



**UNIVERSITÀ GIUSTINO FORTUNATO**  
D.M. 13 aprile 2006 - G.U. n° 104 del 6/05/2006 - TELEMATICA



**UniforJob**  
ACADEMY



**Accademia Eraclitea**  
ENTE DI RICERCA E DI ALTA FORMAZIONE ACCREDITATO

# Master Universitario di primo livello in “Deglutologia geriatrica” A.A. 2023/24

## La valutazione della deglutizione nell’anziano – VFS

Stefano Doratiotto

U.O.C Radiologia Diagnostica ed Interventistica - Ospedale Ca Foncello di Treviso

Centro Regionale di Riferimento per la Disfagia



Società Italiana di  
Radiologia Medica  
e Interventistica



Dott. Stefano Doratiotto

Medico Radiologo

Azienda ULSS2 Ospedale Ca Foncello di Treviso

Centro Regionale di Riferimento per la Disfagia

(Delibera della Giunta Regionale n. 2458 del 01 agosto 2006,

Bur n. 76 del 29 agosto 2006)

stefano.doratiotto@aulss2.veneto.it



**GECH**  
Gruppo Gastro Enterologico CHirurgico

U.O.C. DI CHIRURGIA PEDIATRICA  
Direttore  
Prof.ssa Paola Midrio

e-mail: [gech@aulss2.veneto.it](mailto:gech@aulss2.veneto.it)

Since 2015



Gruppo Multidisciplinare Disfagia  
Since 1998



# Contenuti

1. La metodica radiologica (Videofluoroscopia) applicata alla deglutizione
2. Radiazioni e Radioprotezione
3. Videofluoroscopia: anatomia e fisiologia della deglutizione
4. Le alterazioni della Fase Orale
5. Le alterazioni della Fase Faringea
6. Le alterazioni della Fase Esofagea
7. Decisione clinica basata sui risultati della Videofluoroscopia
8. La refertazione della Videofluoroscopia
9. Casistica



**UNIVERSITÀ GIUSTINO FORTUNATO**  
D.M. 13 aprile 2006 - G.U. n° 104 del 6/05/2006 - TELEMATICA



**UniforJob**  
ACADEMY



**Accademia Eraclitea**  
ENTE DI RICERCA E DI ALTA FORMAZIONE ACCREDITATO

# Master Universitario di primo livello in “Deglutologia geriatrica” A.A. 2023/24

## La metodica radiologica applicata alla deglutizione

Stefano Doratiotto

U.O.C Radiologia Diagnostica ed Interventistica - Ospedale Ca Foncello di Treviso

Centro Regionale di Riferimento per la Disfagia



Società Italiana di  
Radiologia Medica  
e Interventistica





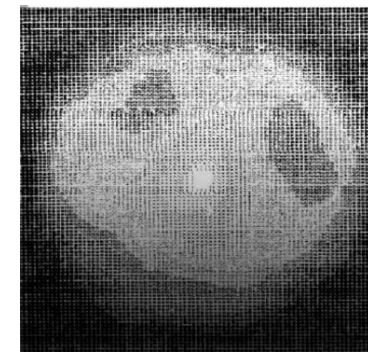
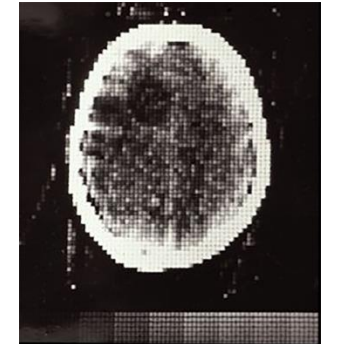
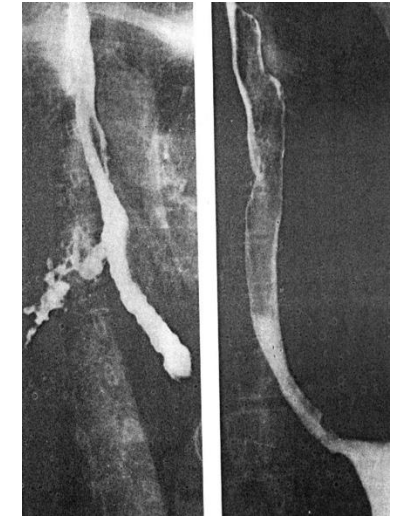
# L'evoluzione radiologica nell'età contemporanea

La storia della medicina non conosce una scoperta che abbia avuto una così rapida diffusione come i raggi X:

- Nel 1895, W. C. Röntgen scopre i raggi X
- Nel 1896, Armand Imbert (1851-1922) pubblica un libro sulla tecnica della radiografia
- Nel 1897, Antoine Bécclère (1856-1939), a Parigi, dà inizio ad un corso di Radiologia Clinica

Nei decenni che seguono si perfezionano le procedure diagnostiche per immagini:

- Si somministra, per bocca o attraverso il retto, un liquido di bario, opaco ai raggi X, per l'esplorazione del tubo digerente
- Si introducono nei vasi delle sostanze iodate per osservare la circolazione sanguigna e linfatica;
- John Julian Wild è stato considerato il vero fondatore della diagnostica tissutale ad ultrasuoni (1949). Karl Theodore Dussik (1942)
- Nel 1971, un ingegnere inglese, Hounsfield, mette a punto la TAC (tomografia assiale computerizzata) // nel 1977 a punto la RMN
- Nel 1981 la Radiologia Digitale



Marc S. Levine, MD • Stephen E. Rubesin, MD • Hans Herlinger, MD  
• Igor Laufer, MD

## Double-Contrast Upper Gastrointestinal Examination: Technique and Interpretation<sup>1</sup>

**T**HE development of routine double-contrast techniques for examining the upper gastrointestinal (GI) tract has dramatically improved our ability to diagnose a variety of inflammatory and neoplastic diseases in the esophagus, stomach, and duodenum. Despite increasing acceptance of this technique, many radiologists still use conventional single-contrast radiography as the primary modality for examining the upper GI tract. In a recent survey, more than 50% of the responding radiologists at major academic institutions indicated that they did not perform double-contrast upper GI studies on a routine basis (1). In many cases, double-contrast techniques are avoided because of lack of experience or training in the technical aspects of performing or interpreting these studies.

The issue of single- versus double-contrast technique has recently been overshadowed by another, more ominous development in the practice of GI radiology. Data indicate that there has been a gradual but steady decline in the total number of upper GI fluoroscopic examinations performed during the past decade (2,3). This trend can be attributed partly to the increased use of cross-sectional imaging modalities, such as computed tomography or ultrasound, to evaluate GI problems. The greater availability of effective histo-

mine-blocking agents has also changed the clinical approach to patients with dyspepsia or ulcer symptoms, since many of these patients are now treated empirically without further diagnostic evaluation. However, another major factor in the declining number of fluoroscopic examinations is the increasing use of endoscopy as the initial screening study in these patients. This trend has been spurred by a number of correlative radiologic-endoscopic studies from the gastroenterology literature in which endoscopy was found to be a more accurate diagnostic examination (4-6). However, these studies tended to be biased in favor of endoscopy, because the primary authors were usually endoscopists. It also remains unclear whether the ability of endoscopy to depict radiographically missed lesions in the upper GI tract has any significant effect on the management or eventual outcome of the conditions in these patients.

While fiberoptic endoscopy has been recognized as a highly accurate technique for examining the upper GI tract, it is also an invasive technique with a small but measurable risk of gastric perforation or other complications. Furthermore, it is an expensive technique, costing three to four times more in the United States than double-contrast upper GI examinations. Because barium studies are safer and less expensive than endoscopy, radiologic evaluation of the upper GI tract remains a viable alternative as long as its radiologic accuracy approaches that of endoscopy for clinically significant disease. We believe that a carefully performed double-contrast upper GI study provides the best opportunity for radiology to be competitive with endoscopy as a diagnostic modality. A detailed description of the technical aspects of performing and interpreting these examinations is therefore presented.

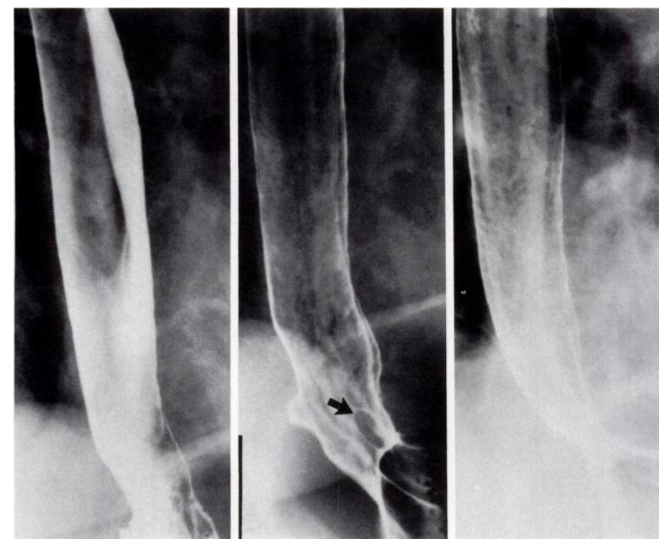
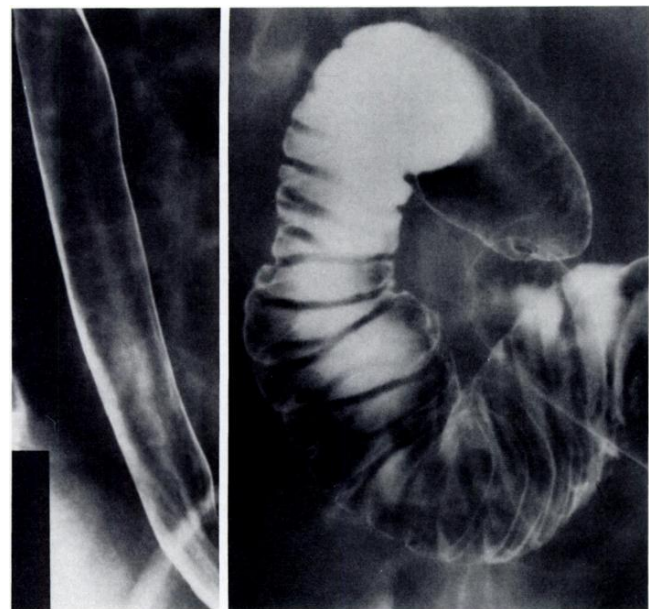
a biphasic study in which both double-contrast and single-contrast views of the esophagus, stomach, and duodenum are obtained. In the double-contrast portion of the study, a series of maneuvers is required to achieve adequate gaseous distention of the lumen while a thin layer of high-density barium is spread on the mucosa. The double-contrast examination is facilitated by the routine use of hypotonic agents. Subsequently, the double-contrast study should be supplemented by prone or upright single-contrast views of the esophagus, stomach, and duodenum obtained with low-density barium and varying degrees of compression. The basic elements of the double-contrast examination, including mucosal coating, gaseous distention, hypotonia, fluoroscopic maneuvers, and a step-by-step approach to the routine examination, are discussed separately in the following sections.

### Mucosal Coating

Adequate mucosal coating is achieved in the upper GI tract by flowing a high-density barium suspension over the mucosa. Because mucosal coating depends on the physical and chemical properties of the barium suspension, the choice of barium directly affects the quality of the examination. In general, the best results are obtained with high-density (ie, 200% wt/vol), intermediate-viscosity barium, such as E-Z-HD (E-Z-EM, Westbury, NY) or HD 85 (Lafayette Pharmaceutical, Lafayette, Ind). Adequate mucosal coating is usually present when a thin, uniform white line is observed with fluoroscopy along the contour of the stomach. The quality of mucosal coating may also be judged on the basis of whether an *areae gastricae* pattern is visible in the stomach. With standard barium suspensions, however, *areae gastricae* can be detected in only about 70% of patients (7). Since visualization of these structures depends on multiple factors, including the amount and viscosity of mucus in the stomach, failure to dem-

### The Routine Examination

1. A standard dose of 0.1 mg of glucagon diluted to 0.25 mL with sterile water is given intravenously.
2. The patient swallows one packet of effervescent granules or "fizzies" (ie, E-Z Gas; E-Z-EM) followed by 10 mL of water.
3. The patient gulps a cup of high-density barium (120 mL) as quickly as possible. The two best barium suspensions for this purpose are E-Z-HD (E-Z-EM) and HD 85 (Lafayette Pharmaceutical).
4. One three-on-one or two two-on-one upright spot radiographs are obtained in rapid sequence to demonstrate the entire length of the esophagus in a left posterior oblique (LPO) projection (Fig 1a). (All radiographic projections are indicated with respect to the tabletop.)
5. The table is brought to the hori-



**Index terms:** Duodenum, abnormalities, 73.2 • Duodenum, neoplasms, 73.3 • Duodenum, radiography, 73.123 • Esophagus, abnormalities, 71.2 • Esophagus, neoplasms, 71.3 • Esophagus, radiography, 71.123 • Radiology and radiologists, How I Do It • Stomach, abnormalities, 72.2 • Stomach, neoplasms, 72.3 • Stomach, radiography, 72.123

**Radiology 1988; 168:593-602**

<sup>1</sup> From the Department of Radiology, Hospital of the University of Pennsylvania, 3400 Spruce St, Philadelphia, PA 19104. Received March 22, 1988; accepted and revision requested April 22, 1988; revision received May 13. Address reprint requests to M.S.L.  
© RSNA, 1988

### TECHNIQUE

The routine double-contrast upper GI examination should be performed as



## The Double-contrast Barium Meal: A Correlation with Endoscopy

G. M. FRASER and P. M. EARNSHAW\*

Department of Radiodiagnosis and Gastrointestinal Unit, Western General Hospital, Edinburgh

The radiological and endoscopic findings are described in 214 patients with 252 lesions in whom endoscopy had been requested by a radiologist either to confirm or clarify a radiological opinion. There was radiological and endoscopic agreement about the presence or absence of oesophagitis in 73% of patients, but there was agreement about the presence or absence of duodenitis in only 48%. There were only two cases of early gastric cancer, and no early gastric cancers were found in a group of 43 patients on whom endoscopy had been specifically requested because of an abnormal gastric mucosal pattern. Endoscopy failed to detect 13% of gastric ulcers at the initial endoscopic examination.

In a review of 1500 consecutive double-contrast barium meal (DCBM) examinations, of whom 225 had also been examined by endoscopy, Laufer (1976) stressed that correlation with endoscopy was of particular value in assessing the finer points of interpretation. In the same paper he also demonstrated that when the radiologist was confident of his diagnosis there was almost 100% correlation with endoscopy, but when the radiologist was in doubt an error rate approaching 25% could be expected.

The purpose of this paper is to describe our own experience of those patients in whom endoscopy was requested either for confirmation of a radiological diagnosis or for elucidation where there was radiological doubt.

### METHODS

In the 5-year period 1977-81 the case notes of 214 patients on whom endoscopy had been per-

Table 1 - 214 patients with 252 abnormalities at DCBM or endoscopy

|                                | Number of patients |
|--------------------------------|--------------------|
| Oesophagitis                   | 49                 |
| Gastric ulcer or scar          | 61                 |
| Gastric cancer                 | 25                 |
| Gastric polyps                 | 14                 |
| Abnormal gastric mucosa        | 43                 |
| Post-operative stomach         | 9                  |
| Miscellaneous gastric lesions  | 3                  |
| Duodenitis                     | 21                 |
| Duodenal ulcer                 | 25                 |
| Miscellaneous duodenal lesions | 2                  |

formed at the request of the radiologist were available for scrutiny. In 38 patients there was multiple pathology and a total of 252 lesions were available for analysis.

Most of the DCBM examinations were performed by the same radiologist using a modification of the



Fig. 1 - Minimal change oesophagitis. At endoscopy there was a solitary 3 x 1 mm linear erosion as the only evidence of oesophagitis. This is seen radiologically as puckering of the mucosa with radiating folds *en face* and a crenated margin in profile (arrow).

Viviane Creteur, M.D.<sup>2</sup>  
Ruedi F. Thoeni, M.D.  
Michael F. Federle, M.D.  
John P. Cello, M.D.  
Albert A. Moss, M.D.  
Steven H. Ominsky, M.D.  
Henry I. Goldberg, M.D.  
Leon Axel, M.D.<sup>3</sup>

Sixty-seven patients with endoscopically proved oesophagitis and 25 patients who had no oesophageal disease were examined by double-contrast esophagography, followed by a single-contrast examination. The radiographs were evaluated separately and as a combined examination technique by three independent radiologists in a blind analysis. The respective sensitivities were 77% for the single-contrast examination, 80% for the double-contrast examination, and 88% for the combined examination method with no significant statistical difference ( $P = 0.05$ ). The sensitivity increased for all methods with an increased severity of oesophagitis. False positives more frequently occurred with double-contrast radiography, leading to similar accuracy rates for all methods (74% to 77%). The double-contrast examination technique showed an advantage over single-contrast radiography only if a granular pattern and erosions were the only radiographically detectable features of oesophagitis. The use of the combined examination technique is recommended.

Index terms: Oesophagitis • Esophagus, radiography, 7(1), 123

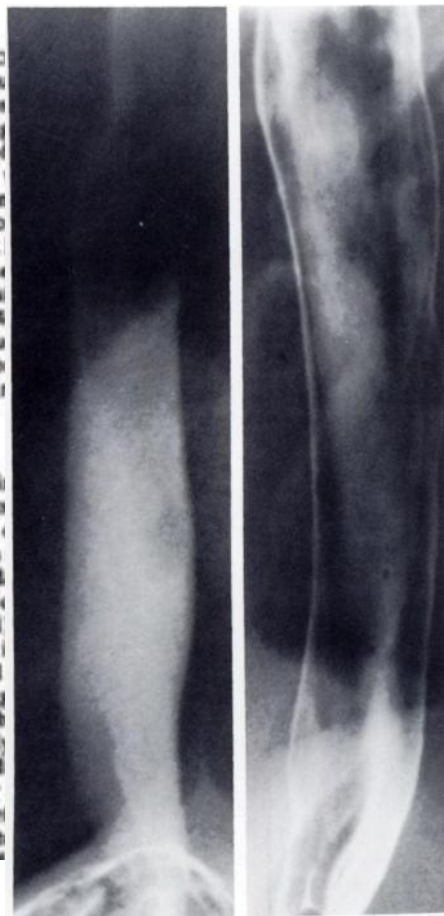
Radiology 147: 71-75, April 1983

## The Role of Single and Double-Contrast Radiography in the Diagnosis of Reflux Esophagitis<sup>1</sup>

REFLUX ESOPHAGITIS is a common condition. It is often diagnosed on the basis of clinical symptoms. The diagnosis is confirmed by endoscopy or radiography. The role of single and double-contrast radiography in the diagnosis of reflux esophagitis is the subject of this study.

This study is a retrospective analysis of 100 patients who had undergone endoscopic and radiographic examinations of the esophagus. The patients were divided into two groups: 50 patients with reflux esophagitis and 50 patients without reflux esophagitis.

The clinical symptoms that suggest reflux esophagitis are heartburn, regurgitation, and dysphagia. The radiographic findings of reflux esophagitis are a granular mucosal pattern, erosions, and strictures.



of the  
armed  
pected  
n. The  
) eso-  
studies  
tract.  
nd DC  
ielded  
ity in-  
ed by  
as un-  
lined

i. Each  
scopic  
-week  
armed  
ese 92  
hageal  
agitis.

symp-  
dyne-  
stive  
troin-  
of the  
astro-  
ad no

\*Present address: Freeman Hospital, Newcastle upon Tyne.

# Cineradiography of the pharyngeal stage of deglutition in 250 patients with dysphagia

By O. Ekberg, M.D. and G. Nylander, M.D.

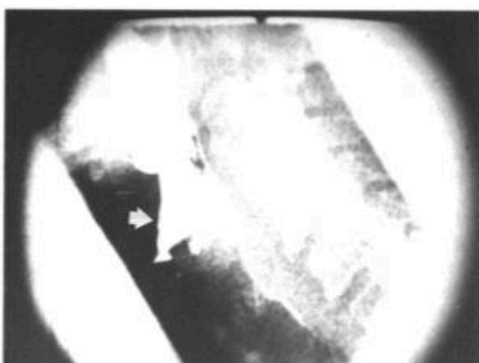
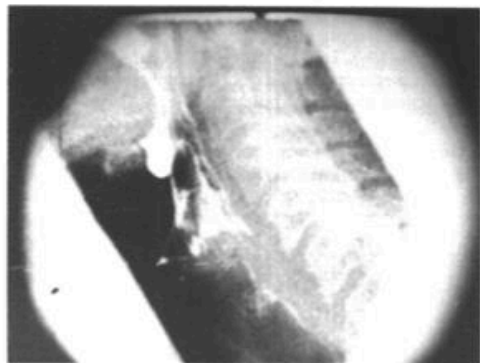
Department of Diagnostic Radiology, University of Lund, Malmö General Hospital, S-214 01 Malmö, Sweden

(Received June 1981)

### ABSTRACT

In order to define the diagnostic outcome of cineradiographic examination of the swallowing act (pharyngeal stage) in patients with dysphagia 250 such patients were consecutively examined. Synchrotron radiation was used for the examination, i.e., cine-radiography. The examination was performed in the anteroposterior and lateral projections. The contrast medium used was a water-soluble contrast medium. The contrast medium was administered through a nasogastric tube. The contrast medium was administered through a nasogastric tube. The contrast medium was administered through a nasogastric tube.

secondary swallowings. Cineradiograms were obtained in the AP and lateral projections. The films obtained were analysed by Steenbeck analector allowing a frame by frame examination.



function of swallowing ranges

# The British Journal of Radiology

## Cineradiography of the pharyngeal stage of deglutition in 150 individuals without dysphagia

By O. Ekberg, M.D. and G. Nylander, M.D.

Department of Diagnostic Radiology, University of Lund, Malmö General Hospital, S-214 01 Malmö, Sweden

(Received January 1981 and in revised form June 1981)

### ABSTRACT

With the aid of cineradiography the pharyngeal stage of deglutition was examined in 150 individuals without dysphagia. The act of swallowing had a synchronous pattern. Different types of aberrations were registered in 26 individuals (17%). The epiglottis did not tilt down to the retroverted position during deglutition. The contrast medium passed into the larynx. The larynx had a dysfunction of the cricoid cartilage. One individual had a dysfunction of the cricoid cartilage. In all but two instances the dysfunction was isolated and not concomitant with other abnormalities of the act of swallowing.

O. Ekberg and G. Nylander



36 (negative) AP : swallow-lum (60% of contrast) to clear ceds of 50 taviour of t's ridge, cements of e than 45° f contrast into the



## Double-Contrast Examination of the Pharynx

Olle Ekberg and G. Nylander

Department of Diagnostic Radiology, University of Lund, Malmö General Hospital, Malmö, Sweden

**Abstract.** The radiographic techniques for evaluation of the pharynx are described, with particular emphasis on double-contrast examination. Radiographic anatomy of the pharynx is illustrated.

**Key words:** Pharynx, radiography.

The value of double-contrast examination (DCE) of the esophagus is widely accepted and the procedure is now used routinely in most radiology departments. Several reports on this examination technique, its diagnostic applications, and its clinical importance have been published recently [1-3]. However, radiologic exploration of the pharynx by DCE has been adopted only by a few departments and there is a paucity of reports in the radiologic literature.

This review article describes examination of the pharynx using fluoroscopy, single-film technique, and double-contrast radiographs. Cine- and video-techniques for functional monitoring in patients with dysphagia are not described here but presented elsewhere [4, 5].

following sequences: soft-tissue roentgenograms, fluoroscopy during swallowing, and radiographs during and after ingestion of contrast media.

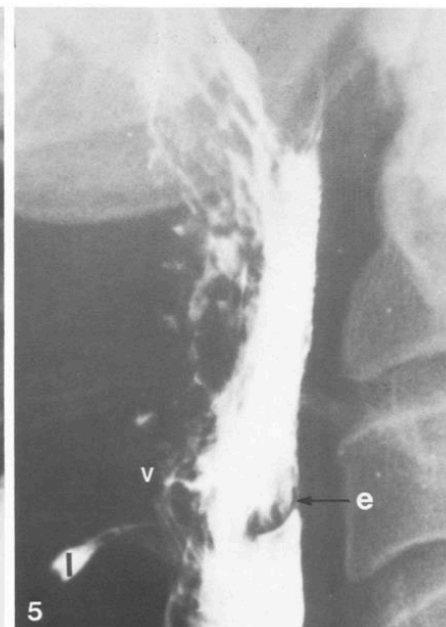
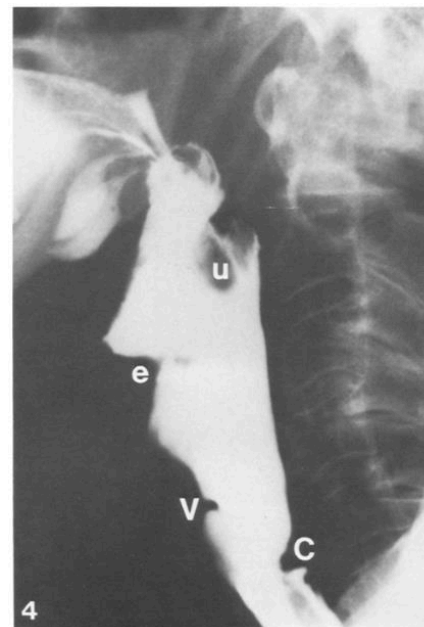
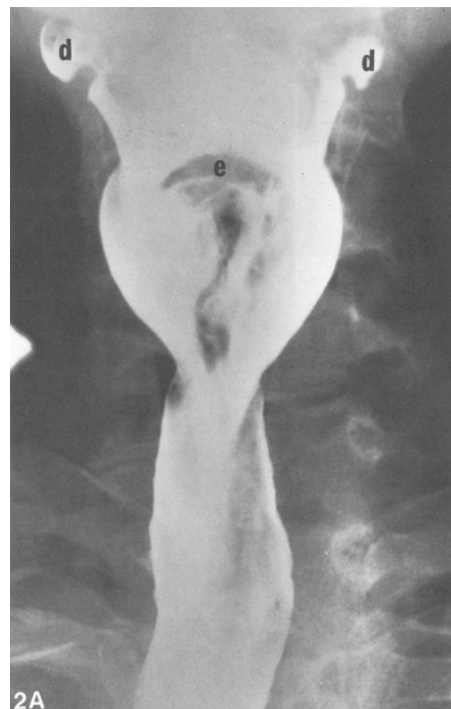
### Soft-Tissue Roentgenograms

Posteroanterior (PA) and lateral views were obtained before the patient was allowed to swallow any contrast medium. The films were exposed to visualize the soft-tissue patterns; hence they were not overexposed. To avoid superposition of the mandible on the pharynx, the PA-films were obtained by positioning the lower portion of the mandible in line with the occipital bone (Fig. 1). Lateral views were obtained with the shoulders of the patient lowered. The lateral view included the epipharynx.

### Fluoroscopy During Swallowing

A thorough screening was performed following a scheme that included assessment of various defined functions. Initially the patients were given a small amount of contrast medium to swallow. If a patient was unable to swallow and passed most of the contrast medium into the airways, the examination was discontinued after a few exposures to document the observed disability. However, if the patient could swallow properly or with only a minor degree of spillover into the airways, the examination was continued.

The oral stage of swallowing, including the voluntary initiation of pharyngeal swallowing, was observed. The formation of a bolus and its transportation by the tongue through the *fornix pharyngea* were verified. The *closure of the rima glottidis*



# Dynamic Radiology of Swallowing Disorders

O. Ekberg, R. Olsson

Dept. of Diagnostic Radiology, Malmö University Hospital, Malmö, Sweden

Endoscopy 1997; 29



Phys Med Rehabil Clin N Am  
19 (2008) 769–785

PHYSICAL MEDICINE  
AND REHABILITATION  
CLINICS OF  
NORTH AMERICA

## The Videofluorographic Swallowing Study

Bonnie Martin-Harris, PhD, SLP, BRS-S<sup>a,b,c,\*</sup>,  
Bronwyn Jones, MBBS, FRACP, FRCR<sup>d</sup>

<sup>a</sup>Evelyn Trammell Institute for Voice and Swallowing,  
<sup>b</sup>Department of Otolaryngology, Head and Neck Surgery, Medical University  
of South Carolina, Charleston, SC 29425, USA

<sup>c</sup>Department of Communication Sciences and Disorders, College of Health...

Dysphagia is a common symptom from the oral cavity, pharynx, or esophagus. The most common cause is a structural or functional disorder of the upper esophageal sphincter. The most common cause of the disorder is a structural or functional disorder of the upper esophageal sphincter.



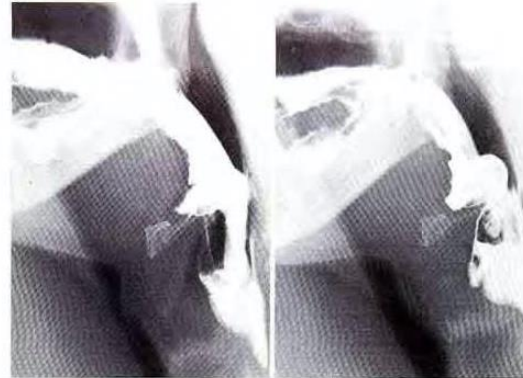
The most common cause of the disorder is a structural or functional disorder of the upper esophageal sphincter.

### Introduction

Barium swallow patients with dysphagia. Although the prevalence of dysphagia is high, the clinical presentation is often subtle.



It is a common symptom from the oral cavity, pharynx, or esophagus. The most common cause is a structural or functional disorder of the upper esophageal sphincter.



It is a common symptom from the oral cavity, pharynx, or esophagus. The most common cause is a structural or functional disorder of the upper esophageal sphincter.

It is a common symptom from the oral cavity, pharynx, or esophagus. The most common cause is a structural or functional disorder of the upper esophageal sphincter.



The present study was designed to evaluate the timing of the swallow and the response of the patient to the swallow. Further research is needed to determine the applicability of the study.

The modified barium swallow (MBS) examination, is often considered the



## Subjective Assessment of Videofluoroscopic Swallow Studies

Janet W. Lee, MD<sup>1</sup>, Derrick R. Randall, MD, MSc<sup>1,2</sup>,  
 Lisa M. Evangelista, CScD, CCC-SLP<sup>1</sup>, Maggie A. Kuhn, MD<sup>1</sup>,  
 and Peter C. Belafsky, MD, PhD<sup>1</sup>

2016

Sponsorships or competing interests that may be relevant to content are discussed at the end of this article.

### Abstract

**Objective.** The videofluoroscopic swallow study (VFSS) is the gold standard diagnostic tool to evaluate oropharyngeal dysphagia. Although objective measurements on VFSS have been described, there is no universal method of analysis, and the majority of clinicians use subjective interpretation alone. The purpose of this investigation was to evaluate the accuracy of subjective VFSS analysis.

**Study Design.** Double-blinded experiment.

**Setting.** Tertiary care laryngology center.

**Subjects and Methods.** Seventy-six de-identified videos from VFSS evaluations of patients with dysphagia were presented to blinded, experienced speech-language pathologists and laryngologists individually. Evaluators rated each video as normal or abnormal for hyoid elevation (HE), pharyngeal area (PA), pharyngeal constriction ratio (PCR), and pharyngoesophageal segment opening (PESo). A blinded investigator assessed evaluators' inter- and intrarater agreement and compared their responses to objectively measured results for these parameters to examine accuracy.

**Results.** Evaluators correctly classified only 61.5% of VFSS videos as normal or abnormal, with moderate interrater agreement ( $\kappa = 0.48$ ,  $P < .0001$ ). Intrarater agreement was highly variable ( $\kappa = 0.43$ - $0.83$ ). Accuracy was greatest for PCR (71.6%), with poorer performance for HE (61.3%), PESo (59.2%), and PA (45.3%). Interrater agreement was moderate for all parameters, with greater concordance for PCR ( $\kappa = 0.59$ ) and PESo ( $\kappa = 0.54$ ) and less for HE ( $\kappa = 0.40$ ) and PA ( $\kappa = 0.44$ ). Evaluators unanimously agreed on a correct interpretation of a VFSS only 28% of the time.

**Conclusion.** Subjective assessment of VFSS parameters is inconsistently accurate when compared with objective measurements, with accuracy ratings ranging from 45.3% to 71.6% for specific parameters. Inter- and intrarater reliability for subjective assessment was moderate and highly variable.

### Keywords

dysphagia, modified barium swallow, MBS, fluoroscopic swallow study, dynamic swallow study, objective measures, reproducibility, VFSS, pharynx, deglutition

Received September 30, 2016; revised December 27, 2016; accepted January 10, 2017.

**D**ysphagia, or difficulty swallowing, is a symptom that may develop from myriad etiologies, including gastroesophageal reflux disease, cricopharyngeus muscle dysfunction, obstructing spinal osteophytes, neuromuscular disorders, and ineffective esophageal motility. Alternatively, iatrogenic causes, such as head and neck cancer therapy or spinal surgery, can alter the sensory and muscular function of the pharynx. Dysphagia is a common problem experienced by patients in both inpatient and community settings. Estimates of the prevalence of dysphagia range from 11% to 68%, with an associated health care cost of \$547 million annually in the United States.<sup>1</sup> As the prevalence of dysphagia is higher in the elderly, one can expect that the aging population will increase the burden of dysphagia on health care resources.

The evaluation of a patient with dysphagia often requires multiple studies with significant attendant time and cost. Flexible laryngoscopy, esophagoscopy, pH and impedance monitoring, videofluoroscopic swallow study (VFSS), and manometry may all have a part in the workup of dysphagia. VFSS is considered the gold standard for visualization of the anatomy and physiology of a patient's oropharyngeal

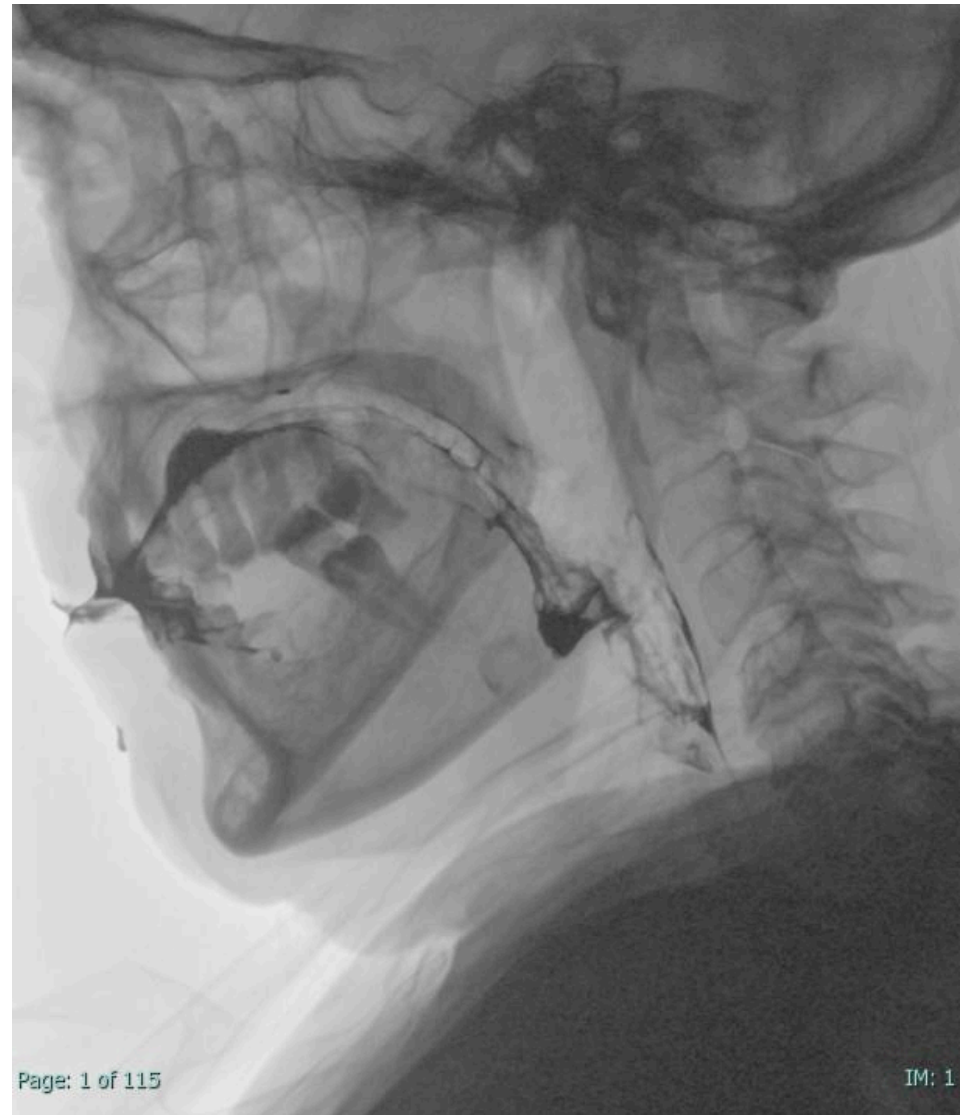
<sup>1</sup>Center for Voice and Swallowing, Department of Otolaryngology-Head and Neck Surgery, University of California-Davis, Sacramento, CA, USA

<sup>2</sup>Section of Otolaryngology-Head and Neck Surgery, Department of Surgery, University of Calgary, Calgary, Canada

This article was presented at the 2016 AAO-HNSF Annual Meeting & OTO EXPO, September 18-21, 2016, San Diego, California.

### Corresponding Author:

Peter C. Belafsky, MD, PhD, Center for Voice and Swallowing, Department of Otolaryngology-Head and Neck Surgery, Suite 7200, 2521 Stockton Blvd, University of California-Davis, Sacramento, CA 95817, USA.  
 Email: pbelafsky@ucdavis.edu



# Videofluoroscopia

Componenti fisiologiche valutate durante il VFSS

- FO {
  - 1. Chiusura delle labbra
  - 2. Elevazione linguale
  - 3. Preparazione / masticazione del bolo
  - 4. Trasporto del bolo / movimento linguale
  - 5. Retrazione della base della lingua
- FF {
  - 6. Innesco del riflesso della deglutizione
  - 7. Elevazione e retrazione del palato molle
  - 8. Elevazione laringea
  - 9. Escursione anteriore dell'osso ioide
  - 10. Inversione epiglottica
  - 11. Chiusura laringea
  - 12. Contrazione faringea
- FE {
  - 13. Apertura del segmento faringo-esofageo
  - 14. Peristalsi esofagea





# Videofluoroscopia

Analisi dei cosiddetti segni maggiori della disfagia orofaringea:

- Deficit motilità e retropulsione linguale
- ritardo dell'innesco del riflesso faringeo
- reflusso naso-faringeo
- stasi in ipofaringe
- Penetrazione / aspirazione
- Ipertono SES



# Videofluoroscopia

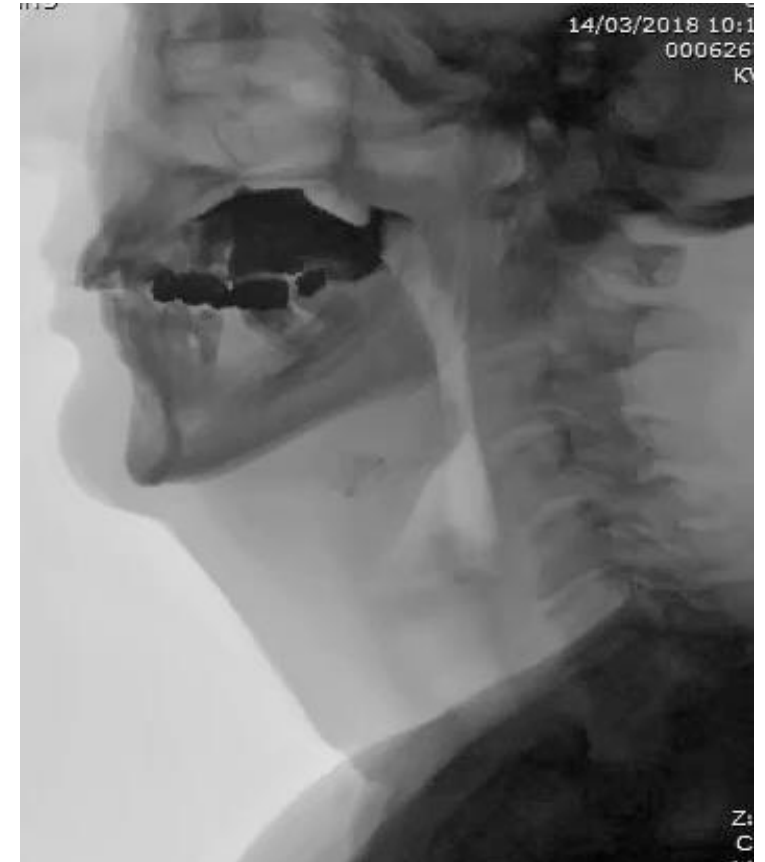
- Esame imprescindibile per una pianificazione terapeutica e per il controllo della sua efficacia a breve termine

Martin-Harris et al., PhysMed Rehabil Clin N Am. 2008

➤ Dysfagia 2008

- Tuttavia nessuna linea guida riporta i tempi in cui eseguire l'esame come studio e follow-up della deglutizione

Jauch et al., Stroke 2013 ; Kern et al., Cerebrovasc Dis 2013  
Donovan et al. Stroke 2013; SPREAD 2012





# Videofluoroscopia

Gold Standard

- Valuta la **sicurezza** (safety) e l'**efficacia** (efficacy) del processo di deglutizione al variare di densità e volume



Logemann, JA. Manual for the videofluorographic study of swallowing. 2 ed.. ProEd; Austin: 1993

Jones, B.; Donner, MW. Normal and abnormal swallowing: Imaging in diagnosis and therapy. Springer Verlag; New York: 1991

Dodds WJ, Logemann JA, Stewart ET. Radiologic assessment of abnormal oral and pharyngeal phases of swallowing. Am J Roentgenol May;1990

# VFSS: principali obiettivi

- Identificare e distinguere la presenza, il tipo e la gravità della compromissione fisiologica della deglutizione
- Determinare la sicurezza (protezione delle vie aeree) e l'efficacia dell'assunzione orale
- Valutare gli effetti delle posture, delle manovre e delle diverse consistenze del bolo sulla fisiologia della deglutizione, sulla protezione delle vie aeree e sull'efficienza
- Sviluppare interventi terapeutici mirati per la condizione clinica del paziente e sviluppare piani di assunzione e di gestione nutrizionale in collaborazione con il medico specialista e il team multidisciplinare

# VFS: vantaggi

- Valutazione morfologica
- Ristagno post-deglutitorio
- Valutazione sensibilità
- Ripetibilità
- Può fornire un feedback visivo per gli esercizi riabilitativi



# VFS: vantaggi

Possibilità di analizzare:

- Adeguata valutazione della fase orale
- La latenza del riflesso faringeo
- Adeguata valutazione motilità faringo-laringea
- Evidenza diretta dell'aspirazione
- Adeguata valutazione della fase esofagea

# VFS: svantaggi

## Dose radiazioni ionizzanti al paziente

[Dysphagia](#). 2022 Dec;37(6):1519-1524. doi: 10.1007/s00455-022-10411-x. Epub 2022 Feb 15.

### New Radioprotective Device that can be Used for Fluoroscopic Exam: Possibility to Contribute to Staff Exposure Protection During VFSS

Yoshiaki Morishima <sup>1, 2</sup>, Koichi Chida <sup>3</sup>, Osamu Ito <sup>4</sup>

Comparative Study [Dysphagia](#). 2007 Jan;22(1):13-5. doi: 10.1007/s00455-006-9031-x. Epub 2006 Oct 6.

### Radiation dose in videofluoroscopic swallow studies

Ivan Zammit-Maempel <sup>1</sup>, Claire-Louise Chapple, Paula Leslie

[Am J Speech Lang Pathol](#). 2019 Aug 9;28(3):1053-1059. doi: 10.1044/2019\_AJSLP-18-0271. Epub 2019 May 21.

### Relationships Between Radiation Exposure Dose, Time, and Projection in Videofluoroscopic Swallowing Studies

Heather Shaw Bonilha <sup>1, 2</sup>, Janina Wilmskoetter <sup>1</sup>, Sameer Tipnis <sup>3</sup>, Janet Horn <sup>1</sup>, Bonnie Martin-Harris <sup>4</sup>, Walter Huda <sup>5</sup>

Comparative Study [Dysphagia](#). 2013 Jun;28(2):153-8. doi: 10.1007/s00455-012-9424-y. Epub 2012 Sep 9.

### Patients' radiation dose during videofluoroscopic swallowing studies according to underlying characteristics

Hong Min Kim <sup>1</sup>, Kyoung Hyo Choi, Tae Woo Kim

Review [Dysphagia](#). 2023 Apr;38(2):517-542. doi: 10.1007/s00455-021-10335-y. Epub 2021 Jul 12.

### A Tutorial on Diagnostic Benefit and Radiation Risk in Videofluoroscopic Swallowing Studies

Harry R Ingleby <sup>1</sup>, Heather S Bonilha <sup>2</sup>, Catriona M Steele <sup>3, 4</sup>

Review [Dysphagia](#). 2019 Jun;34(3):290-297. doi: 10.1007/s00455-018-9945-0. Epub 2018 Sep 22.

### Radiation Exposure to Staff and Patient During Videofluoroscopic Swallowing Studies and Recommended Protection Strategies

Victoria Jean Earl <sup>1</sup>, Mohamed Khaldoun Badawy <sup>2, 3</sup>

[Dysphagia](#). 2016 Aug;31(4):574-8. doi: 10.1007/s00455-016-9718-6. Epub 2016 Jun 18.

### Estimation of the Dose of Radiation Received by Patient and Physician During a Videofluoroscopic Swallowing Study

Yoshiaki Morishima <sup>1, 2</sup>, Koichi Chida <sup>3</sup>, Hiroshi Watanabe <sup>4</sup>

[Dysphagia](#). 2020 Feb;35(1):84-89. doi: 10.1007/s00455-019-10006-z. Epub 2019 Apr 3.

### Radiation Dose During Videofluoroscopic Swallowing Studies and Associated Factors in Pediatric Patients

Hyo Won Im <sup>1</sup>, Seung Yeun Kim <sup>1</sup>, Byung-Mo Oh <sup>1</sup>, Tai Ryoan Han <sup>1</sup>, Han Gil Seo <sup>2</sup>

[Dysphagia](#). 2021 Feb;36(1):73-82. doi: 10.1007/s00455-020-10112-3. Epub 2020 Apr 11.

### Radiation Safety in Videofluoroscopic Swallowing Study: Systematic Review

Jun-Yong Hong <sup>1</sup>, Na-Kyoung Hwang <sup>2</sup>, Gihyoun Lee <sup>3</sup>, Ji-Su Park <sup>4</sup>, Young-Jin Jung <sup>5, 6, 7</sup>

[Acta Radiol](#). 2017 Sep;58(9):1037-1044. doi: 10.1177/0284185116685924. Epub 2017 Jan 13.

### Feasibility of low-dose digital pulsed video-fluoroscopic swallow exams (VFSE): effects on radiation dose and image quality

Jakob Weiss <sup>1, 2</sup>, Mike Notohamiprodjo <sup>1, 2</sup>, Klement Neumaier <sup>3</sup>, Minglun Li <sup>3</sup>, Wilhelm Flatz <sup>2</sup>, Konstantin Nikolaou <sup>1, 2</sup>, Andreas Pomschar <sup>2</sup>

Published in final edited form as:

*Curr Opin Otolaryngol Head Neck Surg*. 2020 December ; 28(6): 371–375. doi:10.1097/MOO.0000000000000665.

### Radiation Exposure in Modified Barium Swallow Studies

Heather Shaw Bonilha, Ph.D., CCC-SLP,

Published in final edited form as:

*Dysphagia*. 2022 April ; 37(2): 399–406. doi:10.1007/s00455-021-10291-7.

### Radiation Effective Doses to Adults Undergoing Modified Barium Swallow Studies

Sameer V. Tipnis, Ph.D.,

Published in final edited form as:

*Dysphagia*. 2019 December ; 34(6): 922–929. doi:10.1007/s00455-019-09993-w.

### Radiation risks to adult patients undergoing Modified Barium Swallow Studies

Heather Shaw Bonilha<sup>\*,†</sup>, Walter Huda<sup>\*\*</sup>, Janina Wilmskoetter<sup>\*</sup>, Bonnie Martin-Harris<sup>§,¶</sup>, Sameer V Tipnis<sup>‡</sup>

Radiol med (2006) 111:123–129  
DOI 10.1007/s11547-006-0013-8

**HEAD AND NECK RADIOLOGY  
RADIOLOGIA DEL CAPO E DEL COLLO**

Dynamic swallowing study and radiation dose to patients

*Studio dinamico della deglutizione e dose radiante al paziente*

L. Moro<sup>1</sup> • C. Cazzani<sup>2</sup>

American Journal of Speech-Language Pathology • Vol. 29 • 1078–1093 • July 2020

**AJSLP**

Review Article

### Best Practices in Modified Barium Swallow Studies

Bonnie Martin-Harris,<sup>\*,§</sup> Cheri L. Canon,<sup>b</sup> Heather Shaw Bonilha,<sup>c,d</sup> Joseph Murray,<sup>°</sup> Kate Davidson,<sup>d</sup> and Maureen A. Lefton-Greif<sup>§,g,h</sup>

# Videofluoroscopia

## Radiazioni ionizzanti



Dose Efficace di 0,01-1,1 mSv (mediana = 0,2 mSv)



# Videofluoroscopia

## Radiazioni ionizzanti

L'esame strumentale è GIUSTIFICATO (D.Lgs. 101/2020)...

- Ragionevole dubbio sulla sicurezza e sull'efficienza dell'atto deglutitorio
- Per comprendere il meccanismo che porta allo sviluppo dei sintomi disfagici
- Per capire meglio i fenomeni funzionali alterati

# Videofluoroscopia

## Radiazioni ionizzanti

- È importante considerare il grado di rischio associato alla VFS nel contesto di altre fonti di radiazioni nella vita quotidiana del paziente e in medicina
- È necessario effettuare un'analisi rischi/benefici in relazione alla sicurezza del paziente in termini di eventi di aspirazione, nonché alla sicurezza del paziente e degli operatori in relazione all'esposizione alle radiazioni

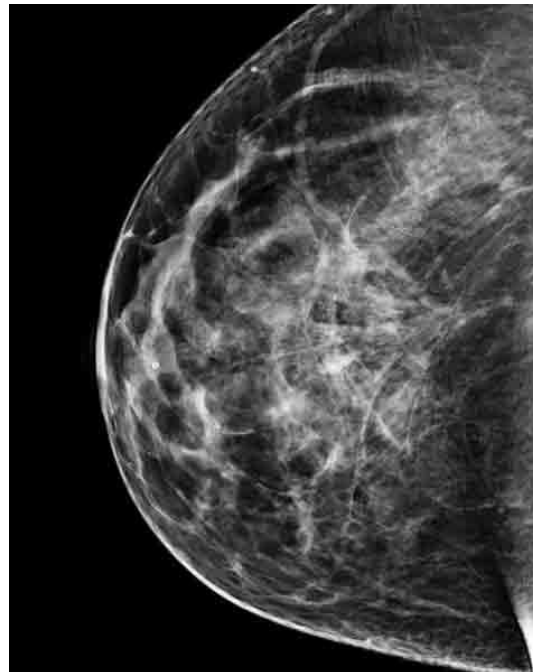


# Videofluoroscopia

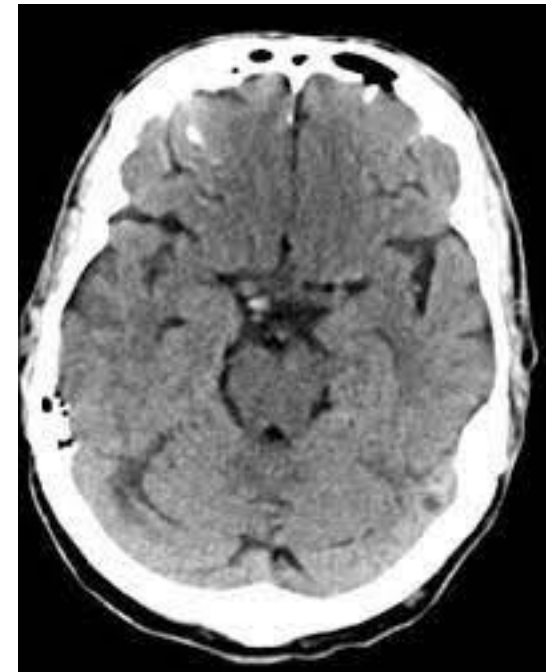
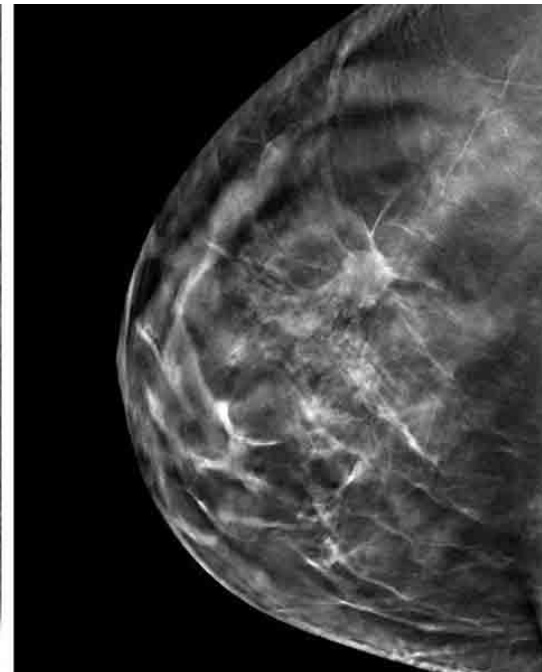
## Radiazioni ionizzanti



0,27 mSv



0,4 mSv



2 mSv

Limite di dose efficace anno: 1 mSv



# Videofluoroscopia

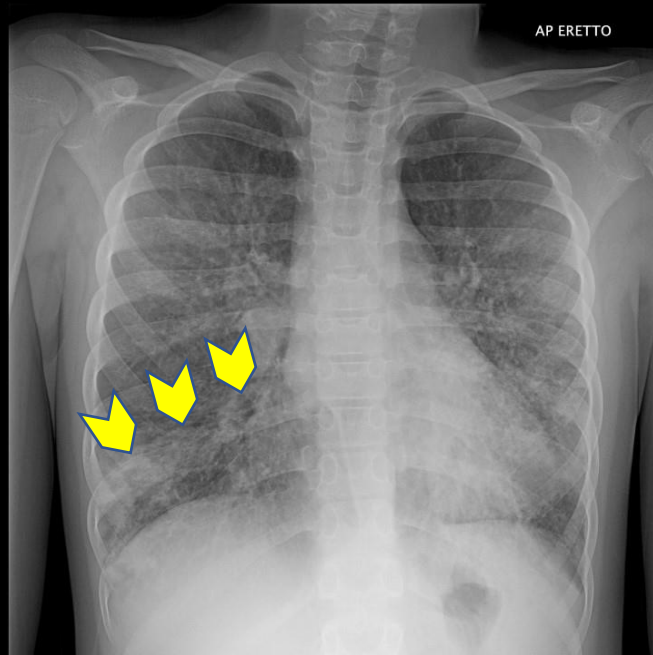
## Radiazioni ionizzanti

L'esame strumentale è GIUSTIFICATO (D.Lgs. 101/2020)

- Episodi di polmoniti...ad origine sconosciuta
- Ripetute ospedalizzazioni



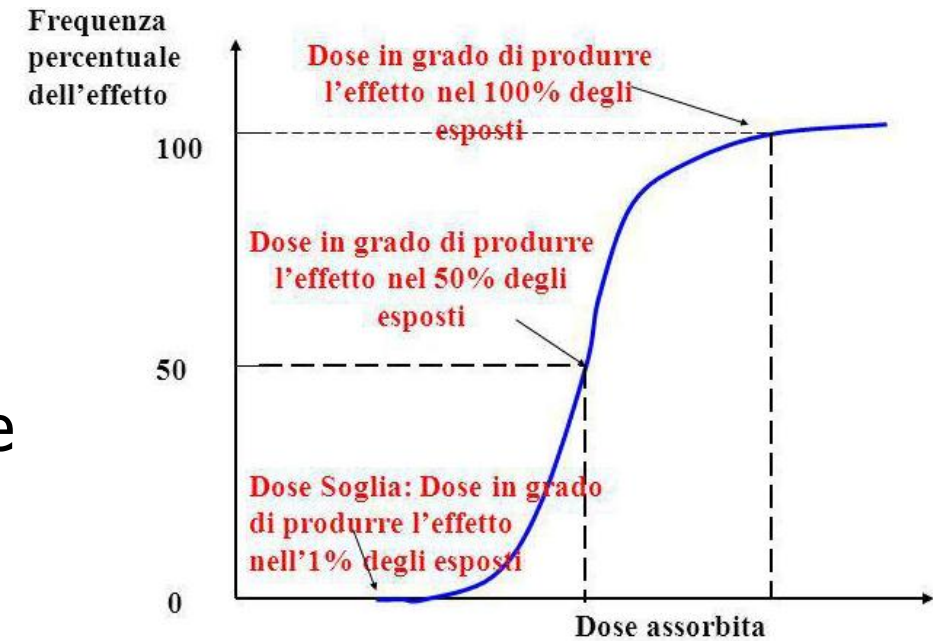
# Complicanze



# Videofluoroscopia

## Radiazioni ionizzanti

- l'esperienza dell'operatore
- la durata dell'esame
- l'uso di un protocollo standardizzato
- la metodologia utilizzata per calcolare l'esposizione
- la posizione del paziente
- i parametri dell'unità di fluoroscopia



**VFSS**



**FEES**

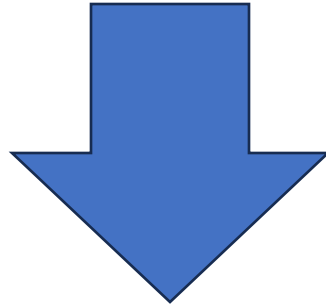




**VFSS**



Indagini complementari



**FEES**

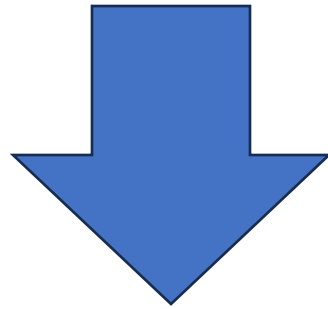


Non devono essere in concorrenza fra loro  
ma devono integrarsi sulla base dei rispettivi  
vantaggi e svantaggi

**FEES**



Indagini complementari



**VFSS**



**CONSENTONO DI RIDURRE LA PERCENTUALE  
DI FALSI NEGATIVI**

# Videofluoroscopia



# Protocollo d'esame





# Videofluoroscopia

## Somministrazione del bolo

### Modificazioni:

- Quantità
- Densità
- Consistenza



- T. R. Han, et al. Dysphagia, 2008
- Logemann JA. Manual for the videofluorographic study of swallowing, 1993
- Robbins JA, Levine RL, Arch Phys Med Rehabil, 1993
- Holas MA, et al. Arch Neurol., 1994

# Videofluoroscopia



Il Quadro IDDSI prevede l'adozione di una terminologia standardizzata ai fini della descrizione delle consistenze dei cibi e dei liquidi addensati.



# Protocollo d'esame

- ✓ **3 consistenze**

(semiliquida-semisolido-liquida)

miscelate con la polvere di solfato di bario (prontobario HD 250% peso-volume Bracco, Milano, Italia)

- ✓ **Ai volumi 2 cc (cucchiaino) e 6 cc (cucchiaino)**

- Bolo semiliquido: yogurt, acqua e polvere di solfato di bario (1:1:1)

- Bolo semisolido: budino e polvere di solfato di bario (1:1)

- Bolo liquido: acqua e polvere di solfato di bario (1:1)

- ✓ **Consistenza solida**



# Protocollo d'esame

## ➤ SEMI LIQUIDO 1-2

- ✓ Mdc in un CUCCHIAINO 1° STEP
- ✓ Mdc in un CUCCHIAIO 2° STEP

## ➤ SEMI SOLIDO 3-4

- ✓ Mdc in un CUCCHIAINO 3° STEP
- ✓ Mdc in un CUCCHIAIO 4° STEP

## ➤ LIQUIDO 5-6

- ✓ Mdc in un CUCCHIAINO 5° STEP
- ✓ Mdc in un CUCCHIAIO 6° STEP



- ✓ Somministrati almeno due boli per consistenza
- ✓ Esame sospeso nel momento in cui si è verificata aspirazione



# Videofluoroscopia

## Posture di compenso

- Utilizzano la gravità per far progredire il bolo
- Riducono le dimensioni delle vie respiratorie
- Riducono l'aditus laringeo

L'effetto delle posture di compenso  
è immediato

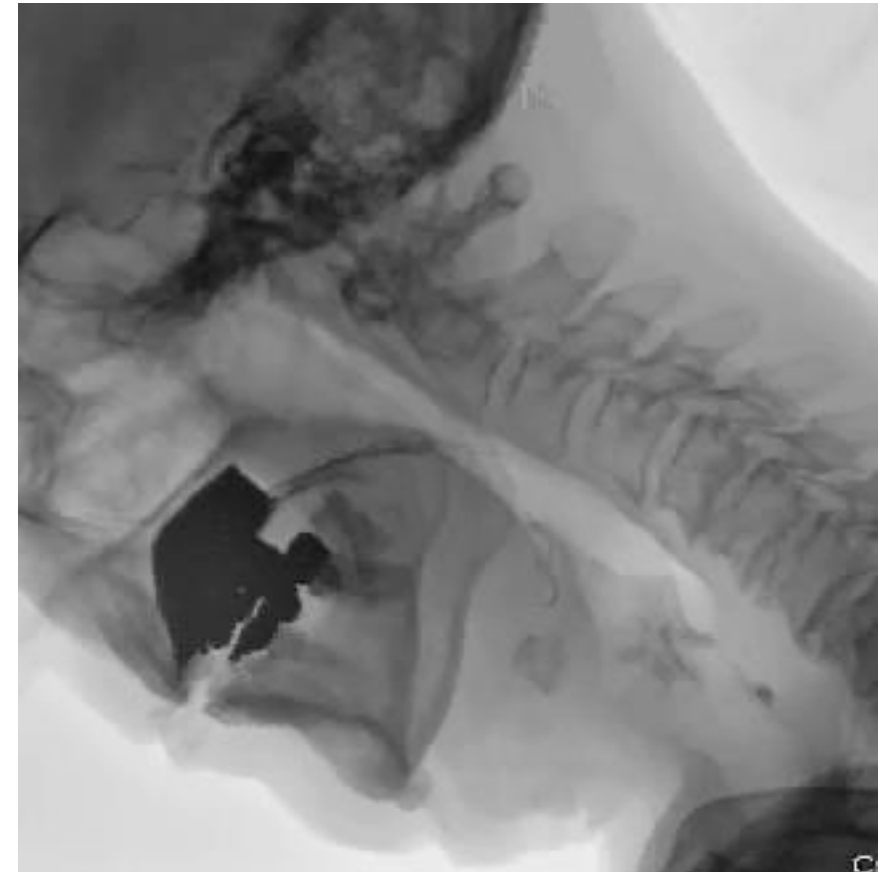
# Videofluoroscopia

## Postura a capo flesso anteriormente

Il capo flesso allarga le vallecule glossoepiglottiche, sposta il base lingua e l'epiglottide posteriormente

### Indicazione:

- ritardo innesco del riflesso deglutitorio
- caduta pre deglutitoria
- incompetenza glottica



# Videofluoroscopia

## Postura a capo flesso e ruotato (es. dx)

Chiusura del seno piriforme omolaterale alla rotazione (es. dx) con transito del bolo controlateralmente (es. sx)

### Indicazione:

- asimmetria dx/sn con lesione o insufficienza omolaterale alla rotazione



# Videofluoroscopia



## Osservazioni possibili:

- movimenti linguali e di propulsione del bolo
- tempo di transito nei vari distretti (orale, faringeo, esofageo)
- corretta sequenzialità dell'evocazione del riflesso deglutitorio
- eventuale ristagno orale-orofaringeo e/o ipofaringeo
- presenza ed entità di penetrazione ed aspirazione
- presenza di tosse in rapporto all'inalazione radiologicamente dimostrata
- esistenza di fistole



# Videofluoroscopia

Ha lo scopo di studiare la dinamica della deglutizione e non le strutture anatomiche della deglutizione

