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# RURS' elbow guard: An innovative treatment of the thumb-sucking habit in a child with Hurler's syndrome

## Abstract

Thumb sucking is the process of sucking on the thumb for oral pleasure. Thumb and finger sucking habits, or nonnutritive sucking, are considered to be the most prevalent of oral habits. Some parents are concerned by thumb sucking and may even try to restrain the infant or child. In most cases, this is not necessary. Most children stop thumb sucking on their own. When older children continue to suck their thumbs, it could mean they are bored, anxious, or have emotional problems such as depression. This article presents a case report of a child with Hurler's syndrome along with thumb sucking/biting habit. Hurler's syndrome, also known as mucopolysaccharidosis I, is a rare condition inherited as an autosomal-recessive trait. It represents the classical prototype of mucopolysaccharide disorder.

A unique appliance to prevent thumb sucking/biting was developed and termed as "RURS' elbow guard," which was successfully used to break thumb sucking of the child with Hurler syndrome. The present report also describes the steps in fabrication of this new habit-breaking appliance, which is also designed to protect the finger from the effects of the sucking habit.

## Key words

Finger sucking, Hurler's syndrome, RURS' elbow guard, thumb sucking

## Introduction

Thumb sucking is a form of nonnutritive sucking occurring as early as the 29th week of gestation. It is seen commonly in infants and peaks at 18–21 months of age.<sup>[1]</sup> Thumb and finger sucking habits, or nonnutritive sucking, are considered to be the most prevalent of oral

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habits, with a reported incidence ranging from 13% to almost 100% at some time during infancy.<sup>[2,3]</sup> The finger-sucking habit, normal in the first 2–3 years of life, may cause permanent damage if continued beyond this time.<sup>[4]</sup> The continuation of oral habits is usually due to physical and emotional stimuli such as boredom, stress, hunger, hyperactivity, sadness, pleasure and various kinds of disabilities. An acute increase in the child's level of stress or anxiety can also account for continuation of the sucking habit.<sup>[5]</sup>

The two theories about finger sucking involve emotional and learned behavior. The emotional theory is Freudian based and relates finger sucking to the oral phase of child development. If sucking continues beyond the oral phase of child development, it becomes a fixation.

Finger sucking at a later stage is usually considered a sign of regression. Both fixation and regression are the signs of emotional disturbance. The learned behavior theory stems from an adaptive response and suggests that sucking is an innate urge in infants and that finger sucking is an outlet for an excess sucking urge because of efficient feeding, either breast-feeding by a nutritionally competent mother or bottle-feeding. When feeding is quickly and efficiently satisfied, the excess sucking urge is expressed as nonnutritive sucking.<sup>[5,6]</sup> This theory has gained favor recently.<sup>[7]</sup>

The prevalence of a digit-sucking habit decreases with age and most children abandon this activity by 3.5–4 years of age. On occasion, individuals may continue to exhibit a digit habit throughout childhood and even into the adult years. Prolonged digit sucking habit may affect the occlusion and dentofacial structures. Frequency and duration of the habit, intensity of the sucking, relationship of the dental arches and the child's state of health are the factors effective in the development of dental and skeletal problems.<sup>[5]</sup>

Reported maxillary changes associated with a prolonged sucking habit are proclination of the maxillary incisors,<sup>[8,9]</sup> increased maxillary arch length,<sup>[8]</sup> anterior placement of the maxillary apical base,<sup>[8]</sup> increased sella-nasion-point A angle<sup>[9]</sup> and decreased palatal arch width. Effects on the mandible include proclination of the mandibular incisors,<sup>[8]</sup> decreased sella-nasion-point B angle and increased intermolar distance. Other dental alterations are increased overjet,<sup>[8,10]</sup> decreased overbite<sup>[8,11,12]</sup> and posterior crossbite.<sup>[13,14]</sup> The response to the changes in the axial inclination of the incisors is anterior rotation of the occlusal plane. Underlying mechanisms of the malocclusion are direct pressure from the digit and reduced intraoral pressure produced by sucking.<sup>[8]</sup> The tongue and lips are also affected by sucking. Lip incompetence and tongue thrust are usually associated with sucking habits.

Because prolonged finger sucking may cause permanent damage to the digits, necessitating corrective surgery, the habit should be broken at an earlier age, before finger deformity or malocclusion have had time to develop.<sup>[9]</sup> Once the decision for treatment has been made, one must then determine what intervention is appropriate. The levels of treatment possibilities that are usually considered are age-appropriate explanations to the child, positive reinforcement, digital reminders and fixed or removable intraoral habit breakers to prevent sealing of the digit against the palate and to

eliminate the pleasure associated with the habit.<sup>[6]</sup>

This article presents a case report of a child with Hurler's syndrome along with thumb sucking/biting habit. Hurler's syndrome, also known as mucopolysaccharidosis I (MPS I-H), is a rare condition inherited as an autosomal-recessive trait. It represents a broad spectrum of disorders due to deficiency of one group of enzymes that degrade three classes of mucopolysaccharides: heparan sulfate, dermatan sulfate and keratan sulfate.<sup>[15]</sup> Hurler syndrome represents the classical prototype of mucopolysaccharide disorder. Its frequency is quite low and the world wide incidence has been reported to be 1:100,000.<sup>[16]</sup>

A unique appliance to prevent thumb sucking was developed and termed as "RURS' elbow guard," which was successfully used to break thumb sucking of the child with Hurler syndrome. The present report also describes the steps in fabrication of this new habit-breaking appliance, which is also designed to protect the finger from the effects of the sucking habit.

## Case Report

An 11-year-old male patient accompanied by his mother reported to the Department of Pedodontics and Preventive Dentistry with a chief complaint of bleeding from the oral cavity since 1 day.

Detailed medical history revealed that he was a diagnosed case of Hurler syndrome, which represented the classic prototype of mucopolysaccharide disorder. He had slightly retarded growth with a short stature for his chronological age. He exhibited frontal and parietal bulges, dolichocephalic head and hypertelorism. His nasal bridge was depressed with a broad nasal tip. The mouth was large and his lips were enlarged and patulous [Figure 1]. He even presented thumb sucking habit [Figure 2] along with the claw hands and scabbing with keratinization of the left thumb [Figure 3]. His parents mentioned that he had been sucking and biting his thumb for a long time and that the habit was provoked with emotional factors like boredom, stress or pleasure. Because of his disability, explanations or positive reinforcement from his parents were not effective in preventing the habit.

Intraoral clinical examination revealed a large tongue with widely placed teeth set in thick gingival tissue. Grade II mobility was seen with maxillary right second primary molar. It was concluded that the cause of



**Figure 1:** Extraoral view of the patient demonstrating clinical features of Hurler's syndrome



**Figure 2:** Extraoral view of the patient exhibiting thumb-sucking habit



**Figure 3:** Patient with "claw hand" and scabbing with keratinization of the left thumb



**Figure 4:** Left hand of the patient with RURS' elbow guard in place

intraoral bleeding was due to pressure created by the thumb sucking habit on the mobile tooth that was about to exfoliate. The maxillary right second primary molar was extracted under local anesthesia using physical restraint. The patient was recalled after 1 week and it was observed that bleeding had stopped.

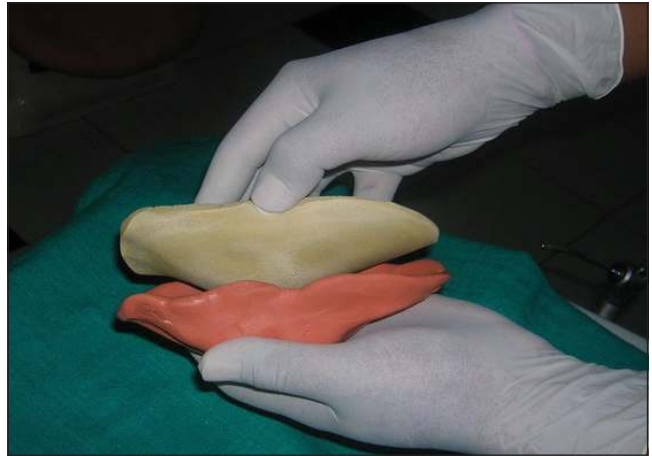
Now, specific attention had to be given to prevent the thumb sucking and biting habit. It was difficult to take an impression of his teeth without applying general anesthesia, and persuasion of the patient to use an intraoral habit breaker appliance seemed impossible because of the patient's mental retardation. However, the behavior was severe enough to cause orthopedic damage and chronic infection of the thumb or finger and intervention was inevitable. It was decided to place an elbow guard to stop the habit as it restricted the thumb from reaching the mouth. An orthopedic surgeon was also consulted before starting the procedure.

An impression of the elbow was made and a cast was obtained. Two layers of modelling wax were adapted to the cast, which acted as a spacer. Acrylization was performed using self-cure acrylic. The spacer was removed and was replaced by a layer of sponge for cushioning and to allow limited movements of the elbow. A cover with velcro strap was stitched over the acrylic elbow guard. This innovative appliance was termed as "RURS' elbow guard" and was delivered to the patient [Figure 4].

When the patient returned for follow-up after 1 month, it was observed that the skin of the finger was healing. His parents mentioned that he easily adapted to the appliance. He was recalled for follow-up at 1-month intervals and he used the appliance for 3–4 months continuously. The appliance was removed at the end of the fourth month when his parents mentioned that the habit was broken.



**Figure 5:** Impression making of the elbow using vinyl polysiloxane putty impression material



**Figure 6:** Cast obtained from the impression



**Figure 7:** Two layers of modelling wax adapted over the cast as a spacer



**Figure 8:** Acrylic elbow guard after removal of spacer

**Steps in fabrication of the “RURS’ elbow guard”**

It was practically difficult to take photographs at every step as the patient was mentally challenged. However, the steps to be followed in fabrication of the RURS Elbow Guard is been illustrated below wherein it was used on a normal patient with finger sucking habit.

Step 1: Child was prepared for impression making. Elbow was kept at 45–60 degree angulation and the impression of the elbow was made using vinyl polysiloxane putty impression material [Figure 5].

Step 2: Impression was poured with dental stone and the cast was obtained [Figure 6].

Step 3: Two layers of modelling wax were adapted over the cast, which acted as a spacer [Figure 7].

Step 4: Acrylization was performed using self-cure acrylic. The spacer was removed and the acrylic elbow guard was trimmed for any sharp edges [Figure 8].

Step 5: The spacer was replaced by a layer of sponge for cushioning and to allow limited movements of the elbow [Figure 9].

Step 6: A cover with velcro strap was stitched over the acrylic elbow guard [Figure 10].

Step 7: RURS’ elbow guard was tried on the cast [Figure 11].

Step 8: RURS’ elbow guard was removed from the cast and delivered to the patient [Figure 12].

RURS’ elbow guard allowed some movement of the elbow but it did not allow the thumb to reach the mouth. The patient was comfortable with the RURS’ elbow guard [Figure 13].

**Discussion**

Numerous studies in the dental literature report on



**Figure 9:** Acrylic elbow guard after placement of a layer of sponge



**Figure 10:** RURS' elbow guard with velcro strap



**Figure 11:** RURS' elbow guard tried on the cast



**Figure 12:** Patient wearing RURS' elbow guard



**Figure 13:** RURS' elbow guard allowing the movement of the elbow but restricting the thumb from reaching the mouth

the prevalence of digit sucking. The results differ from 1.7% to 47.0%, and many of these investigations report thumb sucking as the most common oral habit.<sup>[12,17-19]</sup> Every effort should be made to treat finger sucking if the habit is prolonged, because a finger-sucking habit that is not broken will result in not only serious deformities

and injuries of the digit but also dental malocclusions such as anterior open bite, increased overjet due to flared maxillary anterior teeth and retruded mandibular incisors, posterior crossbite due to transverse maxillary deficiency and tendency to Class II malocclusion. Additionally, the swallowing pattern and speech of the child may be affected.<sup>[12,14,19]</sup> In previous reports, several methods have been demonstrated for the treatment of finger-sucking habits. These methods can be classified as (1) preventive therapy and (2) appliance therapy. Preventive methods include the application of a bitter solution or adhesive tape and wearing a sock, glove, mitten, thumb guard or long-sleeve gown. Appliance therapy includes the use of fixed or removable habit breakers designed to make the sucking habit difficult or unpleasant.<sup>[18]</sup> Age-appropriate explanations to the child and positive reinforcement are other treatment possibilities for digit suckers and are also necessary for the success of clinical management.<sup>[20]</sup>

Some of the methods presented above have a number of reported disadvantages. Clinical experiences have

revealed that a bitter solution usually has a limited effect.<sup>[18]</sup> Application of adhesive tape may cause sweating or infection and may also have the risk of reducing blood circulation,<sup>[21]</sup> while the items worn on the hand can easily be removed involuntarily during sleep. Alteration of the child's pajamas to prevent the movement of hand to mouth usually increases the child's frustration and wakefulness.<sup>[22]</sup> Additionally, the pajamas method can be used only if the habit is prevalent during sleep. With the use of fixed orthodontic habit breakers, decalcification of enamel surfaces, increased tendency for caries and gingival inflammation may occur and removable appliances need patient cooperation. Another disadvantage of intraoral appliances is the deviation in speech and pronunciation.<sup>[18]</sup>

In the case presented, it was decided to place an acrylic elbow guard instead of using an intraoral habit breaker because making an impression of the teeth and applying an intraoral appliance to children with mental retardation is difficult and general anesthesia is often required to make an impression. Additionally, most children with mental retardation have difficulties pronouncing words, and they are usually in need of speech therapy. Therefore, the use of intraoral appliances, which impede speaking even in normal children, is thought to be inconvenient for patients with mental retardation.<sup>[7]</sup> Furthermore, a fixed intraoral appliance may create difficulties during eating, and children with mental disability may try to remove their appliance and may frequently break it. On the other hand, removable appliances require patient cooperation, making it impossible for children with mental retardation.<sup>[7]</sup> Furthermore, caries levels are reported to be higher among disabled children because oral hygiene is usually poor and intraoral habit breakers may make it worse.<sup>[23]</sup>

Applying an appliance on the patient's elbow in the presented cases has some advantages over orthodontic habit breakers. First of all, it does not create difficulties during speech and chewing. In addition, it is easier to make an impression of the elbow than of the tooth since general anesthesia is not required. Preparation of the elbow guard appliance is simple, economic and unlike intraoral habit breakers; this type of appliance does not affect oral hygiene negatively.

Clinical observations revealed that the patients accepted the appliance easily. They perceived it something like a wrist band and thought themselves to

be fashionable and, therefore, they did not try to take it off. The elbow guard was firm enough to prevent the child from removing the appliance, but it was also loose enough to allow limited movement and sufficient blood flow. The elbow guard protected the finger from the harmful effects of biting. Additionally, the patients abandoned the habit in a short time as the appliance prevented the pleasure of sucking and, interestingly, the patient did not begin to suck or bite the thumb of the other hand.

## Conclusions

RURS' elbow guard may provide an alternative to intraoral habit breakers and it may be used successfully. Because of its advantages, this type of extraoral appliance should especially be preferred in the treatment of a mentally retarded child with a digit-sucking habit. Further studies on a sufficient number of mentally retarded or healthy children are required to evaluate the short and long-term effects of the presented method.

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