CME

Dysphagia in the elderly

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OBJECTIVE To review the problem of dysphagia in the elderly so that primary care physicians are better able to recognize and manage it.

QUALITY OF EVIDENCE Dysphagia, a prevalent problem in the elderly, causes significant morbidity and even mortality. Age-related deterioration of the oropharyngeal phase of swallowing is well documented. Diagnosis and treatment of dysphagia in the elderly is based mainly on clinical experience with large groups of patients. Few controlled clinical trials have been conducted.

MAIN FINDINGS Oropharyngeal dysphagia in the elderly is often due to irreversible neuromuscular disease. These patients benefit from swallowing therapy performed by speech pathologists. Esophageal causes of dysphagia are similar in the elderly and younger patients, and the approach to treatment is also similar, although noninvasive forms of therapy play a larger role for elderly patients.

CONCLUSIONS Dysphagia is a common problem that lowers quality of life for the elderly. Primary care physicians must be aware of causes of dysphagia for which specific treatments are available, as well as of the role of nonspecific treatments offered by ancillary health professionals.

OBJECTIF Passer en revue le problème de la dysphagie chez les personnes âgées afin de sensibiliser davantage les médecins de première ligne à identifier et à traiter ce problème.

QUALITÉ DES PREUVES La dysphagie, un problème courant chez les personnes âgées, entraîne une morbidité et même une mortalité significatives. La détérioration progressive avec l'âge de la phase oropharyngée de la déglutition est bien documentée. Le diagnostic et le traitement de la dysphagie chez les personnes âgées reposent avant tout sur l'expérience clinique avec de grands groupes de patients. Les essais cliniques contrôlés sont rares.

PRINCIPAUX RÉSULTATS Chez les personnes âgées, la dysphagie oropharyngée est souvent attribuable à une atteinte neuromusculaire irréversible. Ces patients ont avantage à suivre une thérapie de déglutition dispensée par les orthophonistes. Les causes oesophagiennes de dysphagie sont semblables chez les personnes âgées et les plus jeunes. L'approche thérapeutique est également similaire bien que les formes non invasives de traitement jouent un rôle plus important chez les personnes âgées.

CONCLUSIONS La dysphagie est un problème courant qui entrave la qualité de vie des personnes âgées. Les médecins de première ligne doivent être sensibilisés aux causes de la dysphagie pour lesquelles on dispose d'un traitement spécifique ainsi qu'au rôle des thérapies non spécifiques offertes par les autres professionnels de la santé.

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EUROPEAN SURVEYS HAVE SUGGESTED THAT UP to 10% of people older than 50 experience troublesome dysphagia,[1] yet most of these do not consult a physician about the problem.[2] In nursing homes, 30% to 60% of residents have impairment of the oropharyngeal phase of swallowing,[3,4] whereas about 10% of patients in general medical wards experience oropharyngeal dysphagia, and another 15% esophageal dysphagia.[5]

Dysphagia in the elderly is also an important cause of morbidity and mortality. Siebens et al[6] found that nursing home patients with dysphagia had a higher 6-month mortality rate than those without dysphagia. Croghan et al[7] documented increased morbidity (recurrent pneumonias and repeated hospitalizations) and mortality in elderly patients with oropharyngeal dysphagia and associated aspiration. Elderly patients with dysphagia also have lower quality of life. Problems with dysphagia adversely affect social and mental health and lead to considerable isolation and meal-related anxiety.[2,8,9]

There is some therapeutic nihilism toward the problem of dysphagia in the elderly, primarily because the underlying cause is often not specifically treatable. Recent advances in the management of elderly dysphagic patients have improved both specific and nonspecific therapy. Family physicians must not only be aware of causes of dysphagia in the elderly that can be treated, but also of nonspecific treatments offered by ancillary health professionals.

Physiology of swallowing and age-related changes

It is convenient to think of swallowing in terms of an oropharyngeal and an esophageal phase.[10] The oropharyngeal phase, in turn, can be divided into an oral preparatory stage, which is under voluntary control, and a pharyngeal stage, which is largely involuntary.

Food is initially taken into the mouth and, through mixing with saliva, mastication, and tongue manipulation, is formed into a bolus. This bolus is then thrust to the posterior pharynx, which triggers the pharyngeal phase of deglutition in which numerous nerves and muscles are activated in rapid succession. The soft palate is first elevated to close off the nasopharynx, and the larynx is pulled up and forward by the actions of the suprahyoid muscles. Simultaneously, the intrinsic laryngeal muscles contract and the epiglottis flips down to further protect the airway from the path of the oncoming bolus. The bolus is then engulfed and driven aborally by sequential contractions of the pharyngeal musculature.

For the bolus to reach the esophagus successfully, the upper esophageal sphincter (UES) must open briefly to let it pass. This requires both relaxation of the cricopharyngeus and contraction of the suprahyoid muscles, which open the UES by pulling laryngeal structures up and forward. Once the bolus has passed, the UES closes and the esophageal circular muscle contracts sequentially. This in turn pushes the bolus toward the stomach. Entry into the stomach is afforded by relaxation of the lower esophageal sphincter, which begins almost immediately after initiation of swallowing and persists until the bolus has passed.

Age-related alterations in swallowing have been extensively studied[11-22]; however, it is difficult to separate age-related phenomena from the effects of superimposed disease. Although earlier studies suggest that esophageal motor function deteriorates with age,[17-19] recent studies, which used more sophisticated recording techniques and excluded patients with confounding diseases, demonstrate minimal or no age-related changes in esophageal motility.[20-22] Thus, the term presbyesophagus could be a misnomer and simply represent diffuse esophageal spasm in the elderly.

Careful studies of the oropharyngeal phase of deglutition have identified several age-related changes, including increased sensory thresholds for initiating deglutition and impaired pharyngeal peristalsis and UES opening.[11-16] However, in healthy elderly individuals who display some of these abnormalities, bolus transfer through the oropharynx is usually adequate.[12] Nevertheless, some researchers speculate that these changes result in decreased functional reserve, such that problems develop more easily when disease or

generalized weakness as a result of systemic illness intervenes.

Approach to diagnosis

In general, dysphagia in the elderly is no different from dysphagia in any other patient. However, elderly patients sometimes do not communicate their symptoms adequately and are more likely than younger patients to present with recurrent aspiration pneumonia without being aware of dysphagia.[23] *Table 1* lists common causes of dysphagia in the elderly.

Clinical examination. The first question to sort out is whether the dysphagia is oropharyngeal or esophageal in origin. If a patient has problems getting the bolus out of the mouth, the origin is oropharyngeal. If the food sticks retrosternally, one can be certain of an esophageal origin. Some patients with esophageal dysphagia will sense food sticking in the lower throat or suprasternal notch. In these patients it is important to seek ancillary symptoms of oropharyngeal dysphagia, such as nasal regurgitation, choking, or coughing upon swallowing. It is helpful to observe patients as they swallow to determine the timing of the dysphagia. If esophageal problems arise at the suprasternal notch, dysphagia begins several seconds after swallowing begins.

Once the origin of dysphagia is determined, the next question is whether it has a structural or functional cause. Although contrast radiography is required for clarification, certain historical features can be helpful. Episodic dysphagia for both liquids and solids from the outset suggests a motor disorder, whereas deteriorating dysphagia that occurs initially in response to solids, such as meat and bread, and then progresses to semisolids and liquids, suggests a structural cause.

Associated historical details can also point to the correct diagnosis. For instance, rapidly progressive solid food dysphagia with associated weight loss suggests esophageal cancer, whereas slowly progressive solid food dysphagia in a patient with long-standing heartburn suggests peptic stricture. Because smoking and alcohol abuse are associated with an increased risk of

Table 1. **Differential diagnosis of dysphagia in the elderly**

OROPHARYNGEAL DYSPHAGIA
Structural problems
• Neoplasms*
• Infection or abscess*
• Postsurgical (eg, laryngectomy) complication
• Zenker's diverticulum*
• Vertebral osteophytes
Functional (neuromuscular) problems
• Cerebrovascular accident
• Amyotrophic lateral sclerosis
• Multiple sclerosis
• Brainstem neoplasm
• Bulbar poliomyelitis and postpolio syndrome
• Miscellaneous peripheral neuropathies
• Oculopharyngeal muscular dystrophy
• Polymyositis and dermatomyositis*
• Myasthenia gravis*
• Metabolic myopathy (eg, hypothyroidism or hyperthyroidism)*
• Idiopathic neuromuscular dysfunction
ESOPHAGEAL DYSPHAGIA
Structural problems
• Peptic stricture*
• Rings and webs*
• Neoplasm (intrinsic or extrinsic)*
• Vascular compression (dysphagia lusoria)
• Diverticula
Functional (neuromuscular) problems
• Achalasia*
• Diffuse esophageal spasm and related disorders
• Motility disorder secondary to gastroesophageal reflux disease*
• Motility disorder secondary to system disease (eg, scleroderma, diabetes, or other connective tissue disease)

**Causes of dysphagia for which effective specific therapy is available*

developing esophageal cancer and reflux disease, patients should be asked for this information.

Physical examination is most useful for patients with oropharyngeal dysphagia. The quality of the voice should be noted (patients with chronic laryngeal aspiration have a "wet," hoarse voice). The oropharynx should be examined for structural or inflammatory disorders, xerostomia, or signs of neuromuscular disease. A general neurological examination is also important. Clinicians must look for evidence of complications, such as malnutrition and aspiration-induced lung disease. In esophageal dysphagia it is important to examine cervical lymph nodes for metastases from esophageal cancer.

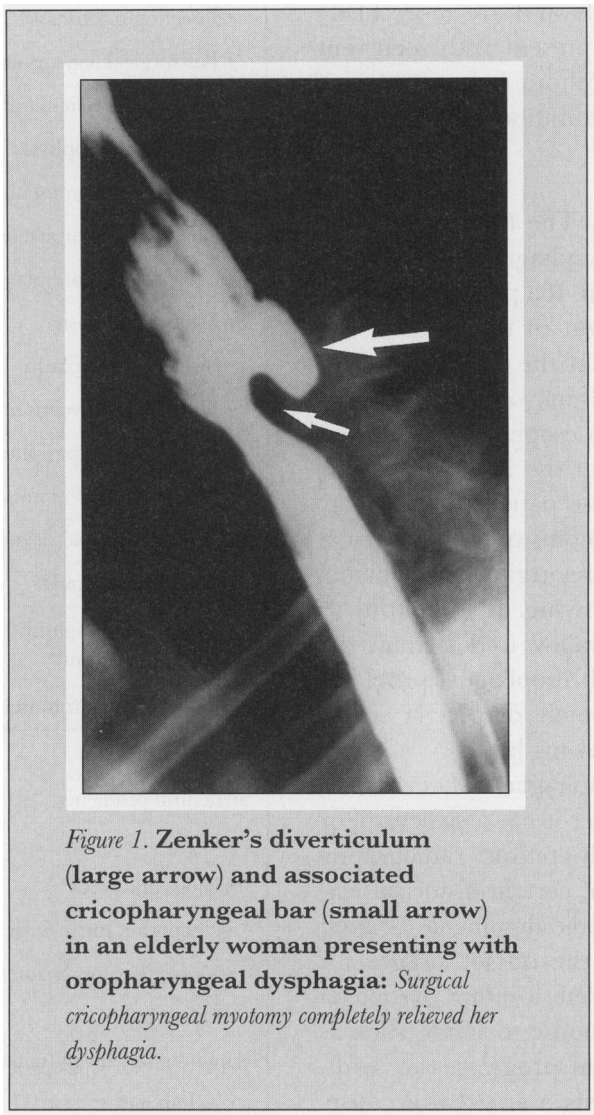

Figure 1. **Zenker's diverticulum (large arrow) and associated cricopharyngeal bar (small arrow) in an elderly woman presenting with oropharyngeal dysphagia:** *Surgical cricopharyngeal myotomy completely relieved her dysphagia.*

Routine investigations. Physicians should keep in mind the causes of dysphagia for which specific treatment is available. Occult thyroid disease (particularly hyperthyroidism) is an uncommon cause of oropharyngeal dysphagia but is treatable. Polymyositis is another treatable condition that is not always clinically obvious in the elderly. It is, therefore, reasonable to check thyroid function and creatinine phosphokinase levels in elderly patients with oropharyngeal dysphagia if the cause is not apparent from clinical examination. A chest x-ray examination should also be performed if there is concern about aspiration or if a thymoma underlying myasthenia gravis is possible.

By far the most important investigation is a carefully performed contrast videofluoroscopic study of the swallowing mechanism. It is crucial that referring physicians communicate with radiologists so that an appropriate study is conducted. Reading an upper gastrointestinal series, radiologists often focus on the distal esophagus, stomach, and duodenum and pay insufficient attention to the oropharyngeal phase. In patients with oropharyngeal dysphagia, a modified barium swallow study should be performed.[24] This consists of using calibrated amounts of barium of different consistencies to assess the swallow. If a patient is already known to have neuromuscular disease, both the radiologist and speech pathologist should attend while this study is performed. The speech pathologist has expertise in assessing modified barium swallow results and can use them to plan therapy.

Further investigations are predicated on the results of the barium swallow study. Esophagoscopy is usually required in esophageal dysphagia and occasionally is necessary in pharyngeal dysphagia to fully exclude mucosal disease. Yet endoscopy should not be considered as a replacement test for contrast radiography because the two examinations provide complementary information. Endoscopy does not assess motor dysfunction adequately and does not always detect subtle esophageal strictures. Manometric studies are useful to assess esophageal motor disorders but to date have limited clinical use for patients with oropharyngeal disorders.

Electromyography, muscle biopsy, and the Tensilon test might be needed to rule out treatable neuromuscular disease.

Management

Specifically treatable oropharyngeal disorders. Cricopharyngeal myotomy relieves dysphagia in more than 90% of patients with Zenker's diverticulum (*Figure 1*).[25] It has also been used to treat several other types of oropharyngeal dysphagia, but the results are unpredictable. Inadequate opening of the UES is not necessarily caused by dysfunction of the cricopharyngeal muscle alone. More often there is associated weakness of the suprahyoid muscles, which actually open the sphincter, or associated problems with pharyngeal peristalsis.[26] Authors of a recent review suggest that cricopharyngeal myotomy should be tried in patients with clear-cut radiological evidence of obstruction caused by the cricopharyngeus muscle or elevations of intrabolus pressure (recorded manometrically) as the bolus traverses the upper sphincter.[26]

Nonspecific treatment of oropharyngeal dysphagia. Most diseases that cause oropharyngeal dysphagia in the elderly are not specifically treatable. Cerebrovascular accident is the most common cause of oropharyngeal dysphagia. Up to

Table 2. **Training and compensatory techniques used to treat oropharyngeal dysphagia**

PROBLEM	TECHNIQUE	RATIONALE
POSTURAL MANEUVERS		
Delayed triggering of deglutition reflex	Tilt head forward	Prevents fluids from arriving at pharynx prematurely
Poor tongue thrust movement	Tilt head backward	Uses gravity to get bolus to pharynx
Unilateral pharyngeal or laryngeal paresis	Turn head to side of unilateral impairment	Helps close larynx and and piriform sinus on the affected (weak) side; bolus is directed along normal side
CHANGE FOOD CONSISTENCY		
Poor oral or tongue control; delayed triggering of deglutition reflex	Thicken liquids and puree foods	Thickened liquids will not flow into hypopharynx before larynx is protected
Impaired pharyngeal propulsive function	Thin liquids	Thin fluids require less propulsive force to move through pharynx
ALTER DEGLUTITION REFLEX		
Delayed triggering of deglutition reflex	Thermal stimulation (stroking anterior facial folds with laryngeal mirror)	Increases sensory receptor sensitivity
Impaired laryngeal closure with aspiration	Supraglottic swallow (patient holds breath during swallow, then coughs immediately after swallow)	Induces vocal cord closure during deglutition, thereby protecting airway
MUSCLE TRAINING		
Impaired bolus formation and control	Lip and tongue movement exercises	Strengthens weakened muscle
Impaired laryngeal closure	Laryngeal closure exercise	Strengthens weakened muscle

45% of stroke victims will have early dysphagia,[27-29] but most will recover before they are released from hospital. Nevertheless, one study of 411 stroke patients admitted to a rehabilitation service showed that 16% had evidence of stroke-related dysphagia.[30]

Early supportive therapy is important to assure that nutritional and respiratory complications do not develop. In these and other patients with irreversible neuromuscular disease, common-sense measures, such as ensuring that patients wear properly fitted dentures and advising them to chew food well and slow down food ingestion, could be all that is needed. In the last decade, speech pathologists have assumed a role as swallowing therapists. They use the modified barium swallow study to characterize the disorder and then instruct patients on compensatory and training techniques to improve swallowing function (*Table 2*). Therapy could involve altering the consistency of food ingested,[31] in which case a nutritionist's help can be invaluable.

Although no prospective controlled trials demonstrate the efficacy of speech pathologists' interventions, retrospective, case-control studies have suggested benefit.[32] The US Department of Health and Human Services, after receiving input from several scientific and health care agencies, have endorsed the use of speech pathologists in therapy for patients with oropharyngeal dysphagia.[33] Intensive follow-up swallowing therapy does not appear to add benefit to the initial evaluation and intervention.[34] Because access to speech pathologists is limited, it is important that primary care physicians be selective in their referrals. Patients should be screened radiologically to rule out structural causes. Only those with oropharyngeal dysphagia secondary to irreversible neuromuscular disease should be referred.

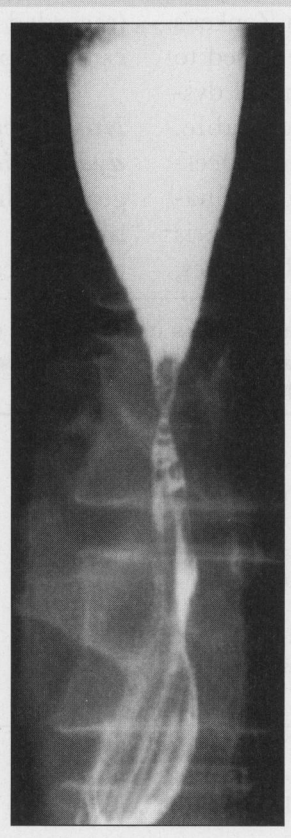

Figure 2. **Peptic stricture with associated hiatus hernia in an elderly patient who presented with slowly progressive solid food dysphagia and a history of long-standing heartburn and acid regurgitation:** *Endoscopy with mucosal biopsy and brushing confirmed that the stricture was benign. The patient's symptoms resolved following two esophageal dilation sessions and institution of proton pump inhibitor therapy.*

Speech pathologists collaborating with radiologists can often help determine whether patients will be able to swallow safely. When this is clearly impossible, nonoral feeding techniques, such as endoscopically or radiologically placed gastrostomy tubes, should be instituted early on to prevent complications.[35]

Esophageal disorders. The most common cause of esophageal dysphagia in the elderly is reflux esophagitis with peptic stricture (*Figure 2*) or secondary dysmotility. Strictures require endoscopic evaluation with mucosal biopsy to rule out malignancy, and usually respond well to esophageal dilation. Recent studies have shown that the more effective control of reflux afforded by proton pump inhibitors decreases the recurrence rate of peptic strictures and also improves dysphagia related to reflux esophagitis without stricture.[36,37] These

drugs are well tolerated in people of all ages and should be considered drugs of choice for reflux esophagitis with stricture.

Esophageal dysmotility is also common in the elderly. Well-established treatment is available for the esophageal motor disorder achalasia. One must consider secondary achalasia (due to underlying malignancy) if elderly patients present with symptomatic achalasia of recent onset.[38] Elderly patients could respond better to pneumatic dilation than their younger counterparts,[39] but this procedure has about a 5% risk of perforation, which can be disastrous for elderly patients. Botulinum toxin injection into the lower esophageal sphincter has recently been shown to relieve symptoms for up to a year.[40] This less invasive form of therapy for achalasia could become the treatment of choice for elderly patients.

Treatment of other motility disorders is far less successful. Calcium channel blockers, nitrates, or anticholinergics, taken in liquid form 20 to 30 minutes before meals, can alleviate dysphagia in patients with diffuse esophageal spasm by virtue of their ability to relax esophageal smooth muscle. Controlled clinical trials on the use of these agents have not been reported.

Esophageal cancer is also more common in the elderly. It is seldom realistic to consider surgical cure for such patients. Some relatively noninvasive treatments, such as external beam radiotherapy, ethanol injection, laser photocoagulation, or stenting, can provide useful palliation.[41]

An important consideration for all elderly patients with esophageal dysphagia is the risk of pill-induced esophageal injury.[42] Certain medications, such as doxycycline, Emepronium bromide, potassium chloride, and nonsteroidal anti-inflammatory drugs, are particularly likely to cause esophageal injury. Liquid forms of medication are preferred, but if liquids are unavailable, patients should be carefully instructed to take pills with plenty of fluids and to remain upright for at least 15 to 20 minutes after ingesting their medications. ■

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References

1. Lindgren S, Janzon L. Prevalence of swallowing complaints and clinical findings among 50-79-year-old men and women in an urban population. *Dysphagia* 1991;6:187-92.
2. Tibbing L, Gustafsson B. Dysphagia and its consequences in the elderly. *Dysphagia* 1991;6:20-2.
3. Trupe EH, Siebens H, Siebens A. Prevalence of feeding and swallowing disorders in a nursing home. Paper presented at the American Congress of Rehabilitation Medicine, Boston 1994.
4. Layne KA, Losinski D, Zenner PM, Ament JA. Using the Fleming Index of dysphagia to establish prevalence. *Dysphagia* 1989;4:39-42.
5. Groher ME. The prevalence of swallowing disorders in two teaching hospitals. *Dysphagia* 1986;1:3-6.
6. Siebens H, Trupe E, Siebens A, Cook F, Anshen S, Hanauer R, et al. Correlates and consequences of eating dependency in institutionalized elderly. *Am J Geriatr Soc* 1986;34:192-8.
7. Croghan JE, Burke EM, Caplan S, Denman S. Pilot study of 12-month outcomes of nursing home patients with aspiration on videofluoroscopy. *Dysphagia* 1994;9:141-6.
8. Gustafsson B, Tibbling L. Dysphagia, an unrecognized handicap. *Dysphagia* 1991;6:193-9.
9. Norberg A, Athlin E, Winblad B. A model for the assessment of eating problems in patients with Parkinson's disease. *J Adv Nurs* 1982;12:473-81.
10. Goyal RK, Paterson WG. Esophageal motility. In: Wood JD, editor. *Handbook of physiology: section 6 – the gastrointestinal system.* Vol 1, pt 2. Motility and Circulation. New York: Oxford Press, 1989:865-908.
11. Tracy JF, Logemann JA, Kahrilas PJ, Jacob P, Kobara M, Krugler C. Preliminary observations on the effects of age on oropharyngeal deglutition. *Dysphagia* 1989;4:90-4.
12. Logemann JA. Effects of aging on the swallowing mechanism. *Otolaryngol Clin North Am* 1990;23:1045-56. ➢

13. Robbins J, Hamilton JW, Lof GL. Oropharyngeal swallowing in normal adults of different ages. *Gastroenterology* 1992;103:823-9.
14. Fulp SR, Dalton CB, Castell JA, Castell DO. Aging-related alterations in human upper esophageal sphincter function. *Am J Gastroenterol* 1990;85:1569-72.
15. Shaker R, Ren J, Podorsan B, Dodds WJ, Hogan WJ, Kern M, et al. Effect of aging and bolus variables on pharyngeal and upper esophageal sphincter motor function. *Am J Physiol* (Gastrointest Liver Physiol 27) 1993; 264:G427-G432.
16. Shaker R, Ren J, Zamir Z, Sarna A, Liu J, Sui Z. Effect of aging, position and temperature on the threshold volume triggering pharyngeal swallows. *Gastroenterology* 1994;107:396-402.
17. Soergel KH, Zboralske FF, Amberg JR. Presbyesophagus: esophageal motility in nonagenarians. *J Clin Invest* 1964;43:1472-9.
18. Zboralske FF, Amberg JR, Soergel KH. Presbyesophagus: cineradiographic manifestations. *Radiology* 1964;82:463-7.
19. Hollis JB, Castell DO. Esophageal function in elderly men – a new look at "presbyesophagus." *Ann Intern Med* 1974;80:371-4.
20. Richter JE, Wu WC, Johns DN, Blackwell JN, Nelson JL, Castell JA, et al. Esophageal manometry in 95 healthy adult volunteers. *Dig Dis Sci* 1987;32:583-92.
21. Adamek RJ, Wegener M, Wienback M, Gielen B. Long-term esophageal manometry in healthy subjects: evaluation of normal values and influence of age. *Dig Dis Sci* 1994;39:2069-73.
22. Weihrauch TR, Vallerius P, Alpers H, Ewe K. Assessment of various factors influencing esophageal pressure measurement. *Klin Wochenschr* 1980;58:287-92.
23. Horner J, Massey EW. Silent aspiration following stroke. *Neurology* 1988;38:317-9.
24. Logemann JA. *Evaluation and treatment of swallowing disorders.* San Diego: College Hill Press, 1983.
25. Lindgren S, Ekberg O. Cricopharyngeal myotomy in the treatment of dysphagia. *Clin Otolaryngol* 1990;15:221-7.
26. Goyal RK, Martin SB, Shapiro J, Spechler SJ. The role of cricopharyngeus muscle in pharyngoesophageal disorders. *Dysphagia* 1993;8:252-8.
27. Gordon C, Hewer RL, Wade DT. Dysphagia in acute stroke. *BMJ* 1987;295:411-4.
28. Gresham SL. Clinical assessment and management of swallowing difficulties after stroke. *Med J Aust* 1990; 153:397-9.
29. Barer DH. The natural history and functional consequences of dysphagia after hemispheric stroke. *J Neurol Neurosurg Psychiatry* 1989;52:236-41.
30. Kuhlemeier KV, Rieve JE, Kirby NA, Siebens AA. Clinical correlates of dysphagia in stroke patients [abstract]. *Arch Phys Med Rehabil* 1989;70:A-56.
31. Curran J, Groher ME. Development and dissemination of an aspiration risk reduction diet. *Dysphagia* 1990;5:6-12.
32. Kasprisin AT, Clumeck H, Nino-Murcia M. The efficacy of rehabilitative management of dysphagia. *Dysphagia* 1989;4:48-52.
33. Erlichman M. The role of speech pathologists in the management of dysphagia. *US Department of Health and Human Services Technology Assessment Reports*, No. 1, 1989.
34. DePippo KL, Holas MA, Reding MJ, Mandel FS, Lesser ML. Dysphagia therapy following stroke: a controlled trial. *Neurology* 1994;44:1655-60.
35. Ciocon JO. Indications for tube feedings in elderly patients. *Dysphagia* 1990;5:1-5.
36. Marks RD, Richter JE, Rizzo J, Koehler RE, Spenney JG, Mills TP, et al. Omeprazole versus H_2-receptor antagonists in treating patients with peptic stricture and esophagitis. *Gastroenterology* 1994;106:907-15.
37. Smith PM, Kerr GM, Cockel R, Ross BA, Bate CM, Brown P, et al. A comparison of omeprazole and ranitidine in the prevention of recurrence of benign esophageal stricture. *Gastroenterology* 1994;107:1312-8.
38. Kahrilas PJ, Kisak SM, Helm JF, Dodds WJ, Harig JM, Hogan WJ. Comparison of pseudoachalasia and achalasia. *Am J Med* 1987;82:439-46.
39. Robertson CS, Fellows IW, Mayberry J, Atkinson M. Choice of therapy for achalasia in relation to age. *Digestion* 1988;40:244-50.
40. Pasricha PJ, Ravich WJ, Hendrix TR, Sostre S, Jones B, Kalloo AN. Intrasphincteric botulinum toxin injection for the treatment of achalasia. *N Engl J Med* 1995;332:774-8.
41. Jaskiewicz J. Cancer of the esophagus: state of the art. *Eur Cancer News* 1994;7:1-5.
42. Delpre G, Kadish U, Stahl B. Induction of esophageal injuries by doxycycline and other pills. A frequent but preventable occurrence. *Dig Dis Sci* 1989;34:797-800.

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