American College of Radiology
ACR Appropriateness Criteria®

Clinical Condition: **Dysphagia**

Variant 1: **Oropharyngeal dysphagia with an attributable cause.**

Radiologic Procedure	Rating	Comments	RRL*
X-ray barium swallow modified	8		☢ ☢ ☢
X-ray pharynx dynamic and static imaging	6		☢ ☢ ☢
X-ray biphasic esophagram	4	Double contrast and single contrast.	☢ ☢ ☢
X-ray barium swallow	4		☢ ☢ ☢
Tc-99m transit scintigraphy esophagus	2		☢ ☢ ☢
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			***Relative Radiation Level**

Variant 2: **Unexplained oropharyngeal dysphagia.**

Radiologic Procedure	Rating	Comments	RRL*
X-ray pharynx dynamic and static imaging	8	Both pharyngeal and esophageal examinations needed, since patient may have referred dysphagia.	☢ ☢ ☢
X-ray biphasic esophagram	8	Both pharyngeal and esophageal examinations needed, since patient may have referred dysphagia. Double contrast and single contrast.	☢ ☢ ☢
X-ray barium swallow modified	6		☢ ☢ ☢
X-ray barium swallow	6		☢ ☢ ☢
Tc-99m transit scintigraphy esophagus	4		☢ ☢ ☢
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			***Relative Radiation Level**

Variant 3: **Retrosternal dysphagia in immunocompetent patients.**

Radiologic Procedure	Rating	Comments	RRL*
X-ray biphasic esophagram	8	Endoscopy and biphasic esophagram are both excellent diagnostic tests in this setting. Double contrast and single contrast.	☢ ☢ ☢
X-ray barium swallow	6	Probably indicated if that is all the patient can do.	☢ ☢ ☢
X-ray barium swallow modified	4		☢ ☢ ☢
X-ray pharynx dynamic and static imaging	4		☢ ☢ ☢
Tc-99m transit scintigraphy esophagus	4		☢ ☢ ☢
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			***Relative Radiation Level**

Clinical Condition: **Dysphagia**

Variant 4: **Retrosternal dysphagia in immunocompromised patients.**

Radiologic Procedure	Rating	Comments	RRL*
X-ray biphasic esophagram	8	Endoscopy and biphasic esophagram are both excellent diagnostic tests in this setting. Double contrast and single contrast.	☢ ☢ ☢
X-ray barium swallow	5		☢ ☢ ☢
X-ray barium swallow modified	4		☢ ☢ ☢
X-ray pharynx dynamic and static imaging	3		☢ ☢ ☢
Tc-99m transit scintigraphy esophagus	2		☢ ☢ ☢
Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			***Relative Radiation Level**

DYSPHAGIA

Expert Panel on Gastrointestinal Imaging: Bronwyn Jones, MD[1]; Bob W. Gayler, MD[2]; Max Paul Rosen, MD, MPH[3]; Michael A. Blake, MB, BCh[4]; Mark E. Baker, MD[5]; Brooks D. Cash, MD[6]; Jeff L. Fidler, MD[7]; Thomas H. Grant DO[8]; Frederick L. Greene, MD[9]; Douglas S. Katz, MD[10]; Tasneem Lalani, MD[11]; Frank H. Miller, MD[12]; William C. Small, MD, PhD[13]; Gary S. Sudakoff, MD[14]; David M. Warshauer, MD[15]; Judy Yee, MD.[16]

Summary of Literature Review

"Dysphagia" according to *Stedman's Medical Dictionary* and *Dorland's Medical Dictionary* is defined as "difficulty in swallowing." Dysphagia is also a symptom, defined as the "subjective awareness of swallowing difficulty during passage of a liquid or solid bolus from the mouth to the stomach." As a symptom, it is usually indicative of an abnormality in the function or structure of the organs involved in swallowing or those involved in swallowing, breathing, and speech interaction. However, it is important to be aware of the fact that a person may have a swallowing problem but not be symptomatic. In one recent examination of 2,000 videofluoroscopic studies, 51% of the patients aspirated, but of those who did, over half had no protective cough (silent aspiration) [1].

This symptom can be caused by functional or structural abnormalities of the oral cavity, pharynx, esophagus, or even the gastric cardia. A barium study may be performed with videofluoroscopy to assess pharyngeal function and esophageal motility, as well as a series of double-contrast and single-contrast static images to assess structural abnormalities such as rings, strictures, or tumors. Other possible diagnostic tests include a modified barium swallow, endoscopy, manometry, and nuclear scintigraphy esophageal transit studies. The choice of test may depend on the clinical setting, as well as the nature and location of the patient's dysphagia. For example, in the immediate postoperative scenario, the choice of contrast may include water-soluble contrast such as diatrizoate meglumine and diatrizoate sodium solution (Gastrografin®) or iohexol (Omnipaque®), rather than barium sufate.

Clinical Perspective

Many patients with dysphagia can subjectively localize a sensation of blockage or discomfort to the throat or retrosternal region. Patients with pharyngeal dysphagia typically complain of food sticking in the throat or of a globus sensation with a lump in the throat. Other symptoms of oropharyngeal dysfunction include coughing or choking during swallowing due to laryngeal penetration or aspiration, a nasal-quality voice or nasal regurgitation due to soft-palate insufficiency, and food dribbling from the mouth or difficulty chewing due to an abnormal oral phase of swallowing. When oropharyngeal dysphagia has an attributable cause (eg, recent stroke), a modified barium swallow with different bolus consistencies may be the appropriate test to assess the patient's swallowing status and initiate treatment by a speech therapist. In patients with unexplained oropharyngeal dysphagia, however, a more detailed barium study may be needed to determine the cause. It also is important to recognize that abnormalities of the mid or distal esophagus or even the gastric cardia may cause referred dysphagia to the upper chest or pharynx, whereas abnormalities of the pharynx rarely cause referred dysphagia to the lower chest [2]. The esophagus and cardia should therefore be evaluated in patients with pharyngeal symptoms, particularly if no abnormalities are found in the pharynx to explain these symptoms. Thus, a combined radiologic examination of the oral cavity, the pharynx, esophagus, and gastric cardia is appropriate for patients with unexplained pharyngeal dysphagia.

Other patients may have retrosternal dysphagia with a sensation of blockage or discomfort anywhere from the thoracic inlet to the xiphoid process. This symptom may be caused by esophageal motility disorders or by structural abnormalities of the esophagus or cardia such as esophagitis, rings, strictures, or tumors. When barium studies are performed on these patients, the esophagram often consists of a biphasic examination that includes upright double-contrast views with a high-density barium suspension to assess mucosal disease and prone single-contrast views with a low-density barium suspension to assess distensibility and motility and the presence of a hiatal hernia.

Optimal evaluation of patients with dysphagia depends on the nature and location of the dysphagia and the clinical setting. The following four scenarios are considered separately:

1. Oropharyngeal dysphagia with an attributable cause;
2. Unexplained oropharyngeal dysphagia;

[1]Principal Author, Johns Hopkins Hospital, Baltimore, Maryland.
[2]Research Author, Johns Hopkins Hospital, Baltimore, Maryland.
[3]Panel Chair, Beth Israel Deaconess Medical Center, Boston, Massachusetts.
[4]Panel Vice-chair, Massachusetts General Hospital, Boston, Massachusetts.
[5]Cleveland Clinic, Cleveland, Ohio.
[6]National Naval Medical Center, Bethesda, Maryland, American Gastroenterological Association.
[7]Mayo Clinic, Rochester, Minnesota.
[8]Northwestern Medical Faculty, Chicago, Illinois.
[9]Carolinas Medical Center, Charlotte, North Carolina, American College of Surgeons.
[10]Winthrop University Hospital, Mineola, New York.
[11]Inland Imaging Associates and University of Washington, Seattle, Washington.
[12]Northwestern University Feinberg School of Medicine/NMH, Chicago, Illinois.
[13]Emory University, Atlanta, Georgia.
[14]Medical College of Wisconsin, Milwaukee, Wisconsin.
[15]University of North Carolina School of Medicine, Chapel Hill, North Carolina.
[16]University of California San Francisco, San Francisco, California.

Reprint requests to: Department of Quality & Safety, American College of Radiology, 1891 Preston White Drive, Reston, VA 20191-4397.

3. Retrosternal dysphagia in immunocompetent patients; and
4. Retrosternal dysphagia in immunocompromised patients.

Oropharyngeal Dysphagia with an Attributable Cause

When oropharyngeal dysphagia has an attributable cause (eg, recent stroke, worsening dementia, myasthenia gravis, amyotrophic lateral sclerosis), a modified barium swallow may be performed with the assistance of a speech therapist [3]. The study is facilitated by examining the patient in a speech therapy chair. The modified barium swallow focuses on the oral cavity, pharynx, and cervical esophagus with videofluoroscopy to assess abnormalities of both the oral phase of swallowing (ie, difficulty propelling the bolus) and the pharyngeal phase (ie, laryngeal penetration, tracheal aspiration, cricopharyngeal dysfunction). It has been shown that the risk of developing aspiration pneumonia is directly related to the degree of swallowing dysfunction on video fluoroscopic studies [4]. The patient may be given high-density or low-density barium suspensions as well as other substances of varying consistency (eg, barium paste or barium-impregnated crackers) to assess the patient's ability to swallow solid or semisolid substances. In conjunction with a speech therapist, various compensatory maneuvers (eg, a chin-tuck position) may be tried to prevent aspiration or other types of swallowing dysfunction [3].

Unexplained Oropharyngeal Dysphagia

In patients with unexplained oropharyngeal dysphagia, a more detailed barium study may be performed to assess both functional and structural abnormalities of the pharynx [5-6]. As in the modified barium swallow, a dynamic examination of the pharynx with videofluoroscopy permits assessment of both the oral and pharyngeal phases of swallowing. However, static images of the pharynx (eg, double-contrast spot films of the pharynx in frontal and lateral projections with high-density barium) should also be obtained to detect structural abnormalities (eg, pharyngeal tumors, Zenker's diverticulum). Because some patients with lesions in the esophagus or at the gastric cardia can have referred dysphagia, the esophagus and cardia should also be carefully evaluated as part of the barium study in these patients, particularly if no abnormalities are found in the pharynx to account for their symptoms (see below) [5,7] In patients with unexplained pharyngeal dysphagia, it has been shown that the combination of videofluoroscopy and static images of the pharynx and esophagus has a higher diagnostic value than either videofluoroscopy or static images alone [8].

Retrosternal Dysphagia in Immunocompetent Patients

The biphasic esophagram is a valuable technique for evaluating retrosternal dysphagia in immunocompetent patients [5]. This technique permits detection of both structural and functional abnormalities of the esophagus. Perhaps the most important structural lesion is carcinoma of the esophagus or esophagogastric junction. In one study, double-contrast esophagography was found to have a sensitivity of 96% in diagnosing cancer of the esophagus or esophagogastric junction [9], which is comparable to the reported sensitivity of endoscopy for diagnosing these lesions. In two other large series of patients, endoscopy failed to reveal any cases of esophageal carcinoma that had been missed on the barium studies [10-11]. The findings in these series suggest that endoscopy is not routinely warranted to rule out missed tumors in patients who have normal findings on radiologic examinations.

While double-contrast views are best for detecting mucosal lesions (eg, tumors, esophagitis), prone single-contrast views with continuous drinking of a low-density barium suspension are best for detecting lower esophageal rings or strictures. It has been shown that lower esophageal rings are two to three times more likely to be diagnosed on prone single-contrast views than on upright double-contrast views because of inadequate distention of the distal esophagus when the patient is upright [12-13]. In one study, the biphasic esophagram was found to detect about 95% of all lower esophageal rings, whereas endoscopy detected only 76% of these rings [13]. Similarly, biphasic esophagrams have been found to have a sensitivity of about 95% in detecting peptic strictures, sometimes revealing strictures that are missed with endoscopy [14-15].

Alternatively, endoscopy may be performed to evaluate the esophagus for structural abnormalities in patients with dysphagia. It is a highly accurate test for esophageal cancer when multiple endoscopic biopsy specimens and brushings are obtained. It also is more sensitive than double-contrast esophagography for detecting mild reflux esophagitis or other subtle forms of esophagitis. However, endoscopy is a more expensive and invasive test than the barium study. It also is less sensitive than the barium study for detecting lower esophageal rings or strictures (see above) [12-15] and does not permit evaluation of esophageal motility disorders. For these reasons, the barium study is often recommended, even by gastroenterologists, as the initial diagnostic test for patients with dysphagia [5,16-19].

The biphasic esophagram is also a useful test in patients with esophageal motility disorders causing dysphagia. Videofluoroscopy of discrete swallows of a low-density barium suspension in the prone right anterior oblique position permits detailed assessment of esophageal motility. In various studies, videofluoroscopy has been found to have an overall sensitivity of 80%-89% and specificity of 79%-91% for diagnosing esophageal motility disorders (eg, achalasia, diffuse esophageal spasm) in comparison to esophageal manometry [20-21]. Occasionally, barium studies may even reveal dysmotility not seen at manometry (eg, some patients with the beak-like distal esophageal narrowing of achalasia are found to have complete relaxation of the lower esophageal sphincter on manometry) [22]. In any case, when a significant esophageal motility disorder is detected on a barium study, manometry may be performed to further elucidate the nature of this motility disorder. A

subcategory of the "retrosternal dysphagia in the immunocompetent patient" is known or suspected achalasia, pretreatment or post-treatment. Specific protocols to assess emptying are useful [23]. It should be determined that the patient does not aspirate thin liquids before large quantities of barium are given. Alternatively, radionuclide esophageal transit scintigraphy is a simple, noninvasive, and quantitative test of esophageal emptying [24-26].

Retrosternal Dysphagia in Immunocompromised Patients

The major consideration in immunocompromised patients with dysphagia or odynophagia (painful swallowing) is infectious esophagitis, most commonly due to Candida albicans or herpes simplex virus. In HIV-positive patients, *Candida* is the cause of esophageal symptoms in the majority of cases, with cytomegalovirus (CMV), herpes simplex, and idiopathic ulcers (also known as HIV ulcers) the other most common etiologies [27-30]. HIV-positive patients with esophageal symptoms are generally treated empirically with antifungal therapy without undergoing a diagnostic examination. Most gastroenterologists prefer that those with persistent symptoms (or severe symptoms at presentation) be evaluated by endoscopy [31-32]. Endoscopy is preferred because of the ability to obtain specimens (eg, histology, cytology, immunostaining, or culture).

The endoscopic or radiographic appearance alone does not accurately predict diseases other than Candida esophagitis; diagnosis requires the acquisition of specimens for laboratory study [29-30]. Barium esophagography is preferred in some centers and can be useful in guiding management. Double-contrast esophagography is more accurate than single-contrast esophagography for detecting ulcers or plaques associated with infectious esophagitis [33-38]. However, single-contrast esophagrams may be performed if the patient is too sick or debilitated to tolerate a double-contrast examination. Patients with radiographically diagnosed *Candida* or herpes esophagitis may be treated with antifungal or antiviral agents without endoscopic evaluation**,** but endoscopy is warranted for patients with giant esophageal ulcers in order to differentiate CMV and HIV, so that appropriate therapy can be started [37,39-40].

Relative Radiation Level Information

Potential adverse health effects associated with radiation exposure are an important factor to consider when selecting the appropriate imaging procedure. Because there is a wide range of radiation exposures associated with different diagnostic procedures, a relative radiation level (RRL) indication has been included for each imaging examination. The RRLs are based on effective dose, which is a radiation dose quantity that is used to estimate population total radiation risk associated with an imaging procedure. Patients in the pediatric age group are at inherently higher risk from exposure, both because of organ sensitivity and longer life expectancy (relevant to the long latency that appears to accompany radiation exposure). For these reasons, the RRL dose estimate ranges for pediatric examinations are lower as compared to those specified for adults (see Table below). Additional information regarding radiation dose assessment for imaging examinations can be found in the ACR Appropriateness Criteria® Radiation Dose Assessment Introduction document.

Relative Radiation Level Designations

Relative Radiation Level*	Adult Effective Dose Estimate Range	Pediatric Effective Dose Estimate Range
O	0 mSv	0 mSv
☢	<0.1 mSv	<0.03 mSv
☢ ☢	0.1-1 mSv	0.03-0.3 mSv
☢ ☢ ☢	1-10 mSv	0.3- 3 mSv
☢ ☢ ☢ ☢	10-30 mSv	3-10 mSv
☢ ☢ ☢ ☢ ☢	30-100 mSv	10-30 mSv

*RRL assignments for some of the examinations cannot be made, because the actual patient doses in these procedures vary as a function of a number of factors (eg, region of the body exposed to ionizing radiation, the imaging guidance that is used). The RRLs for these examinations are designated as NS (not specified).

Supporting Document(s)

- ACR Appropriateness Criteria® Overview
- Procedure Information
- Evidence Table

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