ABSTRACT: Many children of all ages with swallowing disorders now receive at least part of their swallowing therapy in the public schools. This article presents the various types of swallowing therapy available, including postural changes, sensory enhancements, changes in feeding processes, and exercise programs. Other therapy issues discussed include the relationship of the feeding process to swallowing therapy, the schedule of therapy, and maintenance programs as compared to therapy. Clinicians are also provided with a number of references for additional reading on therapy procedures.

KEY WORDS: swallowing therapy, swallow maneuvers, postural changes, schedule of therapy
recovery pattern or degenerative process. Many children with dysphagia who are treated in the public schools have had some damage to the central nervous system (CNS), such as head injury, cerebral palsy, and so forth, from which they may experience recovery or be able to compensate. A few children may exhibit deterioration in their swallow due to progressive conditions, such as brain tumors, various types of muscular dystrophy, or motor neuron disease, including spinal muscular atrophy. In these latter conditions, children may experience deterioration in their swallowing function over a period of months or years. The speech-language pathologist may be able to identify adaptations such as postural changes or diet modifications for the child to use during swallowing in order to maintain optimal swallowing function for as long as possible. At some point in time, these adaptations usually stop being successful if the child’s condition continues to deteriorate.

**Compensatory Treatment Strategies**

Compensatory treatment strategies can be particularly effective in infants and children because they are generally under the control of the caregiver and thus do not require the child to follow directions (Logemann, 1998). Compensatory strategies include postural changes, sensory enhancement procedures, and changes in the feeding process.

**Postural Changes**

Postural changes generally change the direction of food flow and the dimensions of the pharynx (Drake, O’Donoghue, Bartram, Lindsay, & Greenwood, 1997; Larnert & Ekberg, 1995; Rasley, Logemann, Kahrilas, Rademaker, Pauloski, & Dodds, 1993). These changes are entirely predictable for both children and adults. The effects of postures on swallowing have been clearly documented (Drake et al., 1997; Ekberg, 1986; Larnert & Ekberg, 1995; Logemann, 1993a, 1993b, 1998; Ohmae, Ogura, Kurah, Kitahara, & Inouye, 1998; Rasley et al., 1993; Robbins & Levine, 1993; Shanahan, Logemann, Rademaker, Pauloski, & Kahrilas, 1993; Welch, Logemann, Rademaker, & Kahrilas, 1993). The child must be monitored while eating to ensure compliance with the selected posture throughout each meal. Generally, this monitoring is done by an aide or parent.

The chin down posture improves tongue base to pharyngeal wall contact, narrows the airway entrance, and puts the epiglottis closer to the posterior pharyngeal wall, thus improving airway protection (Shanahan et al., 1993; Welch, Logemann, Rademaker, & Kahrilas, 1993). The posture is therefore appropriate for children with any of the following swallowing problems: (a) a delay in triggering the pharyngeal swallow, (b) reduced laryngeal closure, or (c) reduced tongue base to pharyngeal wall contact. These problems may occur in children with cerebral palsy or head injury.

Lifting the chin up facilitates oral drainage by gravity in children with severe oral tongue problems. If the child has a slowness in laryngeal lifting or airway closure and the clinician is concerned about airway closure problems, the chin up posture can be combined with a breath-hold procedure if the child can follow directions (Martin, Logemann, Shaker, & Dodds, 1993; Ohmae, Logemann, Kaiser, Hanson, & Kahrilas, 1996). The breath-hold helps to protect the airway voluntarily before and during the swallow. In this procedure, the child is asked to hold his or her breath and swallow at the same time. This can be made into a game by asking, “Can you swallow and hold your breath at the same time?”

Head rotation to the damaged side of the pharynx or larynx directs the food down the stronger side and improves laryngeal closure (Logemann, Kahrilas, Kobara, & Vakil, 1989). This posture is appropriate for unilateral pharyngeal wall damage or unilateral laryngeal damage, which can occur after polio, head injury, or structural or surgical damage to the neck. Head rotation is always to the weaker side of the pharynx.

If the child has both oral and pharyngeal asymmetries on the same side, tilting the head or the body to the stronger side may be helpful to direct food down the stronger side by gravity in both the mouth and the pharynx. This posture may be helpful if the child has suffered trauma or surgery to one side of the head and neck.

Lying the child down on his or her stronger side or back changes the effect of gravity on any pharyngeal residue. If the child aspirates after the swallow because of residual food left in the pharynx as a result of reduced pharyngeal contraction or reduced laryngeal elevation, lying down may eliminate the aspiration. The child does not need to be in a fully horizontal posture, but may be elevated to 15 or 20 degrees or even more, depending on the severity of the problem (Larnert & Ekberg, 1995). A child with significant gastroesophageal reflux, which comes up into the pharynx, would not be a good candidate for the “lying down” posture. Some children with cerebral palsy, however, may benefit from this posture.

**Sensory Enhancement Procedures**

Sensory enhancement procedures include such activities as: (a) heightening the taste of the bolus through the use of sour boluses (50% lemon juice, 50% water), (b) thermal-tactile stimulation to heighten oral awareness prior to swallow and alert the CNS that a swallow may be needed, (c) use of particular bolus volumes that may facilitate sensory awareness, (d) use of a cold bolus, or (e) use of a certain viscosity of bolus (Bisch, Logemann, Rademaker, Kahrilas, & Lazarus, 1994; Lazarus et al., 1993; Lazzara, Lazarus, & Logemann, 1986; Logemann, 1989; Logemann et al., 1995; Ylvisaker & Logemann, 1998).

Sensory input to the brainstem and cortex is critical for the initiation of the oral swallow and the triggering of the pharyngeal swallow. Both of these points in the swallow are sensory motor integration points, that is, moments when sensory information sent to the cortex and brainstem is recognized in the CNS as a swallow stimulus and the resulting motor action is initiated. The child’s own hand-to-mouth coordination involved in bringing the food to the mouth also alerts the CNS to initiate oral activity for a swallow in response to the placement of food in the mouth.
Clinical observation and feeling the neck. The initial contraction of the submandibular muscles indicates the onset of the swallow in the mouth. A strong forward and upward movement of the larynx and hyoid indicates that the pharyngeal swallow has triggered. The time between the two events should be approximately 1–1½ seconds (Logemann, 1998). Any longer time indicates that the pharyngeal swallow has triggered. The larynx and hyoid so that pharyngeal triggering can be observed (Logemann, 1998). The initial contraction of the submandibular muscles indicates the onset of the swallow in the mouth. A strong forward and upward movement of the larynx and hyoid indicates that the pharyngeal swallow has triggered. The time between the two events should be approximately 1–1½ seconds (Logemann, 1998). Any longer time indicates delayed onset of the oral swallow, poor oromotor control, or delay in triggering the pharyngeal swallow. Although we can clinically identify a delay in this time period, it is not always easy to identify which of the three kinds of problems is occurring in a given child based on clinical observation and feeling the neck.

Changing the Feeding Pattern

Changing the feeding pattern for the child can make a significant difference in the safety and efficiency of eating (Logemann, 1998; Ylvisaker & Logemann, 1998). Particularly, slowing down the swallows by being sure the child has ample time to clear one bolus before feeding another can be critical. The volume given, the position of the food when placed in the mouth, and the pressure applied by the implement as food is placed in the mouth can also facilitate safer eating. Allowing the child to do self-feeding or lifting the child’s hand toward the mouth as the feeder places food in the child’s mouth may be very important in adding to the child’s awareness that a swallow is needed because something is being brought to his or her mouth. Eliminating auditory or visual distractions in the environment can be helpful. Encouraging dry swallowing between boluses or alternating liquid and solid boluses can be useful in clearing any residual food from the mouth or pharynx before a new bolus is presented.

All of these strategies will increase the length of mealtime. The caregiver must not hurry the child because this only increases the risk of inefficient or unsafe swallowing. When deciding whether to teach a child to self-feed, more than the child’s motor skills must be considered. To self-feed successfully, children must also have the cognitive skills to learn the volume and speed with which to feed themselves. Children can become unsafe swallowers (i.e., they can begin to aspirate) if they are fed or feed themselves too much food too fast.

**DIRECT THERAPY STRATEGIES**

Therapy for swallowing problems is differentiated from compensatory strategies because therapy procedures generally require direction-following and are designed to actually change swallow physiology through active exercise. Exercises in this category include range-of-motion exercises for the lips, tongue, and jaw as well as laryngeal elevation, tongue base retraction and the false vocal folds and arytenoids, resistance exercises to the lips and tongue, and swallowing maneuvers (Kahrilas, Logemann, & Gibbons, 1992; Logemann, 1998; Logemann, Pauloski, Rademaker, & Colangelo, 1997; Neuman, 1993).

Range-of-motion exercises involve stretching/moving each structure(s) as far as possible, holding the structure in the extended position for 1 second, then releasing it. Range of motion for laryngeal elevation uses falsetto voice production. Range of motion for the tongue base involves any or all of the following tasks: pulling the tongue straight back in the mouth, yawning, or gargling (Veis, Logemann, & Colangelo, 1997). Exercising the range of motion of the false vocal folds and arytenoids involves holding the breath with great effort (bearing down) (Martin et al., 1993; Ohmoe et al., 1996). Resistance exercises involve using a tongue blade to apply pressure to the lips or tongue (tip, sides, and/or surface) while the child exerts effort with the tongue or lips against the tongue blade. Both resistance and range-of-motion exercises are used when there is reduced range of motion or reduced strength (resistance) because of structural damage or neurologic damage at the lower motor neuron level. Both of these types of exercise can be given to children as a game by asking, “How strong are your muscles?” These exercises should be done 10 times per day for 5 minutes each time. Parents and aides can, with instruction, conduct these exercises.

Swallowing maneuvers are voluntary strategies that are taught to the child to change the timing or strength of...
selected movements during the oropharyngeal swallow. These require direction-following but can be taught to even young children as a game.

There are four swallow maneuvers. These include two maneuvers to change the timing and level of airway closure (i.e., the supraglottic and super-supraglottic swallows) (Martin, Logemann, Shaker, & Dodds, 1993; Ohmoe et al., 1996), one that changes laryngeal motion and cricopharyngeal opening (i.e., the Mendelsohn maneuver) (Kahrilas, Logemann, Krugler, & Flanagan, 1991), and one that improves pressure generated by the oral tongue and tongue base during the swallow (i.e., the effortful swallow) (Pouderoux & Kahrilas, 1995).

The two airway protection maneuvers are difficult but can be taught to children as young as 2 years with good language function. The directions for the supraglottic swallow are: “Take a breath in, hold your breath, swallow, and keep holding your breath, and then cough.” This maneuver closes the true vocal folds before and during the swallow (Martin et al., 1993).

The super-supraglottic swallow is designed to close the airway voluntarily at the false vocal fold level (i.e., the entrance to the airway) (Martin et al., 1993; Ohmoe et al., 1996). The directions are identical for the supraglottic swallow maneuver except for the addition of effort and bearing down. The directions are: “Take a breath in and hold your breath, bear down hard (like you are going to the bathroom). Keep bearing down and holding your breath while you swallow, then cough.” In both maneuvers, the cough is designed to clear any residual food that may be surrounding the airway. When teaching these two breath-holding maneuvers, the child can be challenged with the question, “Can you hold your breath and swallow at the same time?” This then becomes a game.

The third swallowing maneuver, the Mendelsohn maneuver, is the most difficult and may not be appropriate for children under 8 years of age because of their laryngeal position. Throughout childhood, the larynx gradually descends from a very high position of C1 at birth toward the adult location at C5 to 6 (Logemann, 1993b). The Mendelsohn maneuver requires that the child swallow normally and become aware of the laryngeal motion associated with swallowing. The clinician can point the child’s attention to the movement of the voice box in the throat or of something going forward and up as swallowing occurs. When the child is aware of this movement, the clinician can ask him or her to swallow normally. When the child feels the voice box lift, ask him or her to “grab it” with his or her muscles (not his or her hand) and not let the larynx down but to hold the larynx up for several seconds. The child can watch in a mirror or a surface electromyography (EMG) can be used on the laryngeal elevator muscles to give the child greater awareness of laryngeal elevation.

The duration of laryngeal lifting and its extent is prolonged and improved with the Mendelsohn maneuver and, thus, the duration and width of cricopharyngeal opening is also improved. This maneuver is needed when laryngeal motion and cricopharyngeal opening are impaired, which generally results when there is brainstem damage or direct trauma to the larynx or lower pharynx, causing scar tissue. These are not common problems in children or adults, but occasionally children with brain tumors may exhibit this type of swallowing problem. In some cases, swallow maneuvers are used to enable the individual to swallow food; in others, they can be used as exercises (Lazarus, Logemann, & Gibbons, 1993; Logemann & Kahrilas, 1990).

Instructions for the effortful swallow are quite simple, and it is the easiest of the maneuvers to teach to a child. To do the effortful swallow, the child is asked to squeeze very hard with all of his or her muscles as he or she swallows. The clinician can hold the child’s finger or hand and squeeze on the finger as an illustration of the effort that the child’s tongue should use. Improvement in the pressure generated by the tongue improves the clearance of the bolus (Pouderoux & Kahrilas, 1995). The effortful swallow is also a tongue base exercise.

The Relationship Between Feeding and Swallowing Therapy

In general, eating and feeding are pleasurable functions. If therapy is superimposed on mealtime, mealtimes often become unpleasant for the child and eating loses all of its pleasure. Thus, the clinician may wish to identify swallowing strategies, such as compensations, which allow the child to take at least some oral intake safely and efficiently. At other times during the day, clinicians can offer swallowing therapy to improve function.

If therapy is delivered at mealtime, the clinician should be sure that this is the best way and time to deliver the treatment, and this must be noted in daily charts of treatment. In general, if the child’s care is paid for by third parties in health care, feeding is not considered a professional function and may not be reimbursable. Usually, the speech-language pathologist as a professional would identify the best way to feed the child and teach this feeding strategy to the caregiver(s) rather than deliver the actual feeding him or herself.

Schedule of Treatment

To be effective, treatment for swallowing problems generally needs to be delivered multiple times during the day because the goal is to change motor function. Very often, clinicians in the schools do not have the time to provide the treatment 10 times a day for 5 to 10 minutes each time. To provide this intensity of treatment, speech aides, family members, or other caregivers can be taught to deliver this repetitive swallowing therapy quite effectively to children under the direct supervision and direction of a certified and licensed speech-language pathologist.

Many of the therapy strategies, including resistance and range-of-motion exercises, sensory enhancements, and practice of swallow maneuvers, are repetitive tasks that can be encouraged and instructed in follow-up by a caregiver once they are taught to both the child and the caregiver by the speech-language pathologist. It is likely that the child
will progress much faster under these circumstances. Professional expertise is needed to design the program of therapy, to upgrade it as needed by the child, and to evaluate and manage the caregiver’s follow-through. The speech-language pathologist does not need to provide all of the therapy if good training is provided to the caregivers and aides.

**Management of Drooling**

Drooling is usually of great concern to children with cerebral palsy and their family members and caregivers, as well as teachers and others. It is important for the speech-language pathologist to try to determine the reason for the child’s drooling (Dworkin & Nadal, 1991; Lespargot, Langevin, Muller, & Guillemont, 1993). Weakness in muscles of mastication, inability to breathe through the nose, reduced oral awareness of saliva, reduced tongue control, and delay in initiating the oral or pharyngeal swallow are all possible reasons for drooling. The speech-language pathologist must define which etiology is present in each child and institute appropriate therapy.

Examination of respiratory-swallow interactions in these children can be critical (McPherson, Kenny, Koheil, Bablich, Sochanikowskj, & Milner, 1992; Rogers, Arvedson, Msall, & Demerath, 1993). Does the child maintain an open mouth posture because of respiratory problems, that is, difficulty breathing through the nose because of allergies, polyps, respiratory infections, and so forth? Is the drooling the result of infrequent swallowing, for which thermal-tactile stimulation is needed? Is the drooling the result of poor oromotor control of saliva in the mouth, for which oromotor therapy is needed? Once this distinction is determined, the speech-language pathologist can institute the appropriate treatment plan. Unfortunately, the efficacy of oromotor therapy for children with cerebral palsy has not been established.

**Maintenance Therapy**

There is evidence that in some individuals with cerebral palsy, treatment will need to be maintained as a part of their management throughout their life (Helfrich-Miller, Rector, & Straka, 1986). This is usually the case in those children with severe brain damage and very severe oromotor problems.

The need for chronic therapy may also be seen in the child with severe head injury. If this is the case, again, the certified and licensed speech-language pathologist should design the program of therapy and supervise it. Caregivers trained by the speech-language pathologist can carry out the plan multiple times daily because, again, most third-party payers will not approve funding for maintenance therapy delivered by a professional, such as a speech-language pathologist. There is evidence that caregivers can successfully supervise patients with dysphagia in their feeding/therapy programs if the programs are designed and taught by the speech-language pathologist (DePippo, Holas, Reding, Mandel, & Lesser, 1994).

In summary, there are many issues involved in determining the nature of treatment to be delivered to a child with dysphagia in the public schools. However, if the speech-language pathologist obtains information from a careful and detailed (usually instrumental) assessment of the child’s oropharyngeal swallowing, as well as other aspects of the child’s functioning, treatment for swallowing disorders in the public schools can be safe and efficient.

**REFERENCES**


Received September 28, 1998
Accepted September 27, 1999

Contact author: Jeri Logemann, Northwestern University, 2299 North Campus Drive, Evanston, IL 60208-3570. Email: j-logemann@nwu.edu