), (Figure 9).

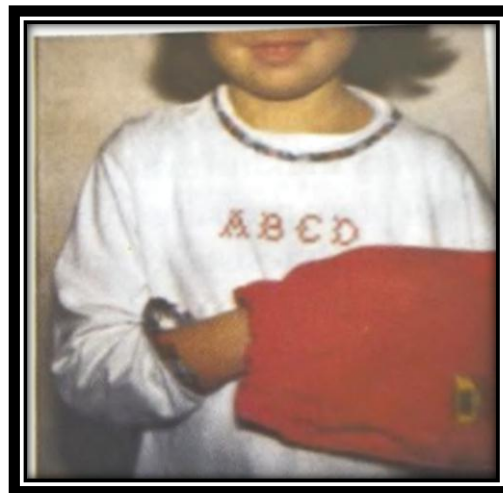


Figure 9: Thumb home concept (Marwah, 2018).

1.9.3.2.7 Hand puppets

The use of hand puppets is currently becoming popular. This is aid in the prevention of thumb sucking. This aids in limiting the harm caused by finger sucking by providing a variety of strategies to address the behaviour in stages (Marwah, 2018; Vijayalakshmi, 2019), (Figure 10).



Figure 10: Hand puppet (Marwah, 2018).

1.9.3.2.8 Band aids

Each night, the youngster can apply band aids on the thumb to remind it to stay out of the mouth.

As the youngster begins to try to manage the habit on his or her own, a discussion with one or both parents should be held to underscore that no one should discuss:

- 1- The issue with the child should not be brought up in the family. These issues will only be addressed by the dentist and the child.
- 2- The insertion of a habit correcting appliance is the following stage if the child is in phase 2 (Vijayalakshmi, 2019).

❖ All these appliances must be used with patient awareness not as a kind of punishment (Bahreman, 2013).

1.9.4 Reward therapy

Is a promise made between the child and parent or dentist, this states that if the child discontinues the habit for a required period he will gain the reward (Proffit *et al.*, 2018).

1.9.5 Appliance therapy

If the previous methods did not succeed in eliminating the habit, different types of removable and fixed appliances terminate the habits which are called habit breakers (Abraham *et al.*, 2013). The use of an appliance to manage oral habits is indicated only if the child desires to prevent the habit (Dima *et al.*, 2017). These appliances must be retained in place for a minimum of 6 months

after sucking has apparently ceased, to ensure the habit has truly stopped (**Gill, 2011**).

***These appliances function in several ways:**

- 1- Make the finger sucking meaningless by interfering with suction so the child does not get real satisfaction from it.
- 2- Each appliance is designed in such a way that prevents the finger from being pressed on the upper incisors to displace them labially that causing open bite or deformation of lips and tongue function.
- 3- The appliance forces the tongue to alter its postural resting position from an extended mass to a nearly normal broader tongue. As a result, the tongue will contribute to apply greater pressure on the buccal segments of the maxilla thereby reversing the narrowing of maxillary arch caused by abnormal swallowing habit. It also prevented the peripheral portions of the tongue from overlies the occlusal surfaces of the posterior teeth interfering with its over eruption (**Sridhar, 2015**).

1.9.5.1 Types of oral habit breakers

1.9.5.1.1 Removable appliance

It consists of acrylic base with palatal wire embedded in the acrylic, the appliance attaches to upper primary 2nd molars or 1st permanent molars by clasps (**Phulari, 2017**).

Most common removable appliances are:

- ❖ Palatal crib (**Avery and McDonald, 2010**), (**Figure 11**).



Figure 11: Hawley appliance with removable palatal crib (Vijayalakshmi, 2019).

- ❖ Oral screen: It is a functional appliance that forms a mechanical barrier between lips and thumb or tongue. Its effect by switching the pressure of the muscles and soft tissue to the teeth so it is used to retrocline proclined incisors (**Abraham R, 2013; Phulari, 2017**), (**Figure 12**).

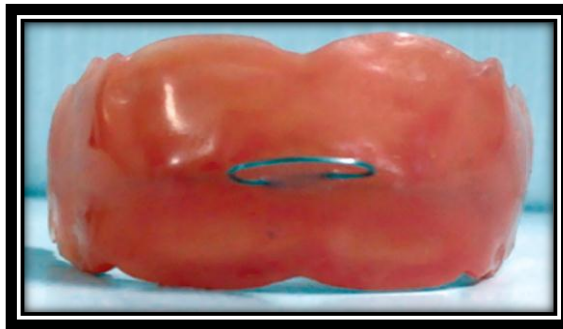


Figure 12: Oral screen (Vijayalakshmi, 2019).

- ❖ The main disadvantage of removable habit breaker is it can be removed by the child at the time when they want to suck their thumb so this is less effective than appliance that cannot be removed (**Noar, 2014**).

1.9.5.1.2 Fixed appliance

It consists of maxillary lingual arch with cribs or rake inserted in the lingual sheath in the anterior region. The lingual arch is fasten to the metal bands fabricated on maxillary deciduous 2nd molars or permanent 1st molars (**Giuntini *et al.*, 2008; Phulari, 2017**).

1- Fixed palatal crib

Is an effective means of arresting thumb sucking and discontinuing finger placement and sucking satisfaction (Avery and McDonald, 2010; Ram *et al.*, 2022) (Figure 13).

Indications of palatal crib (Sridhar, 2015)

- Shouldn't use in children with posterior crossbite.
- Used as a retainer if the children who had not stopped the habit after treatment with quad helix alone, and after maxillary expansion along with quad helix.

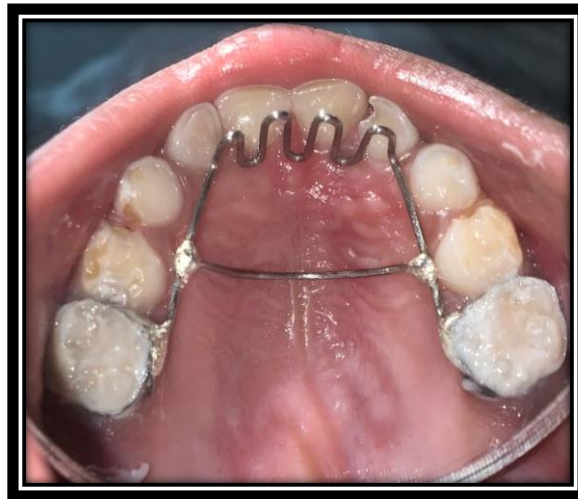


Figure 13: Fixed palatal crib (Shwetha, 2017).

Fabrication and insertion (Sridhar, 2015)

- 1- The bands are fixed on the permanent 1st molars or deciduous 2nd molars.
- 2- A heavy lingual arch (0.40 wire) is bent to 45° to fit passively in the palate and is soldered to the molar bands.
- 3- Another wire is soldered on to the first wire to form a crib or mechanical obstruction for the digit and this should not interfere with the normal occlusion.
- 4- Should not follow the contour of the palate, if the suction and kinesthetic-neuromuscular gratification are to be rendered meaningless.
- 5- Post-insertion instructions should be given after the appliance is cemented and inserted.

- 6- Maintaining good oral hygiene is essential as the appliance collect the food easily and results in halitosis and gingival inflammation.
- 7- The duration of appliance wear is approximately 6 months.
- 8- In about 3 months the habit absences completely which is a good indication against a relapse. In most instances, the habit will abandon after 1st week of appliance wear.
- 9- If there is a tendency toward relapse of the habit, it is essential to leave at least a partial appliance in place for a longer time, or if there is a combination of habits it is necessary to modify the appliance in length duration of the treatment.

2- Bluegrass appliance

This appliance is used as a positive reinforcement to discontinue thumb sucking in children and is recommended by **Haskell and Mink in 1991**. It is indicated for children who want to stop the digit sucking in early mixed dentition period between the ages of 7 to 13 years (**Sridhar, 2015**).

This appliance consists of one roller made from special Teflon material designed to slip over a 0.045 inch stainless steel wire that is soldered to molar bands. The bands can be placed either on the upper 1st molars or on the deciduous 2nd molars. The roller is placed in the most superior aspect of the palate, so due to this position it has minimal effect on the speech and does not interfere with eating, unlike hay-rake and cage-type appliances. The rollers shouldn't be attached to the palate to allow the child rolling them with his tongue. This device works through a counter-conditioning response to the original conditioned stimulus for thumb sucking. To make sure that relapse will not happen the roller should be kept in the mouth for about six months. This appliance is commercially available in either digitally printed bands or in a soldered form (**Greenleaf and Mink, 2003; Shwetha et al., 2014**) (**Figure 14**).

3- Trans –palatal arch with spinning beads

Similar to bluegrass but the segmented bead which is about up to 3 beads makes it easier to clean. This appliance is commercially available in either digitally printed bands or soldered and can be coloured or colourless beads www.nstaro.com (Figure 14).

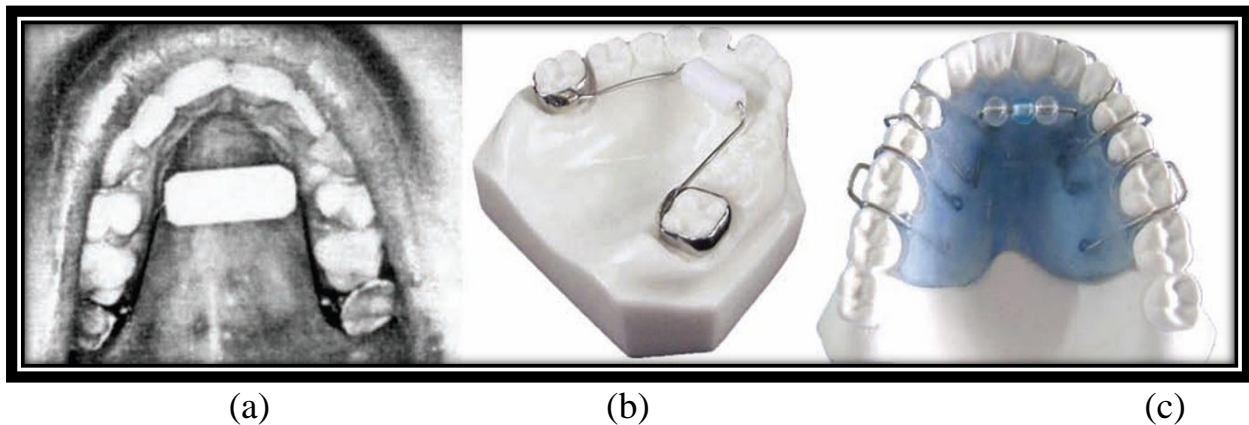


Figure 14: A) Original Bluegrass appliance. (B) New version of Bluegrass appliance. (C) Modified removable type (Haskell, 1991).

4- Quad helix (Figure 15)

It includes the following:

- 1- It is the ideal appliance for correction of posterior crossbite caused by the digit-sucking habit. As the activation of the Quad helix causes expansion of the dental arch so can resolve the crossbite (Vinay et al., 2013).
- 2- It acts as a reminder as the anterior portion with two helixes is placed close to the anterior palatal region (Phulari, 2017).

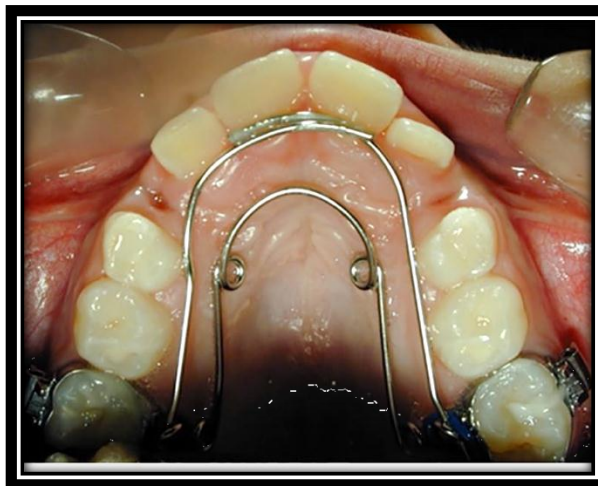


Figure 15: Quad helix appliance (Shah et al., 2021).

5- Rakes/spurs

This appliance can be used for more than one habit; for example tongue thrust and thumb sucking, with The blunt spurs projecting into the palatal vault discourage the habits and improper swallowing habits also (soxman, 2021) (Figure 16).



Figure 16 : Fixed rakes www.smlglobal.com

6- Triple loop connector-Viazis

- It's a basic thumb-sucking habit-control device that may be made by bending three loops in a row (Figure 17).
- It requires little chair side time and can be tailored to cover the whole width of the patient's open bite, making thumb insertion difficult.
- This appliance is effective if there is a substantial open bite and a marked over jet (Vijayalakshmi, 2019).



Figure 17: Triple loop connector-viazis AJODO (Vijayalakshmi, 2019).

7- Bonded lingual spurs

A palatal crib and spurs, according to (Nogueira *et al.*, 2005), are both effective techniques for treating anterior open bite in patients with abnormal swallowing due to lingual pressure (**Figure 18**).

The crib, on the other hand, necessitates consultations and laboratory costs in order to shape and install the equipment. The spur, on the other hand, is affordable and because of its modest size it allows better tongue freedom. BLS is usually bonded with composite resin on the lingual surface of the upper central incisors after prophylaxis with pumice, relative isolation of the region, etching with 37% phosphoric acid and application of adhesive (Nogueira *et al.*, 2005).

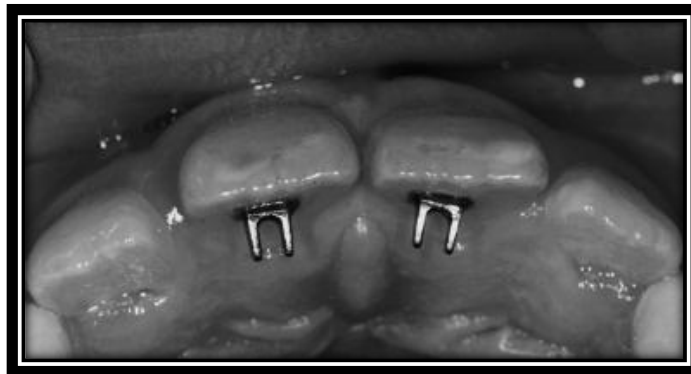


Figure 18: Lingual spurs (Nogueira et al., 2005).

8- Fixed thumb guard

Fixed thumb guard is an effective appliance as it cannot be removed by the patient and is more accepted by the patient as they are less obstructive to the thumb or digit being placed into the mouth (Gill, 2011), (**Figure 19**).



Figure 19: A fixed thumb guard in situ (Gill, 2011).

Chapter 2: Discussion/Comments

Thumb sucking is a relaxing practice that involves placing the thumb into the mouth and rhythmically repeating sucking contact (**Mohammad *et al.*, 2018**).

Thumb and finger sucking is common in infancy and early childhood and, in most cases, is impulsively broken off by the age of five (**Kharat *et al.*, 2014**). Theories attempting to explain this trend contend that children who are breast-fed naturally satisfy their sucking needs and thus have less need to suck a digit, pacifier, or other object (**Kharat *et al.*, 2014**). In toddlers, habit cessation was reported on the first day, whereas it takes a few weeks in 10–12-year-old children (**Diwanji *et al.*, 2013**). As a result, the appliance could be used comfortably in early mixed dentition or even in a younger group (**Diwanji *et al.*, 2013**). If the habit continues for longer time and does not respond to behavioural, reminder therapy and exhibiting dental defect such as posterior cross bite, modified bluegrass appliance can be given with Quad Helix to expand arch. Hence, two-stage treatments can be completed with a single appliance with the correction of habit (**Diwanji *et al.*, 2013**).

Chapter 3: Conclusions and Suggestions

3.1 conclusions

- 1-** Orthodontic intervention for oral habit treatment is usually not required before the eruption of the incisors and during the early years of a child's life because the habit is deemed normal and will go away on its own, but if the habit persists beyond the expected and during the mixed dentition period, or noticed before it is associated with malocclusion then intervention becomes necessary.
- 2-** Appropriate management starts with the prevention of the habit earlier by appropriate education of the parents about the importance of breastfeeding and providing enough care and love to the child. Parents should be aware of the bad effects of oral habits on orofacial structures.
- 3-** Orthodontic treatment alone is not enough to eliminate the habit and psychological consultation with the patient must be included about the importance of the cessation of the habit.
- 4-** For successful treatment, the patient must demonstrate a willingness to stop the habit.

3.2 suggestions

Further study is necessary to evaluate the prevalence of bad oral habits in Iraqi sample and its relation to socioeconomic factors.

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