People normally swallow hundreds of times a day to eat solids or drink liquids and swallow the normal saliva and mucous that the body produces. Difficulty swallowing or dysphagia is common in all age groups, especially in the elderly. Dysphagia refers to the feeling of difficulty passing food or liquid from the mouth to the stomach. In addition to the physiologic needs of swallowing, the ability to eat is one of the basic pleasures in life, and it is an important social function.

Dysphagic patients have complaints that range from mild symptoms of intermittent discomfort in swallowing to life-threatening aspiration and malnutrition. Mild symptoms of dysphagia such as difficulty in swallowing solid foods, sore throat when swallowing, or occasional choking on liquids can be early signs of such serious illnesses as multiple sclerosis, ALS, head and neck cancer and collagen vascular diseases. Astute evaluation of the subtle symptoms of dysphagia can lead to an early diagnosis of progressive diseases and allow treatment to intervene before severe complications arise. Dysphagia is also a prominent cause of long-term morbidity and mortality as a secondary effect of many serious medical problems. The diminution of general strength and cognitive status associated with a serious injury or long illness often lead to a swallowing disorder. Subsequent malnutrition can impede recovery, and aspiration can result in chronic pulmonary disorders, pneumonia, and death.

Appropriate management of swallowing function in severely injured or chronically ill patients can reduce mortality, speed rehabilitation, and improve the patient’s quality of life.

Anatomy and Physiology

The normal swallowing mechanism is dependent upon rapid neuromuscular coordination of structures in the oral cavity, pharynx, and larynx during a brief cessation of respiration. If the event does not occur in a synchronized fashion, there will be nasal reflux, choking, aspiration, and regurgitation. The swallowing mechanism can be divided into three stages: oral stage, pharyngeal stage, and esophageal stage.

Oral preparation, the voluntary stage of the swallowing mechanism, involves the coordination of lip closure, rotary and lateral motion of the jaw, buccal tone, rotary and lateral motion of the tongue, and anterior bulging of the soft palate to narrow the oropharyngeal inlet. This serves to break food down to a consistency appropriate for swallowing and to mix it with saliva. Once food is formed into a bolus, it is held against the center of the palate immediately prior to beginning the swallow. The tongue then moves upward and backward propelling the bolus in the pharynx.

The pharyngeal stage is completely involuntary and starts when the bolus passes the tonsillar pillars. The complex series of events that comprise this stage include:

- Velopharyngeal closure to prevent food or liquid from refluxing in the nose.
- Laryngeal elevation and anterior movement to carry the larynx up under the tongue and out of the path of the bolus, as well as to apply extrinsic stretch to the cricopharyngeal region.
- Laryngeal closure to prevent material from penetrating the larynx
- Pharyngeal peristalsis to clean the pharynx with a wave of contraction
- Opening of the cricopharyngeal region.

The esophageal stage involves active peristalsis from the top to the bottom. This stage concludes when the bolus passes through the lower esophageal sphincter. This is a circular muscular valve that opens to allow the passage of the bolus but is otherwise closed to prevent gastroesophageal reflux.

Evaluation

Basic Evaluation. The patient with dysphagia may present to almost any physician. Symptoms range from mild disruption of normal swallowing to life-threatening aspiration. (Table 1)

Patients with primary swallowing complaints are most often referred to an otolaryngologist or gastroenterologist, while patients with secondary effects of aspiration may first be evalu-
The major advantage of a barium study is that it is a comprehensive study of the entire swallowing mechanism. The disadvantage include that it is a scheduled radiologic procedure requiring the coordination of personnel and transport of the patient, it is not easily applied to the gravely ill or bedfast patient, and it involves radiation exposure.

Esophageal endoscopy is now considered part of the basic evaluation of dysphagia. Upper GI endoscopy is a routine procedure performed with sedative anesthesia, and unsedated transnasal esophagoscopy can be performed without any pre-test preparation. Endoscopy allows for direct visualization of esophageal or gastric pathology with biopsy as indicated.

**Extended Evaluation.** When extrinsic pathology is suspected, a CT or MRI scan of the neck and chest may be indicated. Manometry provides quantitative measurement of muscular contraction and relaxation within the pharynx and esophagus as well as detailed information about the upper and lower esophageal sphincters. Manometry is performed by transnasal passage of a probe with minimal discomfort. 24-hour pH monitoring can provide evidence of GERD and extraesophageal reflux. Impedance manometry is a new method that demonstrates both acid and non-acid reflux events. In some cases when flexible endoscopy is inadequate or not tolerated, operative endoscopy under general anesthesia using both flexible and rigid instrumentation is indicated.

### Causes of Dysphagia and Associated Disorders

**Mechanical Dysphagia.** Mechanical dysphagia refers to a physical blockage in the swallowing system. Lesions in the oral cavity include macroglossia, benign and malignant tumors, and scarring secondary to trauma or surgery. The pharynx can be blocked by intrinsic masses such as benign and malignant tumors of the larynx and pharynx and extrinsic lesions such as retropharyngeal masses, goiter, cervical osteophytes, and vascular tumors. Scarring secondary to surgery, radiation therapy, or trauma can result in stricture. Zenker's diverticulum occurs as an out-pouching just above a narrowed esophageal inlet and can lead to dysphagia with regurgitation.

Esophageal blockage can also be intrinsic and extrinsic. Intrinsic lesions include congenital atresia, benign tumors, cancer, post-inflammatory strictures, radiation strictures and strictures secondary to caustic ingestion. Extrinsic lesions include mediastinal masses, aortic aneurysm, congenital vascular abnormalities, and epiphrenic diverticulum. Pill dysphagia causes an intrinsic stricture and deserves special attention. When there is a problem of slowed transit in swallowing or blockage, pills can get caught most often at the cricopharyngeal level or the aortic arch. Large pills are most likely to get stuck, and acidic preparations such as tetracycline and theophylline cause the most damage.

**Neuromuscular Dysphagia.** Oropharyngeal dysphagia is a common finding in many neurologic conditions. Stroke is probably the most common neurologic condition leading to dysphagia and aspiration. Aspiration is common in stroke patients because of the combination of altered cognitive status as well as sensory and motor deficits that can lead to both swallowing dysfunction and a loss of laryngeal protection. Studies following...

### Table 1: Dysphagia Symptoms

- Slow or difficult swallowing
- Sensation of food lodgment
- Coughing or choking during swallowing
- Wet voice
- Frequent expectoration
- Prolonged eating times
- Weight loss/malnutrition
- Chronic productive cough
- Recurrent Pneumonia
Experts indicate that there is a 20 percent incidence of death due to aspiration pneumonia in the first year following stroke, and that 10 to 15 percent of deaths each subsequent year are from aspiration.

Progressive dysphagia is a common finding in diseases such as multiple sclerosis and ALS. Severe swallowing disorders are also seen in patients with deficits secondary to brain tumor or traumatic brain injury. It is also seen in primary conditions of muscular weakness such as myasthenia gravis, polymyositis, inflammatory myopathy, oculopharyngeal muscular dystrophy, Parkinson's disease, primary tremor, and drug-induced tardive dyskinesia. Cricopharyngeal (upper esophageal sphincter) hyperfunction causes dysphagia at the cervical level manifested by difficulty swallowing, choking, regurgitation, and aspiration. It results from hypertonic or incoordinated function of the cricopharyngeus muscle, and it is a common complication of any disruption of the neuromuscular coordination of swallowing, such as stroke. (Figure 1) Cricopharyngeal hyperfunction is also thought to be the primary etiology of Zenker's diverticulum formation. Patients with Zenker's diverticulum will have symptoms of regurgitation of undigested food and saliva in addition to dysphagia. (Figure 2)

Dysphagia can result from hyperfunction and/or incoordination of the peristalsis in the body of the esophagus or in the lower esophageal sphincter (achalasia). Patients may present with chest discomfort and regurgitation in addition to dysphagia. In achalasia, manometry will often show aperistalsis in addition to LES hyperfunction and barium swallow can show esophageal distention.

Other causes of neuromuscular dysphagia at the oropharyngeal level include, cerebral palsy, Arnold-Chiari malformations, syringobulbia, scleroderma, xerostomia (Sjögren's syndrome), cranial nerve deficits secondary to benign and malignant tumors and inflammatory conditions. Many times the cause of dysphagia is iatrogenic. Drugs may cause a decreased level of arousal, direct suppression of brainstem swallowing regulation, movement disorders, neuromuscular junction blockade, myopathy, oropharyngeal sensory impairment and disturbance of salivation. Surgery can lead to dysphagia by injury to the structures or neural innervation of the swallowing mechanism in the neck (carotid endarterectomy, esophageal cancer surgery, head and neck cancer surgery, anterior cervical fusion, ventral rhizotomy for spasmodic torticollis) and posterior fossa or skull base surgery resulting in cranial nerve injury or perioperative stroke.

Neuromuscular dysphagia in the esophagus can result from degenerative disorders, such as polymyositis, dermatomyositis, scleroderma and amyloidosis, and hyperkinetic conditions such as lower esophageal sphincter achalasia, diffuse esophageal spasm, and symptomatic esophageal peristalsis ("nutcracker esophagus"). It can also result from idiopathic autonomic dysfunction, drug-induced neuropathy, and post-vagotomy dysmotility.

Aging. There is a greater prevalence of difficulties during eating among the elderly for a number of different reasons. In addition to high incidence of concurrent medical disease that may affect the swallowing mechanism, there is also a general deterioration of swallowing function noted with aging. There is a progressive decrease in laryngeal sensation with age, and there is also significant decline in the neuromuscular function of the swallowing mechanism. This combination can lead to both poor oral intake and aspiration. Many older patients also have poor oral hygiene, positioning problems, or cognitive deficits that impede the ability to eat.

Many systemic diseases that contribute to dysphagia are more prevalent in the elderly, such as blood and immunologic diseases, cardiac diseases, dermatologic diseases, diabetes, gastroenterologic and pulmonary diseases. Elderly patients with chronic pulmonary disease are especially at risk to suffer complications of acute or chronic aspiration.

The elderly consume more pills than other demographic groups. Dysphagia can lead to noncompliance when pills are not taken or not taken as scheduled because of swallowing problems. The inability to consume medication appropriately is often the presenting problem forcing medical attention to the swallowing system. However, medications can also injure the esophagus by either direct contact or through systemic action. Some medications can induce slowed muscle function, or decreased pharyngeal sensation, thus adversely affecting the swallow.

Nutritional problems commonly afflicting the elderly can become more complicated when dysphagia is present.
Malnutrition is chronic in the institutional elderly, and poor nutritional status has been proven to be associated with increased morbidity in older patients undergoing rehabilitation.

**Treatment**

When the etiology of dysphagia is determined, treatable causes are addressed. When the patient is at risk for aspiration, dehydration, or malnutrition, treatment of these life-threatening conditions is primary. NPO status and the establishment of an alternative route of nutrition (PEG tube, jejunostomy tube) is the most conservative treatment of severe aspiration. Tracheotomy is often performed in patients with chronic secretional aspiration. Tracheotomy improves pulmonary toilet, but it is not a barrier to chronic aspiration. Additionally, the presence of a tracheotomy can foster aspiration by preventing laryngeal elevation and affecting posture. In patients with severe, life-threatening aspiration, surgery that results in closure of the laryngeal airway, such as laryngectomy, tracheal diversion and tracheal separation is rarely, but occasionally indicated.

In patients with less severe risk of aspiration, swallowing therapy provided by the SLP is often the most important treatment. This behavioral therapy involves stimulation of direct muscle action (tongue protrusion and retraction, pharyngeal contraction via extreme high voice, larynx elevation and depression), reflex stimulation, dietary manipulation (food viscosity, bolus size, sequence), postural changes, and trials of compensatory maneuvers.

Medical treatment for mild to moderate dysphagia without severe aspiration is mainly directed at correcting contributing pathology, such as gastroesophageal reflux and pulmonary insufficiency.

When UES hyperfunction is suspected, fluoroscopic study or manometry can provide confirmation. Treatment options include dilation of the sphincter (usually requiring general anesthesia or heavy sedation), botulinum toxin injection, or surgical cricopharyngeal myotomy. Cricopharyngeal myotomy can be performed by open surgical technique or endoscopically. Surgery for Zenker’s diverticulum is indicated in patients with aspiration, weight loss, or persistent symptoms. This is now routinely performed with endoscopic techniques and often on an out-patient basis. Patients with a paralyzed vocal fold may benefit from a vocal fold medialization procedure to improve glottic closure. This produces better airway protection during swallowing as well as a stronger cough. Vocal fold medialization can be accomplished by injection augmentation performed with local or general anesthesia or by thyroplasty. Thyroplasty is an open surgical procedure usually performed under sedative anesthesia in which an implant is inserted lateral to the vocal fold.

Aggressive reconstructive surgery has been developed for patients that suffer dysphagia from scarring after successful treatment for cancer or trauma of the head and neck. Endoscopic laser surgery can address mucosal scarring. Laryngeal/hyoid advancement can help re-establish pharyngeal swallowing function by opening the cricopharyngeal space narrowed by scarring. When combined with cricopharyngeal myotomy, this method has been found to reverse aspiration risk and allow for re-institution of an oral diet in most patients. Free flap surgical techniques have been successful in replacing areas of complete stricture.

Dysphagia that causes changes in nutrition and complications of aspiration often becomes the most critical issue in the patient’s long-term outcome and quality of life. The need for a feeding tube or tracheotomy can severely restrict a patient and significantly upgrade their level of care. Additionally the denial of liquids or food to reduce the risk of aspiration may cause severe psychological problems. Many of the conditions that lead to this level of severe swallowing disorder are irreversible, and in those cases treatment often is centered on counseling. Decisions...
must be made that balance the quality of life issues of living with a feeding tube and without eating against the risk of shortening life secondary to aspiration or malnutrition. **PN**

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