Approaches to Treating Dysphagia in Patients With Brain Injury

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Dysphagia and its treatment in patients with brain injury are multifactorial. Treatment provided should address each deficit area relevant to dysphagia and should be consistent with current trends and knowledge. This article describes the subskills that compose the ability to swallow and their treatment in patients with brain injury. The available literature describing treatment and its efficacy relevant to each subskill area is reviewed. Specific areas for documenting efficacy of occupational therapy interventions are described.

Components of Dysphagia in Brain Injury

Brain injuries may lead to deficits of oral and pharyngeal sensation and movement that influence swallowing (Kaprisin et al., 1989; Lazarus & Logemann, 1987). Brain injury-related changes in posture and self-feeding also can affect swallowing ability. Cognitive-perceptual and behavioral disorders have been implicated as contributing to swallowing disorders (Cherney & Halper, 1989; Tippett, Palmer, & Linden, 1987). These many potential deficit areas warrant comprehensive treatment for dysphagia. Avery-Smith, Dellarosa, and Rosen (1992) described the subskill areas that should be addressed in any adult with dysphagia: alertness and orientation; cognitive, perceptual, and behavioral status; positioning and proximal control; self-feeding; oral and pharyngeal sensation; and oral and pharyngeal movement. The influence of these areas on swallowing in the patient with brain injury and relevant research are described in the following sections.

Alertness and Orientation

Background literature. After brain injury, decreased arousal, confusion, and loss of circadian rhythms can affect hunger and appetite. An adequate degree of alertness is necessary to eat safely (Groher, 1992; Silverman & Elkkart, 1979). Using the Rancho Los Amigos Hospital Adult Levels of Cognitive Functioning Scale (RLA), Mackay and Morgan (1992) rated patients with head injury who were able to participate in oral intake. They found that, on the average, patients at RLA Level 4, at which they are confused and agitated, are ready to begin eating. However,
full oral intake does not occur until RLA Level 6, at which patients remain confused but display more appropriate behavior (Mackay & Morgan, 1992). In our clinical practice, we find that the therapist may be able to begin prefeeding activities, including snacks, at RLA Level 3, at which patients show localized responses to stimuli.

**Intervention literature.** Multisensory stimulation is often used as a precursor to functional eating activities to improve overall alertness (Farber, 1982; Groher, 1992). During eating, however, a quiet environment is helpful in avoiding overstimulation (Farber, 1982). Self-feeding may improve attention span to eating activities (Groher, 1992). Orientation to an eating activity can be accomplished by facilitation of hand-to-mouth responses, through oral stimulation, and through the presentation of distinctive food odors, tastes, and temperatures, such as ice pops (Farber, 1982).

**Cognitive Impairments and Behavioral Dysregulation**

**Background literature.** Once alertness and attention span have improved, other areas of cognitive and behavioral impairment such as poor memory, limited insight, impulsivity, agitation, inflexibility of thought, poor judgment, and unilateral inattention may become more apparent. These problems, along with communication deficits, compound the physical causes of dysphagia (Cherney & Halper, 1989). This wide range of deficits can interfere with the eating process and may cause aspiration, even in the absence of a physiologic cause for dysphagia. Cherney and Halper (1989) noted in a rehabilitation population that severe cognitive and communication disorders tended to go hand in hand with severe oral intake problems. Cognitive and behavioral deficits can limit the ability to use or participate in compensatory techniques (Tippett et al., 1987). Neumann (1993) found that attentional deficits had a greater negative effect on dysphagia therapy outcome than did memory deficits in a group of patients with neurogenic dysphagia, including those with bilateral brain injury. As noted above, Mackay and Morgan (1992) found that patients at RLA level 6, at which they were more aware of eating, had more successful eating experiences.

**Intervention literature.** The literature includes several programs for improving eating in the presence of cognitive and behavior problems. Tippett et al. (1987) described the treatment of a patient between 2 and 8 months after sustaining a closed head injury who demonstrated poor attention span, poor memory, and impulsivity, along with a fairly normal oral and pharyngeal examination. Behavior modification techniques, a structured eating environment, and intensive use of verbal cuing techniques allowed progression from tube feeding to a full oral diet (Tippett et al., 1987). Yuen and Hartwick (1992) described the treatment of a patient with an acute closed head injury who had sustained behavior changes after a craniotomy for a subdural hematoma 20 years previously and had no basis for dysphagia except for memory and judgment deficits. This patient refused to eat any textures but purées offered in a glass with a straw. Using a near transfer of skills approach, the patient progressed within 6 days from eating purées to eating chopped food, first from a glass and then from a plate with proper utensils. Yuen (1992) described another patient 3 years post closed head injury with poor attention span, memory deficits, and impulsivity, who gorged her food and showed overall poor food intake. The use of paced prompting (presenting one bite at a time with intensive verbal cuing) and reauditorization (having the patient reiterate instructions) facilitated improved attention span, socially acceptable behaviors, and weight gain after 2 months of intervention. Behavioral strategies are also useful in the presence of unilateral inattention; tactile and verbal cuing, setup to attend to the neglected side of the food tray, and cues to orally manipulate the food on the neglected side of the mouth may be helpful (Groher, 1992).

**Positioning and Proximal Control**

**Background literature.** In brain injury, abnormal muscle tone, reflexes, and sensory deficits result in postural problems that affect the ability to assume and maintain a seated upright position. Proper positioning and body alignment during eating assist with maximum airway protection, oral and pharyngeal function, and ease of self-feeding (Boggis, 1985; Farber, 1982; Groher, 1992; Silverman & Elfant, 1979). Rood conceived of proximal stability as a prerequisite to distal mobility (Trombly, 1989). Once the trunk is in a stable position, distal mobility may then be addressed, along with tasks such as self-feeding that require grasp and reach (Trombly, 1989).

**Intervention literature.** Hulme, Shaver, Acher, Mullette, and Eggert (1987) demonstrated in a population with developmental disabilities that the use of adaptive seating devices to correct posture facilitated oral motor performance and progression from pureed to chopped food consistencies. The feeding position advocated by Hulme and colleagues (1987) included at least 90° of hip flexion, 90° of knee flexion, a neutral ankle position with feet supported, and trunk and head in midline. Others have agreed that this position is essential for safe swallowing in the adult population (Farber, 1982; Groher, 1992; Silverman & Elfant, 1979). We additionally position the arms on a tabletop.

**Self-Feeding**

**Background literature.** Self-feeding allows the patient to gain control over the activity, helps to achieve a basic need, and is often a focus of early occupational therapy intervention. Groher (1992) and Stallons (1987)
noted that efforts to enhance self-feeding, an overly
learned and only partly cortical activity, will stimulate eat-
ing and oral swallowing responses.

**Intervention literature.** In clinical practice, we too
observe that in the presence of similar oral–motor skills,
the patient who can self-feed shows more rapid oral ma-
nipulation of food from the utensil and more efficient oral
bolus manipulation than the patient who must be fed.
However, this finding may be related to the patient's level
of overall neurologic impairment and course of recovery.
Because self-feeding is believed to promote appropriate
oral responses to the bolus, guided hand-to-mouth move-
ments as opposed to passive feeding are often recom-
manded for patients with limb apraxias and other limita-
tions in self-feeding (Groher, 1992). Affolter advocated a
"tactile kinesthetic" (1987, p. 165) approach with the use
of hand-over-hand guiding to promote sensory explora-
tion in eating experiences.

**Oral and Pharyngeal Sensory Disorders**

**Background literature.**Absent or limited sensation
is thought to be responsible for a poor motor response to
bolus presentation or leftover bolus in the mouth, al-
though inattention of motor deficits may also be implicat-
ed. The resulting neglect of food in the mouth can create
potential for aspiration (Groher, 1992). Abnormal reflex-
ive responses to oral stimulation, such as a bite reflex,
hyperactive gag reflex, or aversion to touch may be seen.
Different foods possess a wide array of sensory qualities
(Coster & Schwarz, 1987). These sensory qualities in
combination probably stimulate oral movements and trig-
ger the swallowing reflex. Obliteration of sensation in the
pharynx can drastically impair swallowing (Pommerenke,
1927). Changing the volume and viscosity of boluses,
which can be done through the use of different foods, has
been shown to change oral movement responses (Dant
et al., 1990; Dodds et al., 1988).

**Intervention literature.** Presentation of boluses with
heightened sensory qualities (heat, cold, flavor) has been
advocated as a way to elicit better sensory awareness of
food in the mouth (Farber, 1982; Groher, 1992; Silver-
man & Elfant, 1979). We have also used heavier boluses,
that is, those with a higher specific gravity, such as pudding
rather than applesauce. Oral desensitization regimens may
help to reduce hyperactive reflexes that interfere with
eating (Farber, 1982; Groher, 1992; Logemann, 1989). Regu-
lar attention to oral hygiene may help to optimize sensa-
tion (Groher, 1992).

**Oral and Pharyngeal Movement Disorders**

**Background literature.** A wide array of oral and
pharyngeal movement disorders, often occurring in com-
bination, are seen after brain injury. In closed head ma-
trauma these included limited tongue control, reduced oral
and pharyngeal propulsion of the bolus, and a reduced or
absent swallowing reflex (Lazarus & Logemann, 1987).
Delayed oral transit, vocal fold paralysis, and reduced
pharyngeal peristalsis have been seen in patients with
severe traumatic brain injury; difficulty with oral prepara-
tion and transit, delayed swallowing reflex, and reduced
pharyngeal peristalsis have been seen in patients with
multiple cerebrovascular accident (CVA) injuries (Kapri-
sin et al., 1989). Apraxia or motor planning deficits may
also be manifested as a movement deficit during eating,
either orally or pharyngeally.

**Intervention literature.** Different treatments are
used to address oral and pharyngeal movement prob-
lems. Linden (1989) distinguished between indirect ther-
apy, which involves exercises to improve the movement
components to swallowing, such as range of motion and
strength of oral structures, and direct therapy, which
incorporates eating and drinking activities. Sensory stim-
ulation techniques such as icing and stroking, which were
originally devised by Rood (1956), are now standard treat-
ments to elicit active movement in specific muscles in
patients with brain injury and dysphagia (Farber, 1982;
Groher, 1992; Silverman & Elfant, 1978). Lazzara, Lazarus,
and Logemann (1986) tested the efficacy of using cold
stimulation to the faucial pillars and found that it stimu-
lated the swallow reflex in patients with a variety of neuro-
logic diagnoses including brain injury. Other indirect
treatments used for oral and pharyngeal movement prob-
lems include active and passive range of motion for facial
muscles and strengthening of facial muscles and glottic
and velopharyngeal closure. In one patient who had re-
ceived no food by mouth for 7 years after a gunshot
wound to the head, strengthening of glottic and velophar-
yngeal closure as well as tongue range of motion and
strength were addressed intensively in therapy for 9
weeks (Harris & Murry, 1984). Following this treatment
regime, the patient was able to safely swallow small
amounts of pureed foods, although tube feedings were
still required (Harris & Murry, 1984). Biofeedback has
been used to increase awareness of sensation of move-
ment in a patient with oral and lymphatic carcinoma (Bry-
ant, 1991). However, its use in the population with brain
injury has not been explored and may be more difficult
with this population because good cognitive and perceptu-
ial skills are required for this technique. Verbal cuing, a
form of behavioral training, is referred to as "indirect biofeedback" by Logemann and Kahrilas (1989, p. 1136)
and is used widely with patients with brain injury.

Linden (1989) additionally distinguished between di-
rect therapy techniques that she called compensations,
which are physical maneuvers used during swallowing,
and those she called facilitations, which are other changeable variables such as type of utensil, size of the
bolus, and food temperature. The use of compensations
has been widely documented in the literature in patients
with neurogenic dysphagia (Groher, 1992; Logemann &
These include techniques such as holding the breath while swallowing (Logemann & Kahrilas, 1990) or turning the head while swallowing (Logemann & Kahrilas, 1990; Logemann et al., 1989). Logemann (1986) has published a manual with an accompanying videotape of patient videofluoroscopies that demonstrate case by case, on a before-and-after basis, how different head positions improve swallowing efficiency and safety. Likewise, facilitations are noted widely in the literature as standard techniques to use with those with neurogenic dysphagia (Farber, 1982; Groher, 1992, Linden, 1989; Silverman & Elfant, 1979). Again, these references are not specific to brain injury. Successful facilitation techniques examined in the focal brain injury population include the use of thickened textures (Groher, 1987) and the use of adaptive equipment for eating (Groher, 1992). Apraxia for oral and pharyngeal stages of swallowing may best be treated with a self-feeding approach in the context of a meal or snack (Groher, 1992).

Discussion

The review of the treatment and efficacy literature on dysphagia in brain injury described throughout this article strongly indicates a need for more research in all of the swallowing subskill areas. The following are some specific questions for further inquiry in the subskill areas identified.

Alertness and Orientation

Is sensory stimulation actually useful in alerting and arousing patients sufficiently for eating? At what level of arousal can eating be accomplished safely? What are the most efficient ways in which to increase attention to the eating task?

Cognitive Impairments and Behavioral Dysregulation

The single case studies reviewed in this paper suggested useful strategies for various cognitive and behavioral problems. How do the different components of cognition and behavior such as memory, attention span, insight, impulsivity, agitation, communication, and their interaction influence safe eating and swallowing? What intervention methods for addressing these problems are optimal? Are facilitations more immediately effective and expedient than compensations for the patient with brain injury who has cognitive and behavioral problems because they can be affected by a caretaker rather than by the patient?

Positioning and Proximal Control

Positioning and proximal control receive considerable attention in treatment, as reflected in the literature reviewed, but their effectiveness has not been corroborated scientifically. What specific motor components of swallowing does upright position influence? What is the relationship of using the upper limb in feeding to efficient oral and pharyngeal control? Studies that address these questions might use videofluoroscopic (modified barium swallow) tests of swallowing efficacy.

Self-Feeding

Essentially no studies were identified that examined the relationship between the level of skill in self-feeding and efficiency or safety of the swallowing mechanism. Does self-feeding enhance normal sequencing of the feeding process, selection of food, introduction of food into the mouth, length of the oral phase, and/or timing of the swallow? Is self-feeding an efficient way to approach these deficits? Videofluoroscopic studies could again easily help to research this area.

Oral and Pharyngeal Sensory Disorders

Sensation is used to optimize movement through facilitation techniques, but the importance of rehabilitation of sensation per se, through oral sensitization or desensitization programs, is not well established. Certainly, heightening or normalizing sensation allows sensory input to be used to facilitate movement. What are other reasons to normalize sensation? What are the optimal techniques to rehabilitate sensation? Are there measurable sensory thresholds for swallowing? What are the types and amounts of sensory input that trigger the swallow?

Oral and Pharyngeal Movement Disorders

The success of indirect and direct techniques, the latter including compensations and facilitations, needs to be verified in this specific population. Is it more efficient to work on indirect techniques to improve subskills of swallowing or simply to proceed to direct therapy? Many techniques, both indirect and direct, can improve the quality of swallowing. Are they equally applicable to the patient with brain injury? Are there benefits to using compensations versus facilitations in this population? Which techniques are dependent on prerequisite cognitive ability and insight? Is it more efficient to spend time training a patient with memory deficits to remember to perform a compensatory maneuver during swallowing or to have the caretaker perform a facilitation technique?

Conclusion

An important overall consideration in the population with brain injury is examination of the interactions between
different subskill areas, and what effect treatment in one area has on another. Several of the studies cited in this review are based on single case studies that evaluate treatment strategies and their effects on a specific subskill. Traditional scientific method encourages researchers to isolate a single problem and its responses to a single therapeutic technique or a simple combination of techniques. Perhaps the research on treatment of dysphagia for patients with focal brain lesions is more plentiful than that for patients with brain injury, in whom the clinical picture is more complex, because such research is easier to conduct. As mentioned, many of the treatments that therapists use are based on known successful treatments in patients with focal brain injury. More information on the overall effects of all deficit areas commonly seen in patients with brain injury is needed, including which of the major deficit areas are most prevalent in different types of brain injuries; the changes in deficit areas as a patient begins dysphagia intervention; the typical progress in different subskill areas and how that progress affects functional outcome; the nature of spontaneous recovery in the subskill areas; and how specific treatment techniques influence the overall performance. Once this information on typical picture, progress, and outcome is obtained, then a clinical model for treatment incorporating the relevant subskill areas in treatment of the dysphagic patient with brain injury can be established.

References