Conservative Management of Chronic Aspiration

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Rehabilitation method

1. Postural change
2. Increased sensory input
3. Swallow maneuver
4. Diet change
5. Muscle exercise
6. Intraoral prosthesis
7. Surgical procedure

Nonsurgical Methods for Controlling Aspiration
1. Oral motor exercises : Lip seal Tongue retraction and elevation Tongue strengthening
2. Head position maneuvers: Chin tuck Head lift Rotating head to side of lesion in pharyngeal or vocal fold paresis
3. Postural compensation techniques: Sitting upright Lying on side
4. Swallowing retraining Supraglottic swallow Super-supraglottic swallow Mendelsohn maneuver Multiple swallows Frequent throat clearing
5. Diet modification Change in bolus size Change in food consistencies Change in temperature and taste
6. Nonoral diet (NPO)

1. Postural technique
   1) chin down : delayed pharyngeal swallow, reduced airway closure, reduced posterior tongue movement
   2) head back : inefficient oral transit
   3) head turned : unilateral pharyngeal weakness, unilateral laryngeal weakness, cricopharyngeal dysfunction
   4) head tilt : unilateral oral and pharyngeal dysfunction

5) lying down : pharyngeal residue due to reduced pharyngeal contraction or reduced laryngeal elevation

Postural Techniques to reduce or Eliminate Aspiration or Residue

Disorder Observed on fluoroscopy	Posture Applied	Rationale
Inefficient oral transit (Reduced posterior propulsion of bolus by tongue)	Head back	Uses gravity to clear oral cavity
Delay in triggering the pharyngeal swallow (bolus past ramus of mandible but pharyngeal swallow is not triggerd	Chin down	Widens valleculae to prevent bolus entering airway: narrows airway entrance, reducing risk of aspiration
Reduced posterior motion of tongue - base (Residue in valleculae)	Chin down	Pushes tongue-base backward toward pharyngeal wall
Unilateral vocal fold paralysis or surgical removal (Aspiration during the swallow)	Head rotated to damaged side	Places extrinsic pressure on thyroid cartilage, improving vocal fold approximation , and directs bolus down stringer side
Reduced closure of laryngeal entrance and vocal folds (Aspiration during the swallow)	Chin down: head rotated to damaged side	Puts epiglottis in more protective position: narrows laryngeal entrance: improves 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	Eliminates damaged side of pharynx 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 by gravity
Cricopharyngeal dysfunction (Residue in piriform sinuse)	Head rotated	Pulls cricoid cartilage away from posterior pharyngeal wall, reducing resting pressure in cricopharyngeal sphincter

2. Increased sensory input :
delayed oral onset, apraxia, reduced oral sensation,
delayed pharyngeal swallow
-- 1) Increased pressure on tongue
2) Changing bolus taste, temperature, volume (sour, cold, large)
3) Self feeding
4) Thermal/tactile stimulation

3. Swallow maneuver
1) Effortful swallow: reduced tongue base retraction
swallow normally, but squeeze very hard with all of your tongue
and throat muscle while you swallow
2) Mendelsohn maneuver: reduced laryngeal movement & cp opening
swallow normally
when you feel your voice box go up, grab it
with your throat muscle and don'tlet it go down
3) Supraglottic swallow: reduced vocal fold closure,
delayed pharyngeal swallow

hold your breath
continue to hold your breath and swallow
immediately after the swallow, cough

4. Supersupraglottic swallow: reduced closure of laryngeal entrance
hold your breath very tightly and bear down
continue to hold your breath and swallow
immediately after the swallow, cough

Swallow Maneuvers and the Problems for Which They were Designed

Swallow Maneuvers	Problem for Which Maneuver Designed	rationale
Supraglottic swallow	Reduced or late vocal fold closure	Voluntary breath hold usually closes vocal folds before and during swallow
	Delayed pharyngeal swallow	Closes vocal folds before and during delay
Super-supraglottic swallow	Reduced closure of airway entrance	Effortful breath hold tilts arytenoids forward, closing airway entrance before and during swallow.
Effortful swallow	Reduced posterior movement of the tongue base	Effort increases posterior tongue-base movement
Mendelsohn maneuver	Reduced laryngeal movement.	Laryngeal movement opens the upper esophageal sphincter: prolonging laryngeal elevation prolongs upper esophageal sphincter opening
	Discoordinated swallow	Normalizes timing of pharyngeal swallow event

#Vocal Fold Closure and Laryngeal Elevation Techniques

1. Practice coughing.
2. Increase the loudness of the voice.
3. Initiate voice with a hard glottal onset.
4. Produce sustained phonation. Try to increase the duration while maintaining consistent voice quality.
5. Sustain phonation at various pitches. This helps with anterior vocal fold closure as well as laryngeal elevation.
6. An excellent program of laryngeal exercises has been developed by Ramig and her colleagues. This program is called Lee Silverman Voice Treatment. Although this program is designed primarily to increase vocal effectiveness, it also offers promise to those who require increased vocal fold closure to reduce the risk of aspiration.

4. Diet change
1) poor oral control : thick liquid → thin liquid.
2) delayed pharyngeal swallow : thick liquid and thicker foods
3) reduced closure of the laryngeal entrance : pudding and thick food
4) reduced tongue base & pharyngeal wall contraction : liquid.
5) reduced laryngealelevation & cricopharyngeal opening : liquid

5. Range of motion exercise
   1) lips
   2) tongue
   3) jaw
   4) laryngeal elevation
   5) adduction exercise

#Labial exercises to improve strength and awareness of control of the swallowing mechanism

1. Rapid labial opening and closing using the consonants /p, b/.
2. Extended lip squeeze followed by lip retraction
3. Repeating the vowels /u, i/ with increased lip movement
4. Thermal stimulation of the lips with ice. Movement of the ice may be medial-lateral or more focal if drooling on one side is prevalent
5. Holding different objects between the lip such as a straw, tongue blade, plastic spoon, etc. to improve sensory awareness. Objects may be of different sizes, shapes, and weights
6. Apply various foods to lips such as yogurt, peanut butter and encourage the patient to massage the lip together
7. Use the index finger to apply a sudden or quick stretch to the edges fo the upper and lower lips
8. Practice humming. Cue patient to start and stop humming. When humming stop, the patient should open the lips, then close again.
9. Have patient close the lips. Ask him or her to keep them closed while you try gently to break the lip seal.
10. Practice "a facial squeeze" by squeezing lips together. While keeping lips closed, alternate bringing teeth together and separating them. This mimics chewing activity.
11. Practice inhaling and exhaling through the nose rather than mouth. The patient may want to watch this activity with a mirror
12. Prior to swallowing, the patient should hold a glass or cup to the lips. Practice the timing of opening the lips once the cup is placed on the lower lip.
13. Hold small objects such as a button (connected to a string) and place it between the lips and teeth. The clinician can put a gentle pull on the string to improve lip strength.
14. Intraoral stimulation of cheeks with a brush, cold object, or fingers.
15. Resistive exercises. Example : have the patient push the upper lip down while the clinician resists the movement with a tongue blade. Have the patient push the tongue against the cheek while the clinician resists against the outside of the cheek.

#Exercise for tongue and mandible strength and movement

1. Tongue tip elevation. Place tongue tip on alveolar ridge. Hold it for 2 seconds.
2. Tongue tip sweep. After holding the tongue on the alveolar ridge, sweep posteriorly against the palate.
3. Use the phonemes /t, d/ for rapid contact and release of the tongue tip to the alveolar ridge.
4. Use the "ch" sound to improve tongue contact to the middle of the soft palate. Similarly, the sounds "s" and "sh" help with lateral contact of tongue to palate as help to groove the tongue.
5. the /k, g/ phonemes are used to increase posterior tongue to soft palate contact. Combining syllables into quick movements such as "ta-ka" or "cha-ka" id helpful to improve the sweeping motion of the tongue.
6. Range of motion exercises can be done by chewing on gauze initially, then adding small amounts of food when it is safe.
7. To improve sensory awareness, use pressure and temperature stimulation.

a. A cold spoon may be placed on the tip, blade, or back of tongue. Light pressure is applied and the patient is asked to lift the spoon.
b. The palate is touched with tongue blade or cotton and the patient is asked to touch the area with the tongue.
c. Cold or sour materials are given to the patient. They may be frozen on astick if the patient is not yet cleared to swallow.

d. Various sizes and textures of bolus may be given to identify the size and texture most easily transported by the tongue.

8. Mandible movement. Patients with reduced mandible movement may want to use a device such as Therabite7 to increase mouth opening.
9. Resistive exercises to the mandible such as lowering or closing the mandible against the pressure applied by the therapist on the chin.
10. Sucking exercises increase tongue palate contact and help the patient to manage saliva. Sucking may be done with the tongue tip against the alveolar ridge and lips and teeth slightly apart or with teeth closed using a "slurping' or "suctioning" pull of the tongue to the midpalate area. The patient should try to do this with as much sound as possible to increase sensory feedback.

Exercises for Specific Impairments

Impairment	Goal	Task May Include
Limited control, agility or neck rotation,extention, and flexion.	Range, control, agility adequate for needed task.	Obtain consult from physical therapy, depending on need, tasks may focus on development of agility of movement as well as control and ROM
Trismus-Inability of the jaw to open due to injury to the trigeminal nerve or muscular deficiency.	Adequate opening for feeding route (spoon, fork, cup, or biting), for denture or palatal prosthesis placement, and for oral hygiene.	Maintain mandible-maxilla alignment while increasing passive and active range of mandible opening. Movements should be made slowly. Maximum stretch should be maintained $\geq$ 15 seconds. The Therabite is a more sophisticated device, especially useful for marked trismus or when alignment of mandible and maxilla is difficult to maintain.
Weakness or absence of mandibular support/control.	Symmetric mandible-maxilla approximation supportive of potentials for posture, oral nutrition/hydratin, and speech.	Establish optimal alignment passively or actively and present exercise graded for endurance. Increase strength and control using graded resistance and biting, munching tasks to strengthen muscles of mandibular closure and opening.
Weakness or absence of buccal tone.	Increased buccal tone.	Isometric tightening of the buccal area or squeezing of soft objects between cheek and teeth/gums or from buccal sulcus to the molar
Diminished labial opening.	Adequate labial opening size for eating. Adequate shaping for speech.	Passive stretching and exercise to increase range and strength of lateral commissure movement. Maintain mandible alignment throughout
Partial or complete labial incompetence.	Oral continence for saliva management, eating/drinking and speech.	Develop agility for desired range using tasks graded for speed and accuracy. Maintain mandible alignment throughout.
Unilateral patial or complete lingual weakness or missing lateral lingual tissue.	Posterior bolus retention -release control for airway protection. Bolus and airflow control :minimize lateral "leaks"	Maximize lingual symmetry at rest and in a variety of non-speech and speech gestures. Squeezing and lingual manipulation tasks may be appropriate. Palatal prosthesis may facilitate therary.
Bilateral lingual weakness.	Oral transit with minimum oral loss. Maximum coordination with initiation of swallow gestures.	Address sectionally, as above.
Absent tongue.	Development of compensatory mandibular, labial, and head/neck movement strategles.	Develop ROM and agility of movements needed for compensations that take advantage of gravity. Consider mandibular or maxillary shaping prosthesis.

Unilateral or complete weakness or missing tissue of the palate.	Adequate velopharyngeal closure if tissue is adequate. Effective obturation if tissue is inadequate.	Sustained blowing against resistance may strengthen closure. Endoscopic feedback may be helpful even with objurgation may actually recruit improved in closure from the lateral and posterior pharyngeal walls.
Unilateral, bilateral, or regional failure of pharyngeal constriction.	Improved bolus compression.	Maximum lingual retraction. Laryngeal elevation and supraglottic closure.
Incomplete glottic closure.	Improved glottic closure.	Attempt to establish conditions, resulting in improved true vocal fold approximation using pitch, positional, compression, and respiratory support strategies while avoiding false vocal fold participation.
Incomplete supraglottic closure.	Improved supraglottic closure.	Habituate early and effortful laryngeal closure and elevation for swallow. The Mendelsohn maneuver may be used.
Inadequate PRS opening for swallow.	Maximum PES opening	Maximizing extent and timing of hyoid/laryngeal elevation and the effects of pharyngeal compression of the bolus.

#Instructions for the Shaker Exercise Protocol

Please perform this exercise three times per day for the next ___weeks.

Lay flat on your back on the floor or bed
Hold your head off of the floor looking at your feet for one minute. Relax with your head back down for one minute and repeat the sequence two more times.*
Raise your head 30 more times and look at your toes. Do not sustain these head lifts.*
*Do not lift your shoulders while performing this exercise

6. Intraoral prosthesis
   1) palatal lift prosthesis: velar paralysis
   2) palatal obturator: soft palate resection
   3) palatal reshaping prosthesis: tongue resection(50%?)

management of the tracheostomy tube
- deflate the tracheostomy cuff prior to swallowing
- suction both orally and via the tracheostomy
- occlude tracheostomy tube.

* inflated tracheostomy tube.
restriction laryngeal elevation (Bonanno, 1971)
reducing laryngeal sensitivity (Feldman, 1966)

* occlusion of tracheostomy tube during swallowing
· airflow through larynx ↑ → stimulate subglottic sensory receptor → improve vocal fold closure. (Shin 1998)
· reduction a elimination of aspiration (Muz. 1994)
initiating swallowing therapy with tracheostomy tube
· advantage

(1) observe aspiration more directly
(2) elimination of aspirated material more easily

· disadvantage
(1) restriction of upward laryngeal movement.
(2) compression of esophagus.
(3) change in intratracheal pressure.

* the blue dye test
screening test for the presence of aspiration at the bedside
for a tracheotomized patient.
swallow various foods and liquids containing blue dye
blue dye from tracheostomy site - indication of aspiration

References

1. Carrau RL, Murry T. *Comprehensive management of swallowing disorders SanDiego, Oxford:Plural Publishing Inc 2006*
2. Casper JK, Colton RH : *Clinical manual for laryngectomy and head and neck cancer rehabilitation . SanDiego,California:SingularPublishingGroup1993*
3. Dikeman KJ, Kazandjian MS. *Cummunication and swallowing management of tracheostomized and ventilator-dependent adults. SanDiego,California:SingularPublishingGroup1995*
4. Langmore SE. *Endoscopic evaluation and treatment of swallowing disorders. NewYork,NY:ThiemeNewYork2001*
5. Logemann JA : *Studies of speech and swallowing rehabilitation in head and neck cancer patients . Cancer focus Fall/Winter 1986*
6. Logeman JA, Kahrilas PJ, Hurst P : *Effect of intraoral prosthetics on swallowing in patients with oral cancer . Dysphagia 4: 118-120. 1989*
7. Logemann, JA. *A manual for videofluoroscopic evaluation of swallowing (2nd ed.). Austin,TX:Pro-Ed.1993*
8. Logemann JA , Pauloski BR, Rademaker AW, McConnel FM : *Speech and swallow function after tonsil/ base of tongue resection with primary closure . J of Speech and Hearing Res, 36, 918-926 , October 1993*
9. Logemann, JA. *Evaluation and treatment of swallowing disorders (2nd ed.). Austin,TX:Pro-Ed.1998*
10. Logemann, JA et al. *Light digital occlusion of the tracheostomy tube: A pilot study of effects on aspiration and biomechanics of the swallow. Head Neck 20 : 52-57, 1998*
11. McConnel FMS, Hester TR et al. *Manofluorography of deglutition after total laryngopharyngectomy Plastic Reconstr Surg 81(3) : 346-51 1988*
12. Murry J. *Manual of dysphagia assessment in adult. SanDiego,California:SingularPublishingGroup1999*
13. Perlman AL, Schulze-DelrieuKS. *Deglutitionanditsdisorders.SanDiego,London:SingularPublishingGroup1997*
14. Silver KH, et al. *Scintigraphic detection of salivary aspiration; discription of new diagnostic technique and case reports Dysphagia 7 : 45-49, 1992*
15. Stone M, et al. *An ultrasound examination of tongue movement during swallowing Dysphagia 1 : 78-83 1986*