

Role of the modified barium swallow in management of patients with dysphagia

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The modified barium swallow is a radiographic (videofluoroscopic) procedure designed to define the anatomy and physiology of the patient's oropharyngeal swallow and examine the effectiveness of selected rehabilitation strategies designed to eliminate aspiration or excess oral or pharyngeal residue (the symptoms of the patient's dysphagia). Rehabilitation strategies introduced during the modified barium swallow after the patient's oropharyngeal anatomy and physiology have been defined include (1) postural changes to redirect food flow and change pharyngeal dimensions, (2) sensory enhancement techniques, and (3) swallow maneuvers. Combining the modified barium swallow with a follow-up swallowing rehabilitation plan can decrease the cost and time for rehabilitation of patients with dysphagia. In some cases the patient can begin safe oral intake immediately after the modified barium swallow, and therapy may not be needed if consistent spontaneous recovery is anticipated. (*Otolaryngol Head Neck Surg* 1997;116:335-8.)

The radiographic study known as a modified barium swallow has two major purposes: (1) to define the anatomy and physiology of the patient's oropharyngeal swallow during boluses of various types, representing various foods and liquids; and (2) to examine the effects of rehabilitation strategies designed to eliminate the symptoms of the patients' swallowing problem (aspiration and inefficient swallow causing residue in the mouth or pharynx).^{1,2} The modified barium swallow can be used with patients of all ages, from birth to old age, and with patients who have sustained a variety of types of damage to the central nervous system or to the structures of the oropharyngeal region, including gunshot wound or surgical treatment for head and neck cancer.³⁻⁶

PROCEDURE FOR THE MODIFIED BARIUM SWALLOW

The procedure for the modified barium swallow involves examining the patient initially in a lateral view, seated in an upright position in a chair or wheelchair or lying on a cart with a back support to elevate him or her to vertical.^{7,8} Usually, the patient is first presented with measured volumes of thin liquids containing barium, beginning with 1 ml (representing saliva) and progressing to 3 ml, 5 ml, 10 ml, and cup drinking. Two swallows of each are examined. If the patient exhibits any significant swallowing difficulty (i.e., aspiration or significant oral or pharyngeal residue), the patient is given intervention/therapy strategies to improve the swallow. The strategies begin with postural techniques and then sensory enhancement and therapy strategies as needed.² If these strategies are successful in improving the swallow and eliminating aspiration and significant residue, the patient is given larger volumes of liquid to test the extent of effectiveness of the strategies. If the strategies are effective on at least some volumes of liquids, the recommendation is made to allow the patient to take those volumes of liquid orally using these strategies. Then, thicker foods are presented. These may include measured amounts of thick liquid, purees, and food requiring chewing, such as a cookie coated with barium pudding. Again, if the patient exhibits aspiration or excessive residue, intervention strategies are introduced to eliminate the aspiration or reduce the residue.

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Table 1. Postural techniques successful in eliminating aspiration or residue resulting from various swallowing disorders

Disorder observed on fluoroscopy	Posture applied	Rationale
Inefficient oral transit (reduced posterior propulsion of bolus by oral tongue)	Head back	Uses gravity to clear oral cavity
Delay in triggering pharyngeal swallow (bolus past ramus of mandible but pharyngeal swallow not triggered)	Chin down ^{12,13}	Widens valleculae to prevent bolus entering airway; pushes epiglottis posteriorly increasing airway protection
Reduced posterior motion of tongue base (residue in valleculae)	Chin down ¹²	Pushes tongue base backward toward pharyngeal wall
Unilateral laryngeal dysfunction (aspiration during swallow)	Head rotated to damaged side ¹¹	Places extrinsic pressure on thyroid cartilage, increasing adduction
Reduced laryngeal closure (aspiration during swallow)	Chin down ¹² ; head rotated to damaged side	Puts epiglottis in more protective position, narrows laryngeal entrance; increases vocal fold closure by applying extrinsic pressure
Reduced pharyngeal contraction (residue spread throughout pharynx)	Lying down on one side	Eliminates gravitational effect on pharyngeal residue
Unilateral pharyngeal paresis (residue on one side of pharynx)	Head rotated to damaged side ¹¹	Eliminates damaged side from bolus path
Unilateral oral and pharyngeal weakness on same side (residue in mouth and pharynx on same side)	Head tilt to stronger side	Directs bolus down stronger side
Cricopharyngeal dysfunction (residue in pyriform sinuses)	Head rotated	Pulls cricoid cartilage away from posterior pharyngeal wall, reducing resting pressure in cricopharyngeal sphincter

TREATMENT/INTERVENTION TECHNIQUES TO BE INTRODUCED DURING MODIFIED BARIUM SWALLOW

Postural techniques are usually the first procedures introduced if a patient aspirates during the modified barium swallow because they can be highly effective, do not require the patient to follow directions, and can be done without increasing the patient's muscular effort.⁹⁻¹³ Five postural techniques are available to improve swallow physiology. Not all postural techniques are attempted with each patient. Rather, after defining the patient's swallow physiology, a specific postural technique is selected that is most likely to improve that particular swallowing disorder.^{9,10} Table 1 presents the various postures and the disorders for which they are most effective. In general, postural techniques change the direction of food flow and the dimensions of the pharynx. Evidence to date indicates that postural techniques are equally effective for patients with neurologic dysfunction and for those who have been treated for a head and neck cancer.⁹⁻¹³

Postural techniques are not appropriate for all swallowing disorders. Increased sensory input can facilitate the speed and efficiency of the oropharyngeal swallow in some patients with a delay in oral or pharyngeal ini-

tiation of the swallow.² Sensory enhancement techniques include increasing pressure on the tongue with a spoon and increasing the sensory input of the bolus by changing its temperature, texture, or flavor. Other sensory techniques may involve thermal/tactile stimulation (i.e., vertically rubbing the anterior faucial arch five or six times with a cold size 00 laryngeal mirror¹⁴).

Finally, if postural techniques and sensory enhancement do not appear to be sufficient to improve the efficiency of the swallow and eliminate aspiration, therapy strategies may be introduced into the radiographic study. These strategies include swallowing maneuvers that are designed to apply voluntary control to selected aspects of the pharyngeal stage of swallowing.^{2,15-19} The four swallowing maneuvers that are available to date include (1) the supraglottic swallow or voluntary breath hold, which is designed to close the true vocal folds before and during the swallow; (2) the super-supraglottic swallow, designed to close the entry level of the airway at the space between the arytenoids and base of epiglottis before and during the swallow; (3) the effortful swallow, designed to increase tongue-base motion posteriorly toward the posterior pharyngeal wall during the pharyngeal stage of swallowing, thereby decreasing residue in the valleculae; and (4) the

Table 2. Swallow maneuvers, the swallowing disorders for which they are appropriate, and their rationale

Swallow maneuvers	Problem for which maneuver is designed	Rationale
Supraglottic swallow	Reduced or late vocal fold closure; delayed pharyngeal swallow vocal folds before and during delay	Voluntary breath hold usually closes vocal folds before and during swallow ¹⁸ closes
Super-supraglottic swallow	Reduced closure of airway entrance	Effortful breath hold tilts arytenoid forward, closing airway entrance before and during swallow ¹⁸
Effortful swallow	Reduced posterior movement of tongue base	Effort increases posterior tongue base movement
Mendelsohn maneuver	Reduced laryngeal movement	Laryngeal movement opens UES, and prolonging laryngeal elevation prolongs UES opening ^{15,19}
	Discoordinated swallow	Normalizes timing of pharyngeal swallow events ¹⁷

UES, Upper esophageal sphincter.

Mendelsohn maneuver, designed to increase the extent and duration of laryngeal elevation during the pharyngeal stage of the swallow, thereby prolonging and increasing the width of cricopharyngeal opening. Table 2 presents the rationale for each maneuver and the swallowing disorder for which it is appropriate. Swallow maneuvers require the patient to follow direction and increase muscular effort. For some patients, such as those with motor neuron disease, swallow maneuvers are not advisable, other than an easy breath hold to increase airway protection. For treated head and neck cancer patients, and some brain stem stroke patients, the various maneuvers can facilitate oropharyngeal swallowing and oral intake when no other techniques are successful.^{16,17}

Other therapy techniques for swallow disorders are available, but they generally require more learning or practice to be effective and therefore are not feasible to introduce during the radiographic study.

OUTCOMES OF THE MODIFIED BARIUM SWALLOW

When the modified barium swallow is completed, the swallowing therapist, as well as the patient's attending physician, should have a clear understanding of the anatomic and physiologic abnormalities causing the patient's dysphagia and should have devised a treatment plan that can be effective in rehabilitating the dysphagia. In many cases the efficacy of each therapy strategy can be measured during the radiographic study so that there are data to support the recommendations for the therapy plan.²

In addition to information about the rehabilitation plan, the modified barium swallow report should include recommendations regarding oral, nonoral, or combined oral and nonoral intake for nutrition and hydration. If the patient is aspirating on all food consis-

tencies despite the introduction of all appropriate treatment strategies, nonoral feeding should be recommended. If, however, the patient is able to tolerate certain food consistencies orally without aspiration or can tolerate them with postural and other interventions, a combination of oral and nonoral feeding or full oral feeding is appropriate.

TIMING OF THE MODIFIED BARIUM SWALLOW

In general, the modified barium swallow procedure should be introduced as soon as a patient is identified as dysphagic. In the case of patients who have sustained strokes or head injuries, as soon as they are alert and awake and dysphagia is identified, the modified barium swallow should be introduced. In the case of surgically treated patients with head and neck cancer, the modified barium swallow should be introduced when healing has progressed sufficiently that the patient's surgeon would recommend the introduction of attempts to swallow. In those patients who are receiving radiotherapy for head and neck cancer, the modified barium swallow should be used as soon as the patient reports dysphagia.

SUMMARY

With a combined approach of the modified barium swallow with regular swallowing therapy (if needed), more than 85% of dysphagic neurologically impaired and surgically treated patients with head and neck cancer can be restored to oral intake. Those with degenerative disease will be able to maintain oral intake as long as possible with the introduction of various management strategies but will usually reach a time when nonoral feeding is required because of unremitting aspiration despite the intervention strategies.

Without a modified barium swallow, accurate swallowing therapy cannot be planned, and time and money

can be wasted in attempting to evaluate and treat the patient's dysphagia at the bedside. The patient can become frustrated and fearful of eating. By use of the modified barium swallow to define the nature of the patient's dysphagia and examine selected treatment efficacy, an appropriate treatment plan can be quickly identified and implemented. In some cases, the patient can begin safe oral intake immediately after the modified barium swallow, and therapy may not be needed if consistent spontaneous recovery is anticipated.

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