

Malfunction of the tongue

Part III

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THE ETIOLOGY and classification of the abnormal swallowing habit were fully explained in my previous articles on malfunction of the tongue.¹⁻³ The present article will deal primarily with most of the habits which confront the orthodontist, especially the abnormal swallowing habit. The term *abnormal swallowing* has been used in the past like other terms, such as *perverted swal-*

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lowing and *reverse swallowing*. (The latter is used sometimes by speech therapists who believe that the complete process is in reverse.) We now prefer the term *tongue-thrust swallowing*, which describes the process, is readily acceptable to both parent and child, and does not carry the unfavorable implications of the terms *reverse*, *perverted*, and *abnormal*.

Two important factors in the correction of tongue-thrust swallowing are (1) growth and (2) orthodontic treatment to place the teeth in their proper positions and thus simplify proper tongue placement. As the child grows older, the oral cavity becomes larger and the arches become wider; in normal swallows the tongue goes farther back in the mouth as the hyoid bone drops in growth.⁴ Growth and orthodontic treatment alone will not correct tongue-thrust swallowing, however. In correction therapy the twenty-two muscles that are used in normal swallowing should be re-educated to eliminate the tongue-thrust swallowing habit in order that the patient may unconsciously swallow in the correct manner. In my office this is done by means of a series of lessons that have been developed over a twenty-year period through the contributions and suggestions of many dentists, orthodontists, teachers of cerebral palsy victims, speech therapists, and lay persons interested in the problem. Through a process of trial and error, some lessons have been eliminated, others have been added, and older ones have been improved; at first we had only three basic lessons, for several years we had seven, and today we have some sixteen. By means of these lessons, we correct not only the habit but also the soft tissues that are involved. These include the orbicularis oris, with the muscles whose fibers run into and become part of its structure; and especially the mentalis muscle which is used with an upward thrust in most cases of tongue-thrust swallowing.

Lesson 1 provides for two methods of seating the patient, and we have used both. In the first the patient is seated in a dental chair which is tipped back slightly; in the other method, which is used by speech therapists, the child is seated at a table across from the therapist. I prefer the former seating arrangement (perhaps because I am an orthodontist rather than a speech therapist), but both have advantages. Use of the table method, which probably affords a more intimate and relaxed approach, will release one chair in the operatory.

At this point it should be mentioned that the gag reflex does not play an important part in the retraining of the child. There are several reasons for this. For one thing, the gag reflex is slow or absent in as many normal swallows as in tongue-thrust swallows; thus, the so-called anesthetic throat does not enter the picture. Also, strange as it may seem, most of the gag reflex is not located in the back of the throat, soft palate, etc., as formerly thought; rather, according to Ricketts,⁴ it is located on the back of the tongue. Most of us orthodontists have been taking impressions of the mouth and teeth with the patient tipped forward. When the patient is in this position, the tongue has a tendency to come forward; thus, the back of the tongue, where the gag reflex is located, is exposed and the patient gags more readily. When the patient is tipped backward, the tongue goes distally and, even though the soft tissues may have more

impression material on them, the patient will show less tendency to gag. Since coming back from Ricketts' office, I have made it a standard practice to take all impressions with the patient tipped back in a reclining position. To my amazement, in most cases the gag reflex is completely absent because of the backward position of the tongue. When the patient is in the reclining position, the tongue drops to the back of the throat and the gag reflex is not contacted. Therefore, a slightly backward position should help the patient learn to swallow with the tongue back.

In examinations for tongue-thrust swallowing, I use a water pistol, as suggested by Dr. James P. Kerrigan of Washington, D. C. Two squirts of water are used. Either the patient is told to swallow the water or he will do it unconsciously, and the swallowing pattern is noted. This is done many times. If tongue-thrust swallowing is seen, the habit and the importance of its correction during orthodontic treatment are explained to both the patient and the parent. It is pointed out that, unless this habit is corrected, there will be a disturbance of the teeth after orthodontic correction. The benefits to the soft-tissue profile are also explained.

There are other habits that should be corrected and eliminated before orthodontic therapy and correction of tongue-thrust swallowing are started. The sleeping habit is an important consideration in orthodontic problems, especially in the so-called cross-bite relationship. Since very small children cannot blow their noses, pediatricians train them to sleep on their stomachs for drainage of the nasal passages. This is especially true in the case of allergic patients.⁶ (If a child is carried on the mother's back, as in many primitive societies, the nose drains automatically.) Stomach sleeping becomes a habit and places an undue amount of pressure on the sides of the face. To correct this incorrect (from the orthodontist's point of view) method of sleeping, as the child grows older small blocks of wood may be sewn into the front of his sleeping garment and he will readily learn to sleep on his side and back.

The leaning habit is another one that causes many orthodontic deformities. It also leads to relapses in many close-bite cases in which the incisors have been placed in their correct incisal relationship. The head and neck constitute approximately one-fifth or one-sixth of the body weight of a 12- or 13-year-old child; thus, if the child weighs approximately 100 pounds, the head and neck weigh from 15 to 20 pounds. Orthodontists employ an average of 2 or 3 ounces of pressure in moving teeth. The child who has a severe leaning habit, is exerting about 20 times 16 ounces of pressure, or 320 times as much pressure as used by the orthodontist. This will rapidly depress the posterior teeth and cause an incisal closure. We use a substitute habit to correct this. We instruct the child to lean against his head above the eye-ear plane, instead of against his chin; this gives the mandible a better chance to grow normally into a better position and to maintain correct incisal relationship.

We treat fingernail-biting with the same solution that we use in control of thumb-sucking, except that the solution is slightly weaker.

Tongue-sucking is something that, frankly, we do not see too often. It

occurs in young children and usually corrects itself. This is fortunate, as I know of no method to correct it. Tongue-sucking is usually done by the child when he is asleep. Perhaps posthypnotic suggestions could be used in these cases.

Pencil-biting and foreign-object habits can be explained to the child. This includes lip-biting. Usually the patient's response and cooperation are excellent, as these are daytime habits that can be controlled consciously by the child.

This brings us to the most important problem upon which orthodontists, pediatricians, and psychiatrists disagree—thumb-sucking. The sucking urge is usually present in all mammals, but it is sometimes lacking in the human infant. The sucking urge means survival for the infant. When it is lacking, the infant has to be fed by means of an eye-dropper arrangement. In my practice I have seen one child who was born without the sucking urge and was fed by the eye-dropper method. Dr. Virgil Hanson,⁷ a pediatrician who participated in the panel discussions at the Orange County speech therapists meeting, informed me that he had seen four patients in his practice who were born without the sucking urge. Usually if a child is breast-fed for nine to eighteen months a definite feeding and sucking pattern is developed and, according to many authorities, the finger- and thumb-sucking patterns do not appear. If these habits do develop, they do not continue for any length of time, since the child's sucking urge is satisfied at the breast, where he has to work for his food. (Contrast this to the nipple with many holes in it which permit the milk literally to flow down the infant's throat.) Pediatricians and psychiatrists are opposed to dentists stopping finger- or thumb-sucking habits, because they believe that if this sucking urge is stopped prematurely the child may develop bed-wetting (enuresis) or other habits, such as masturbation, which they think may be worse. From the orthodontist's standpoint, thumb- and finger-sucking should be eliminated as early as possible. Some children respond to a method that the parents may use. Sometimes, however, the habit continues. We have had patients, especially girls, who were still sucking their thumbs at the age of 13 years and had severe callouses on one or both thumbs. There are records of patients who still had the thumb-sucking habit at 18 to 21 years of age. There is no question that this is a powerful force and that it disturbs the dentition. Therefore, steps should be taken to break the sucking habits before the dentition is damaged. The dentist or orthodontist should not attempt to control the habit before the child is at least 2½ years of age, depending upon when the child reaches the age of reasoning, or later in some cases because of psychiatric problems. This will vary from child to child. However, when correction is undertaken, the child must understand that it is being done to help him and not as a punitive measure. Usually by the time a child reaches the age of 2½ years he will not be sucking his thumb in the daytime but will indulge in this pleasurable habit only at night for consolation, for pleasure, and to help induce sleep. If he still sucks his thumb by the time he reaches the first grade, he probably will suck it in the daytime, especially when he watches television. I am indebted to Dr. William D. Curtiss⁸ of Washington, D. C., for his

method of correcting television thumb- or finger-sucking. The mother is instructed to obtain some Para Wax* (the kind used to seal jars of jam or jelly) and to cut it into pieces $1\frac{1}{2}$ inches long and $\frac{3}{8}$ inch wide, which she softens in warm water and gives to the child to chew while he is watching television. Chewing gum should not be substituted, as it is not hard enough. It is impossible to chew wax and to suck the thumb at the same time.

For children who suck their thumbs during the daytime and/or at night, and not just while watching television, I have found the use of the Edwall Habit Kit,† with the cooperation of the parent, almost 100 per cent successful. Now there are many other ways to break the thumb-sucking habit. Dr. Allen E. Bishop⁹ has a unique method, and Dr. Robert Washbon¹⁰ uses a similar one by way of explanation to the child and obtaining his confidence. As a rule, children want to stop sucking their thumbs to please their parents but cannot do so because they do not know what they are doing at night when the subconscious mind takes over. When the habit-breaking technique is properly explained to the child and the parent, frustration does not develop. The Straub or Edwall method, which has been approved by several psychiatrists, must be used every day and night or every night, as the case may be, for a period of six weeks. Six weeks in a young child's life is a long time. Usually, the child will stop sucking his thumb within a few days, but the mother must be cautioned to continue the treatment throughout the full six weeks; otherwise, the first time the child is frustrated by some incident, another child, or a parental scolding the thumb will go back into the mouth. It has been our experience, however, that when the Edwall Habit Kit is used for the full six weeks the habit is completely broken and does not recur. This habit kit is used according to the following directions:

1. *Bandaging the elbow(s) (Figs. 1 and 2)*

The elbow(s) must be bandaged loosely every night before the child retires, during nap periods, while watching television, or at any other time when the child sucks his thumb. The bandage is started approximately 4 or 5 inches above the elbow joint and ends the same distance below it, depending on the length of the child's arm. The bandage is wrapped around the arm progressively, with the bandage edges kept $\frac{1}{4}$ inch apart. The bandage, which should end approximately 2 inches above the wrist and below the shoulder, is pinned at the top, bottom, and center.

This bandage will enable the child to bend his elbow for a short time only. As the bandage tightens when the arm is flexed, the circulation is temporarily slowed, giving an uncomfortable feeling which reminds the child to straighten his arm, thus relaxing the pressure. The bandage must be put on loosely so that it does not stop the circulation. The hand

*Para Wax can be obtained from Safeway Stores.

†Edwall Company, Box 141, San Mateo, Calif.

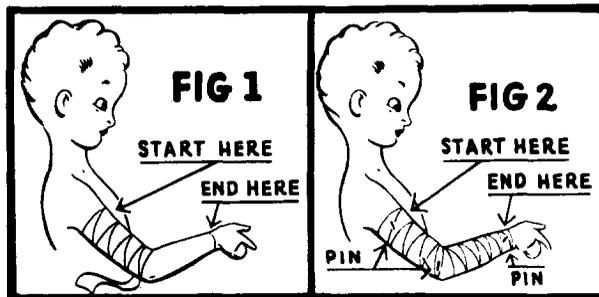
should not change in color (white, pink, or blue); if it does, the bandage is too tight. Bandaging does not inhibit use of the arm; the child may scratch his head, move his pillow, etc.

2. *Habit Reminder Solution*

When the arm bandages are applied, the thumb(s) and/or finger(s) must be painted with the Habit Reminder Solution, which is enclosed with the kit. One without the other is usually not sufficient to correct the thumb-sucking habit. The solution has a disagreeable taste and odor which will help remind the child not to put his thumb in his mouth. The odor reminds him even before he tastes the solution.

3. *Emotional Support*

In breaking a child of the thumb-sucking habit, it is very important to give him a great deal of love and affection. Thumb-sucking is a crutch that the child uses to lean upon, and when this crutch is removed he should be shown a great deal of love and affection by his mother. For example, when he is put to bed, after the bandage and solution have been applied, he should be hugged and kissed and tucked in by his mother. It is important that the mother limit her social activities during this time so that she can be with the child. This will help to prevent any psychiatric problems and will also help to keep the child from replacing the thumb-sucking with some other habit.



I have seen only one case in which bed-wetting developed during this habit therapy. In that case the treatment was stopped and a few weeks later, after the patient had been reoriented, the method was used again with complete success.

If the child is both a thumb-sucker and a tongue-thrust swallower, the thumb-sucking habit is broken first over a six-week period by the method just described. Then a period of two months is allowed to elapse before therapy is instituted to correct the tongue-thrust swallowing. If correction of the swallowing habit is begun too soon after correction of the thumb-sucking habit the child may return to the sucking habit; therefore, this two-month interval is necessary for the surest results.

It is essential that the thumb-sucking habit be corrected before the tongue-thrust therapy is started. If these procedures are followed, I am sure that the orthodontist will see few, if any, relapses and that the patients and their parents will be pleased with the results of the extra efforts. The soft tissues will be brought into balance and will help to keep the teeth in their proper place, and the musculature around the face will improve, giving a better soft-tissue profile. This has been our experience in the past twenty years of habit control.

METHOD FOR CORRECTION OF TONGUE-THRUST SWALLOWING HABIT

On the first visit the patient is seated comfortably and given a mirror, so that he may observe himself while swallowing incorrectly. At this time the tonsils should be checked. If they are large or diseased, the patient should be referred to a nose and throat specialist for examination. Diseased and very large tonsils should be removed, as they make it difficult for the child to bring his tongue back into proper position for swallowing correctly.

The speech therapist examines the speech mechanism, makes a speech evaluation, and notices the position of the tongue during free speech, especially during production of the "S" sound (whether it is a low or a high "S"). If the child makes a high "S" with the tip of the tongue bearing against the upper central incisor, or if he lisps, he may be retrained to make the "S" sound with the tip of the tongue behind the lower incisors. This is optional on the part of the therapist, as a high "S" can be made with perfect safety in tongue-thrust swallowing therapy if the tip of the tongue does not bear against the upper central incisors. Care must be taken to see that the child does not curl his tongue. In explaining incorrect swallowing to the child, be careful that you do not make him feel a bit odd, lest he develop a complex about the habit and become uncooperative. It is suggested that the term *tongue-thrust swallowing*, rather than *abnormal swallowing*, be used in the explanation to the parent and the child, as the parent sometimes associates the word *abnormal* with various unfavorable mental pictures.

LESSON 1. Explain to the child the proper way to swallow. Show him how you swallow. Show him that you do not use any facial muscles of expression and that you use the muscles of the back of the throat and hyoid bone. Explain that your tongue is up against the roof and back of your mouth, and that when you swallow you suck and do not blow. Then allow the child to discover indirectly what he does when he swallows incorrectly. Show him that he keeps his teeth apart and places his tongue between his front teeth, his posterior teeth, or both. Discuss with him what the tongue does in normal swallowing and explain how the lessons are going to strengthen and build tonus in the muscles that he has not used in abnormal swallowing.

When the child becomes conscious of what he is doing wrong, explain what you are going to do to teach him how to put his tongue in the right place. Give him a hand mirror so that he may watch his movements to see that he closes his teeth firmly, that his lips are closed lightly, and that his tongue is against the roof of his mouth and not between his teeth in swallowing. Then

give him the exercises on Card 2, using the words "tact," "tight," etc., to teach him tip placement of the tongue. Tell him that you are going to teach him to put the back of his tongue against the roof of his mouth, but that it is very difficult to do all at one time, therefore, you are going to give him a series of some sixteen distinct half-hour lessons. In the first lesson he is going to be taught to place just the front or anterior third of the tongue in proper position without curling the tongue. In other words, when the tip is placed on the rugae or gum ridges, the entire tongue should come up. If the base remains behind, the tongue curls upward.

Explain to the child the use of the No. 5 or 6 elastics and their placement on the tongue. Tell him that since it is difficult for him to put the back of his tongue against the roof of his mouth in the beginning, you are going to have him hold a little elastic band against the roof of his mouth with the tip of his tongue when he swallows in order to get the front part of the tongue against the palate.

Take a blunt instrument, similar to an amalgam plugger, and press it up against the roof of the mouth where you are going to place the elastic so that the child can form a picture of where his tongue should be. This point is usually on the rugae. Do this several times, even to the extent of producing slight pain, so that the child realizes where the tip of his tongue is to hold the elastics while swallowing.

Tell him also that there are four things which he can do voluntarily in the act of swallowing: (1) close his teeth tightly together in centric occlusion, (2) place his tongue against the roof of his mouth, (3) suck when swallowing, and (4) bring his lips together lightly.

First, teach him to close his teeth together, even if he has to grit them, and then to hold them in that position for some length of time. Next have him practice occluding and relaxing his teeth; then pop or bulge the masseter muscle and have him feel the action with his fingers.

When the child has learned to occlude his teeth, even if he swallows incorrectly, then you are ready to place the elastic (or a sugarless mint if the patient is a young child) on the top of his tongue. Have him hold the elastic about $\frac{1}{2}$ inch posterior from the tip of the tongue; place the plugger with pressure midway between the papilla, which is about 4 mm. from the gingivae of the incisors, for tip placement of the tongue; then press approximately $\frac{3}{8}$ inch posterior from the papilla for the second plugger mark for the elastic. When the child can feel the two spots, then place the elastic. He now knows where to place the tip of the tongue and where to hold the elastic. If you do not want to use the No. 5 or 6 elastics in Lesson 1, use Card 2 (Fig. 3) and practice the first exercise down to and including "My Country 'Tis of Thee," etc.

Have the patient swallow with his teeth closed tightly and with the tongue holding the elastic in place.

If the child is older and you believe that you can add the third exercise to the lesson, teach him that he is to suck rather than blow. Again, show him how he used to swallow abnormally, with his teeth apart, his tongue between his teeth, and blowing rather than sucking.

GREEN CARD**Practice Card For the Correction of Tongue-Thrust Swallowing**

You should practice the following words and sounds, and they should help you place your tongue in position for correct swallowing. If practiced properly a specified number of times daily, it will help you to remember the proper tongue positions.

The following words and sounds will help you place the tip of your tongue on the palate or spot position where it should be for the beginning of correct swallowing. Say them aloud and slowly and feel the tip of the tongue on the palate ridges or spot position. After each line of words swallow.

"Tact, tight, tot, taunt, treat"—swallow.

"Light, lit, lent"—swallow.

"Straight, strict, strut, start"—swallow.

"Dee, doe, dart, day, Dan, dot, dote"—swallow.

"Net, nee, nay, newt, note"—swallow.

"Nun, bun, sun, run, fun"—swallow.

Say: "My Country 'Tis of Thee, Sweet Land of Liberty, of Thee I Sing."

Close the back teeth firmly and say:

"Choo, choo, choo, choo, choo"—swallow.

With the lips open, practice:

"Cha, cha, cha, cha"—swallow.

Practice each line of words slowly and as many times as you can.

Practice clicking, as per instructions, and swallow.

The following sounds will place the middle and back of the tongue high against the roof and back of your mouth. Say them slowly and feel the back of the tongue against the roof of the mouth, and then swallow.

Practice the "K" sounds:

"Kah, kay, key, kye, ko, ku."

Repeat rapidly the "K" as in "K-K-K-Katie," and then swallow.

"Nick, kick, nick, kick, nick, kick, kick, kick"—swallow.

"Ache, ick, ike, oak"—swallow.

Then practice the "G" sounds:

"Ahg, egg, igg, ogg, ugh"—swallow.

"Hag, heg, hig, hog, hug"—swallow.

Practice making the "Ng" sounds through nose for a long time.

"Ahng, ing, ung, ong, sung, sing, hung, king, ring, sung"—swallow.

Practice yawning.—Yawn, yawn, yawn many times a day.

Gargle before you brush your teeth. Practice gargling. These exercises will strengthen the muscles of the back of your throat and mouth and will place your tongue at the back of your throat in proper position for correct swallowing.

Fig. 3.

Thus, the first lesson consists of three steps. First, you are going to teach the child to occlude his teeth firmly in centric; second, you are going to have him put the tip of his tongue up against the roof of his mouth, holding the elastic in place, or do the exercises on Card 2; third, he is to suck when he swallows.

Finally, swallow several times for the child, showing him how he should swallow when he has completed his lesson. Go through this exercise several times. Close the teeth firmly, holding the elastic with the tip of the tongue in its proper place, and then suck and swallow. Tell the child that he is to practice holding the elastic in place with his tongue all day and every day until the next lesson. This is one of the most important lessons, for if the child

can do this successfully he is well on his way to learning to swallow properly. Give him a supply of elastics and instruct him to come back the following week for the second lesson.

Be sure that one or both parents are present for this first lesson, as it is difficult for the child to practice his lessons unless the mother understands thoroughly what he is supposed to do and can direct his practice at home. Instruct the parent to send a note to the child's school, explaining that the child is to hold the elastic with his tongue during school hours.

Also caution the mother not to harass the child or nag him with such phrases as "Why don't you learn to swallow?" or "You can learn to swallow in one lesson." Explain that learning to swallow properly is a gradual process and that she must cooperate by not harassing the child or complaining to him constantly about his habit, otherwise, he will be impervious to her lectures and to the practice lessons.

LESSON 2. In the second lesson check to see what the child has accomplished with Lesson 1. Have him show how he has practiced and how he has swallowed during the one-week interval while holding the elastic in place.

See if he closes his teeth firmly together; show and check the masseter muscle, determine whether or not he is holding the elastic in the right place, and check again with the amalgam plugger so that he feels the two pressure points. Then go over the exercise again. Check to be sure that he is sucking.

In the second lesson, the child is taught to get not only the tip but also the middle third of the tongue, if possible, up against the roof of the mouth. Therefore, we have devised a clicking exercise in which we have the child place his tongue against the roof of his mouth and then suck it down, making a clicking or popping noise.

This is probably the first time that the child has ever had the middle part of his tongue against the roof of his mouth; many children cannot make the clicking noise at first and have considerable difficulty. Here the teacher should use utmost patience to teach him how to click, for the child may have a very narrow arch which makes it difficult for him to place his tongue against the roof of the mouth. If the arch is too narrow, then some orthodontic treatment to widen the arch should be given in conjunction with the lesson.

When the child can click his tongue, have him swallow with his tongue in this clicking position. When he has been successful in placing the tongue in its proper position, explain again how to hold the No. 5 rubber elastic in the proper or comfortable position, as in Lesson 1.

If the child has difficulty in getting the tip of his tongue up against the roof of the mouth, put a tongue blade under the tongue, and press the tip against the palate while the child says "cha." He will then realize where he should put his tongue. Go back to the green card (Fig. 3) for "cha" and "choo." This is optional and can be used for children who have poor coordination, such as semispastic children. This can be done in addition to the elastic technique.

Then have the child occlude his teeth tightly and say "choo." The elastic and pronunciation of the word "choo" with the teeth together do the same

thing—they teach the child to put his tongue properly against the roof of his mouth.

LESSON 3. Explain the rest position of the tongue and the teeth to the child. Tell him that when he is asleep and at all other times except when he is swallowing or chewing food, his teeth are slightly apart or in a rest position. His tongue also maintains a rest position at all times, and the anterior part of the tongue is touching this "spot" position at rest. The tip is definitely against the spot at rest position and is in this position at all times, even when the teeth are apart. All normal swallows hold the tongue here at all times except during deglutition, mastication, and speech. The tongue is not on the floor of the mouth at rest.

Again, use the pressure point on the papilla to show the child where he is to hold the tip of the tongue at all times. Have him concentrate on this spot position. Give him object reminders for holding the tip of the tongue against the roof of his mouth. Use the elastic technique again and again and then go on to the next lesson.

The following exercise is designed to develop the rest position of the tongue:

The following words and sounds will help you place the tip of your tongue on the palate, gum ridges, or spot position where it should be for the beginning of correct swallowing. Say them aloud slowly and feel the tip of the tongue on the palate ridges or spot position. After each line of words swallow.

"Tact, tight, tot, taunt, treat"—swallow.

"Light, lit, lent"—swallow.

"Straight, strict, strut, start"—swallow.

"Dee, doe, dart, day, dan, dot, dote"—swallow.

"Net, nec, nay, newt, note"—swallow.

"Nun, bun, sun, run, fun"—swallow.

Say: "My Country 'Tis of Thee, Sweet Land of Liberty, of Thee I Sing."

Close the back teeth firmly and say:

"Choo, choo, choo, choo, choo"—swallow.

Practice each line of words slowly and as many times as you can.

LESSON 4. In Lesson 4 have the child learn the "2-S exercises,"* consisting of the *spot* and the *squeeze*. The spot is developed in this lesson by producing the "Ch" sound with stress first on such words as those listed below and then in isolation or sound only ("Ch"). This spot should be the rest position for the tip of the tongue. Give a few words (for example, "cha, chair, chin, cheek, chick, chain, chalk").

The squeeze part of the 2-S exercise is done by squeezing the tongue vigorously against the spot with the teeth closed and then squeezing and relaxing three times. The exercise should be repeated many times. Care must be taken to see that the "Ch" sound is produced on the papilla or spot position. This exercise also teaches the child the proper positioning of the anterior third of the tongue and continues to initiate proper swallowing. The stressed "Ch" sound is repeated until the child is sure that he has located the spot. To emphasize, also use the words in Card 2 beginning with the word "tact," etc.

*I am indebted to my therapist, Mr. L. Sack, for the 2-S, 3-S, and 4-S exercises in Lessons 4, 5, 7, and 8.

LESSON 5. When the child has learned to do the 2-S exercise, have him do the "Ch" exercise several times. Have him find the spot and squeeze, and then go into the 4-S exercise.

The four steps for the 4-S exercise are as follows: (1) place the tongue on the papilla or *spot*, which is located by repeating the "Ch" sound, (2) *salivate*, (3) *squeeze*, or press the tongue against the spot, and (4) *swallow*. Remember that the spot is determined by the plugger point or the spot where the "Ch" sound and the words beginning with "tact," etc., are made. The 3-S exercise requires that the child place the anterior part of the tongue on the spot, *salivate*, *squeeze* and *swallow*. This exercise is the same as the 4-S exercise, except for the use of the "Ch" sound. The "Ch" is eliminated for the obvious reason that the child cannot be required to make this sound while practicing throughout the day in school or in the presence of other children.

LESSON 6. To create an awareness of the posterior tongue action used in swallowing, the sound "unka" ("un-ka") is used, with explosive action on the "K" sound. After the child has learned to make the "un-ka" sound properly, he should be drilled on one-syllable words beginning and ending with the "K" sound. For the younger child short stories should be made up, using many words containing "K" sounds. For example, in reading the "Cuddly Bear" story or any story in which there are numerous "C" and "K" sounds, the child should stress only the initial "K" sounds, which include the hard "C" sound.

Have the child practice the following from the Green habit card (Fig. 3):

The following sounds will place the middle and back of the tongue high against the roof and back of your mouth. Say them slowly and feel the back of the tongue against the roof and then swallow.

Practice the "K" sounds:

"Kah, kay, key, kye, ko, ku—K as in Katie"—swallow.

"Nick, kick, niek, kiek, nick, kiek, kiek, kiek"—swallow.

"Ache, ick, ike, oak"—swallow.

Then practice the "G" sounds:

"Ahg, egg, igg, ogg, ugh"—swallow.

"Hag, heg, hig, hog, hug"—swallow.

Practice making the "Ng" sounds through the nose for a long time:

"Ahng, ing, ung, ong, sung, sing, hung, king, ring, sung"—swallow.

LESSON 7. Place the thickness of two tongue blades over the incisal edge of the lower teeth, with the blade protruding into the mouth approximately 1½ inches. Hold tongue blades firmly over the teeth and have patient push the tongue hard against the tongue blades as if to raise them. This is a vigorous exercise which strengthens the back muscles of the tongue and throat. The child may develop soreness in the back of the throat and tongue if this exercise is done too often at first. Then have the child practice the "K" sounds on the green card down as far as the yawning exercise.

LESSON 8. In the eighth lesson, which is concerned with lip control, we teach the child how to whistle by both methods (through the teeth and by pursing the lips). It is surprising how few children can whistle by either method. This is

especially true of girls. Whistling gives the child better control of the facial muscles of expression, the lip muscles, and the orbicularis oris.

The following exercise can also be used: Have the child place his index fingers flat over the risorius muscle on each side and stretch the lip in a lateral direction. Another exercise involves placing the first two fingers of each hand directly beneath the nostril and pulling the lip downward with pressure. The fingers should be wiped to reduce slippage.

LESSON 9. This exercise is a must in all open-bite cases and in children with short upper lips. Have the child grip the mentalis muscle (or chin button muscle) with his right hand and pull the lower lip down by holding the mentalis muscle down with the thumb under the chin and the index finger over the mentalis muscle. Then have him bring his upper lip down to the lower lip, relax it, and repeat again with the count of "1, 2, 3, etc." The child should do this thirty times before and after each meal, a total of 180 times a day. This will lengthen and strengthen the upper lip and will help in normal lip closure, especially when the upper teeth are retracted by orthodontic therapy.

In still another exercise the child holds a business card or a piece of paper the size of a business card between the lips, holding the mentalis muscle in place. Then repeat the preceding exercise.

Everything that teaches the child to control the muscles used in swallowing, whether at rest or during exercise, teaches him control in the swallowing act.

Repeat the exercises in the first seven lessons and correct any mistakes that the child may make.

LESSON 10. Usually a child who has a large, overused mentalis muscle also has a large, deep crevice midway between the chin point and the lip. This area, if examined by the operator's thumb and forefinger, will feel thick and tight.

Lesson 10 is designed to loosen the tissue in this area and help remove the crevice.¹¹ Tell the patient to grasp the mentalis muscle as before, with the lips closed tightly and the upper lip and cheek held firmly against the teeth to resist ballooning. The patient then blows air against the lower lip, ballooning or puffing it out. If this exercise is done correctly, the crevice is puffed out and loosened. By doing the exercise for several months, the patient will loosen the tissue in the crevice; the crevice should lessen and have a tendency to disappear with correction of the orthodontic problem.

At the conclusion of this lesson the therapist shows the child the pink card (Fig. 4), goes over it with him, and gives him one to take home.

LESSON 11. If the child has an open-bite, either complete or partial, or if he is a side-thruster, this lesson, called the "open lip, tongue-back, air-sucking exercise" (sometimes called the "slurp exercise"),* is very important.

Give the child a mirror and instruct him to watch the individual movements that he is to perform at home when practicing this exercise. Tell him to close his teeth tightly together and to keep his lips wide open during this exercise.

*I think that John Barrett, speech therapist of Tucson, Arizona, originated this exercise in part.

PINK HABIT CARD

For the Correction of Tongue-Thrust Swallowing

Directions that you are to follow in swallowing correctly:

1. Close the teeth firmly in contact with one another.
2. Place the tip of the tongue against the palate or spot position.
3. Suck the tongue up flat against the roof of the mouth; then slide the tongue back with sucking action.
4. Swallow.
5. Again close the teeth firmly, close the lips easily with the tongue flat against the roof of the mouth, suck hard, and swallow.

Remember:

Use mirror to watch for facial movements when practicing. Muscles around the mouth are completely relaxed when swallowing.

Never curl the tongue.

Practice on small bits of food and small swallows of liquid. Do not blow but suck when swallowing. Keep the lips closed tightly; use card or wax paper between the lips as a reminder to keep the lips closed.

Repeat the above many times a day and do the following exercises to learn to swallow correctly:

1. Lick the palate or spot position many times each day.
2. Place the tip of the tongue on the palate or spot position and keep it there while studying, playing, watching television, or in school.

NIGHT-TIME SUGGESTIONS:

1. Place the tip of the tongue on the palate or spot position when you go to bed and try to keep it there.
2. When you awaken in the morning, again place the tip of the tongue on the palate or spot position.

Follow the above basic steps of swallowing when you eat breakfast, lunch, snacks, and dinner.

Always think of the four basic steps used in correct swallowing whenever you eat or drink.

Save this card. Keep it with you and study it until you know it by memory.

Fig. 4.

This is one of the few times that the child will practice with the lips open. He is then taught to suck air vigorously and quickly. He is to draw his tongue back at the same time, so that the tip of the tongue touches the back of the palate ridges, and then swallow.

The child is to watch carefully in the mirror to see that his tongue is back, that it remains back, and that it does not touch his teeth at any time or place. This exercise is designed especially for children with complete open-bite and side-thrust swallowing. If the child touches his teeth at any time during the exercise, have him practice until he can do it perfectly throughout the procedure, keeping his tongue against the palate or roof of his mouth and in the back of his throat. He is to practice this exercise with the mirror many times a day. This is one exercise in which the child can see whether he is performing correctly or incorrectly. Be careful that the child does not raise the floor of the mouth and place it between the occlusal surfaces of the teeth.

LESSON 12. For the side-thruster, place a sharp instrument between the premolars and have the child close his teeth tightly and the lips carefully. The instrument should extend beyond the lingual surface of the premolar, and then

the child should swallow. Practice with the child until he can swallow without touching the instrument with his tongue. Have him practice swallowing at home with round toothpicks held between his teeth on both sides until he can swallow without touching them and then intrude them farther and farther up to a reasonable length, until he does not thrust his tongue between the premolars and the canines.

LESSON 13. This lesson is used to refine the normal way of swallowing. First of all, we are going to concentrate on the sucking action, which is difficult for most abnormal swallowers.

Place a little water with a water pistol (or a water syringe may be used), two squeezes at a time, in the child's mouth; then have him close his teeth tightly and swallow with a sucking action. Explain that the middle and back of the tongue squeezes up against the roof of the mouth and moves back as he swallows. In swallowing, the surface of the tongue is pressed against the palate progressively. In other words, the tongue advances to receive the food and then retracts with the food, which is carried to the posterior part of the cavity during mastication, after which the tongue is squeezed up against the palate and the bolus is delivered into the pharynx, much as toothpaste is squeezed from a tube.

This is very important. This lesson is probably the crux of the whole procedure, for if the child does not learn to suck he will have a very difficult time learning to swallow correctly. Have the child practice with liquids and soft foods before meals. He may practice with a cereal (such as rolled oats), Jello, or mashed potatoes to learn the squeezing or toothpaste action.

Also demonstrate to the patient the straw-pull exercise, with the straw at least 1½ inches inside the mouth. The straw is to be held by the tongue against the roof of the mouth with the lips and teeth apart (the only other time that the patient performs an exercise with the lips apart). As the child holds the straw against the roof of the mouth, he sucks in long pulls and swallows. Care must be taken to keep the tongue inside the mouth and the lips and teeth apart. After the child learns to use one straw successfully, double the length of the straw and then bend it to increase the pull.

Now we are ready, in the thirteenth lesson, to go from the sucking to pronunciation of the word "kick" and other allied words that will teach the child to put the back of the tongue up against the soft palate and the uvula in proper swallowing.

Go back to the green card for the "un-ka" "K" sounds, the word "kick," and the "G" sounds. Stop at the line ending in "hog, hug," etc.

If the child does not already have the green card, give him one at this time and have him practice all the words.

LESSON 14 . At the beginning of Lesson 14, review the thirteen previous lessons. Go over the word "kick" again and teach the child to say all the sounds and words on the green card correctly.

Also have the child learn and practice yawning. It is not difficult to do this successfully, and yawning stretches all muscles in the back of the throat

and pulls the tongue into the back of the throat. Have the child practice yawning many times during the day to exercise and strengthen the throat muscles. This exercises the styloglossus, part of the hyoglossus, stylohyoideus, stylopharyngeus, and the pharyngeal muscles or the muscles that help to pull the tongue back and up and close the back of the throat.

Repeat everything on the green card down to the gargling exercise.

Check the words beginning with "tact" to see whether the tongue goes between any of the teeth at any time. Then check the "cha" and "choo" words and all the "K" sounds to "hug."

LESSON 15. Review Lessons 3 through 11 and teach the child to gargle. Gargling also helps to strengthen the muscles in the back of the throat and again pulls the tongue down and backward.

Give the "Ng" sounds at this time and again have the child practice the words and sounds on the green card. This should be a definite speech lesson with the green card. The speech therapist should explain that the "th" in "think" and in "this" and "others" is the only sound made in which the tongue touches the teeth or goes slightly between them. In teaching, avoid these words as much as possible.

If you check the child's tongue when he is reading and saying the sounds properly, you will notice the back of the tongue touching the soft palate for such sounds as "K" and "G." The back of the tongue should be in this position for the completion of proper swallowing.

Also have the child practice saying the word "kick" and close his teeth and swallow so that he may get a mental picture of where the back of his tongue should be with the "K" sounds and in the final position for swallowing. Repeat this many times.

At about this time you should notice a great improvement in the child's facial expression when he swallows; this should be shown and explained to the parents. Show them the complete absence of any facial grimace, as well as the rest position of the orbicularis oris muscle, the levator or corner muscle, the beginning of the relaxation of the mentalis muscle, and the lack of upward movement of the lower lip. Also point out the complete relaxation of the facial muscles around the mouth and the movement of the hyoid bone and throat muscles.

In this lesson have the child place his fingers on the teacher's throat so that he may feel the muscles used by the teacher in swallowing—especially the movement of the hyoid bone and all the muscles attached to it. Then have the child place his finger on his own hyoid bone to feel the movement.

LESSON 16. Have the child look in the mirror and exercise his uvula in order to strengthen the muscles in the soft palate and pharynx and to form a mental picture of the back of the throat.

Usually by this time the child has enough control that he can exercise the uvula and can raise or lower it at will and put his tongue up against the posterior part of the mouth and swallow.

Also have the child repeat the words and sounds on the green card, espe-

cially from the "K" sounds downward, or all the sounds that place the tongue back and against the soft palate and pharynx.

Give the child the mirror again and have him put his fingers very lightly on his lips to see that he does not move the lips or facial muscles when he swallows.

If he cannot do this correctly and if he can feel that he is blowing, then have him go over the sucking exercise in Lesson 13 until he does not move his lips and there is complete absence of pressure over the incisors.

Usually the child will practice this exercise with his finger over his lip, so that when he swallows several times during the day (with his finger in place) he will notice whether he is using either the orbicularis oris or the facial muscles or whether he is blowing forward instead of sucking.

As a partial résumé of the last few lessons, teach the child to yawn, to sip water, to gargle, and exercise the uvula while looking at the mirror.

SUMMARY

These are the basic exercises that we use in teaching the child to swallow properly.

Some of these lessons are very difficult and must be repeated. Instead of terminating with sixteen lessons, some children may have many additional lessons before they learn to swallow correctly. Some of our most difficult cases have had lessons for a year before mastering the problem. Do not overdo this. In other words, if the child seems to respond acceptably, continue until you have taught him to swallow correctly. If after the sixteenth lesson the child lacks interest and fails to absorb the lesson material, give him a rest. Then pick him up at a later date and start over again.

If this re-education of swallowing is carried through, most of our orthodontic problems will be solved as far as the treatment of open-bite cases is concerned. The slight relapses of overbite and overjet will not occur if these conditions are due to the tongue habit.

One should continue to work with the child until he can do all these exercises properly. When he does them unconsciously in swallowing, he will have learned to swallow properly. The acid test is to ask the child to swallow the way he used to. If he cannot do it, then you know that you have taught him to swallow correctly.

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