



ROLE OF BARIUM STUDIES IN VARIOUS ESOPHAGEAL DISEASES

Dr. Dipen Vaidya

Assistant Professor, Gmers Medical College & Civil Hospital, Gandhinagar, Gujarat.

Dr. Pratik Kaswekar*

Assistant Professor, Gmers Medical College & Civil Hospital, Gandhinagar, Gujarat. *Corresponding Author

Dr. Bhargav Patel

Senior Resident, Gmers Medical College & Civil Hospital, Gandhinagar, Gujarat.

ABSTRACT

Barium studies are useful for the evaluation of mucosal surface lesions. In diseases such as fibrovascular polyps, duplication cysts, scleroderma, trauma, caustic esophagitis, hiatal hernia, esophageal diverticulum, achalasia, and paraesophageal varices, the findings of imaging studies are specific, obviating the need for further invasive diagnostic work-up. Recent years have seen a decline in number of barium procedures due to wider availability of cross sectional imaging modalities. Though use of barium esophagography/barium swallow has decreased in day to day clinical practice, it still remains a valuable test for structural and functional evaluation of esophagus. It can be performed as single or double contrast examination or as a multiphasic examination comprising upright double contrast views followed by prone single contrast views. This study demonstrates imaging features of various esophageal diseases on barium studies.

KEYWORDS : Barium swallow, esophagus, web, achalasia, tumours.

INTRODUCTION

The purpose of this study is to review imaging findings of various esophageal diseases on barium studies.

Various esophageal diseases are discussed under five subheadings, viz., oesophageal webs, rings, and diverticulae; motility disorders; esophagitis; esophageal tumors; and miscellaneous esophageal diseases.

Oesophageal diseases are functional disorders [gastro oesophageal reflux disease (GERD), achalasia, oesophageal diverticula], congenital abnormalities (oesophageal duplication cyst) or tumors (leiomyoma, gastrointestinal stromal tumors (GIST), cancer. In patients with GERD, a barium swallow describes the anatomy of the oesophagus and stomach (hiatal hernia, Schatzki's ring, stricture). In patients with oesophageal carcinoma barium swallow determines the location and length of the cancer. [1]

Barium contrast studies are useful for the evaluation of mucosal surface lesions of the oesophagus. In diseases such as fibrovascular polyps, duplication cysts, scleroderma, trauma, caustic oesophagitis, hiatal hernia, oesophageal diverticulum, achalasia and paraesophageal varices, the findings of imaging studies are specific, obviating the need for further invasive diagnostic work-up.

Barium oesophagography is a useful initial imaging modality for the diagnosis of patients with dysphagia, reflux, motility disorders, or perforation. For an intact oesophagus, thick and thin barium are used as contrast; however, if perforation is suspected, a diluted water-soluble contrast agent is typically used followed by dilute barium if no perforation is seen. [2]

AIMS & OBJECTIVES

To assess the role of Barium study in the evaluation of oesophageal lesions.

- To compare oesophageal lesions with clinical outcome.
- To study various types of oesophageal lesions and their imaging features on barium studies.

MATERIALS & METHODS

Sample size = 50 patients

Study design = correlation study

The indication and details of the radiological procedure will be explained to the patient. A written consent will be obtained either from patient or his/her relatives.

Each patient would undergo barium study. Findings of barium study will be correlated with surgical & clinical outcomes whenever available.

All the barium examinations were carried out over a span of 1 year 6 months (MAY 2020 – NOVEMBER 2021) in the Department of Radiology, Civil hospital, Gandhinagar. The examinations were performed after per oral administration of high density barium sulphate (200% w/v) suspension obtained after diluting commercially available high density barium sulphate powder with 70 ml of water. For double-contrast studies, patients were made to ingest effervescent granules followed by ingestion of barium suspension. Upright left posterior oblique (LPO) views were taken, followed by mucosal relief views to evaluate for fold thickness. Patients were asked to turn 360° so as to coat gastric fundus. Recumbent right lateral views were taken to evaluate cardiac rosette and gastric fundus. Prone right anterior oblique (RAO) views were taken to evaluate esophageal motility. Finally, patients were turned from supine to right posterior oblique and right lateral position under fluoroscopy to see for gastroesophageal reflux.

BARIUM SWALLOW PROCEDURE TYPES, MATERIAL & ITS USE:

1) DOUBLE-CONTRAST:

CONTRAST MEDIA:

100% Barium sulfate paste, 80% Barium sulfate suspension for single contrast, 200-250% high density, low viscosity for double contrast study

USE : Double-contrast esophagograms are particularly useful for the detection of mucosal pattern in reflux esophagitis, infectious oesophagitis, oesophageal carcinoma.

2) SINGLE CONTRAST :

CONTRAST MEDIA:

Mouthful 80% w/v Barium sulfate paste given.

USE : Single contrast is used to outline the structure and lumen.

Oesophageal web, diverticula, oesophageal stricture, oesophageal neoplasm, oesophageal ring and oesophageal motility disorder.

NORMAL APPEARANCE OF OESOPHAGUS ON BARIUM:

The normal distended oesophagus has a thin white luminal

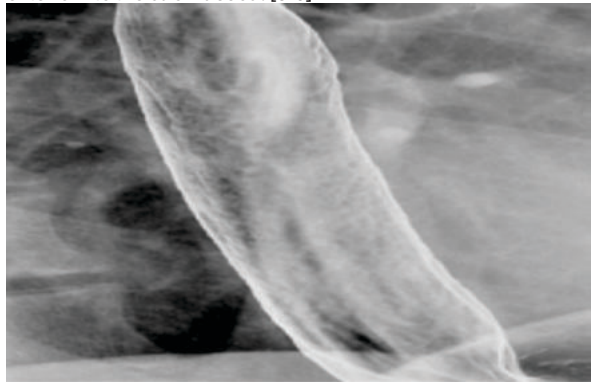
contour in profile and a smooth homogeneous appearance en face. Mucosal-relief views show the normal longitudinal folds as thin, straight, delicate structures no more than 1–2 mm in width.

RADIOLOGICAL APPEARANCE OF VARIOUS OESOPHAGEAL LESIONS:

REFLUX OESOPHAGITIS

Finely nodular or granular appearance with poorly defined radiolucencies that fade peripherally due to edema and inflammation of the mucosa. This nodularity or granularity almost always extends proximally from the gastroesophageal junction as a continuous area of disease.

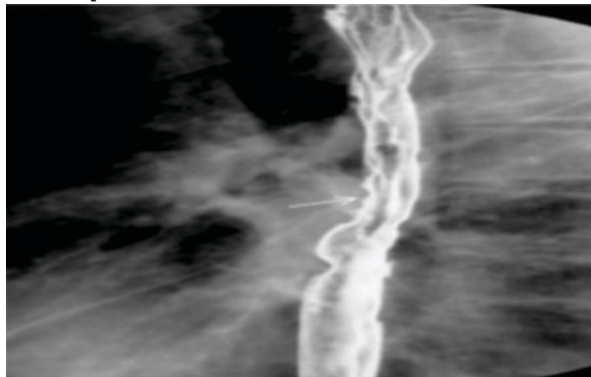
Reflux oesophagitis may also manifest as thickened longitudinal folds as a result of edema and inflammation that extend into the submucosa. [3-6]



UPRIGHT DOUBLE CONTRAST BARIUM SWALLOW: Showing extensive granularity in the lower third of oesophagus secondary to edema and inflammation of the mucosa.

BARRETT OESOPHAGUS

A study reveals a mid oesophageal stricture or ulcer or a reticular pattern of the mucosa.



Double-contrast barium swallow showing mild narrowing (arrow) and reticular pattern in columnar epithelium at mid thoracic esophagus.

CANDIDA OESOPHAGITIS

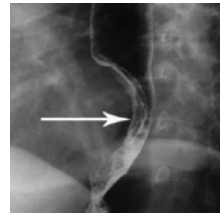
manifests as innumerable tiny ulcers clustered together in the mid oesophagus below the level of the left main bronchus. [7]

SQUAMOUS PAPILLOMAS:

the most common benign mucosal tumor in the oesophagus. These lesions usually appear on double-contrast esophagograms as small sessile polyps with a smooth or slightly lobulated contour. [8]

LEIOMYOMAS:

Leiomyomas are the most common benign submucosal tumor in the oesophagus.

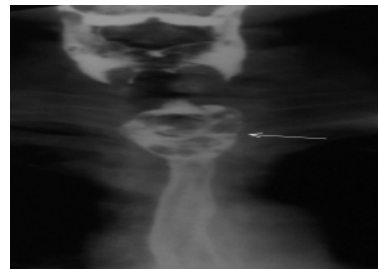


Smooth submucosal mass, which forms a right or slightly obtuse angle with the adjacent oesophageal wall.

FIBROVASCULAR POLYPS :

Benign tumors consisting of varying amounts of fibrovascular and adipose tissue covered by squamous epithelium. Fibrovascular polyps usually arise near the level of the cricopharyngeus muscle.

FINDINGS: Smooth, expansile, sausage-shaped masses that expand the lumen of the upper and middle portions of the oesophagus.



Expansion of cervical and proximal thoracic esophagus with polypoidal filling defect (arrow).

OESOPHAGEAL CARCINOMA:

1) EARLY OESOPHAGEAL CARCINOMA

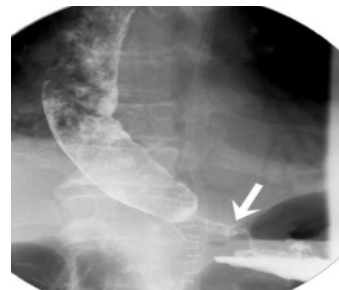
These tumors may manifest as plaque like lesions (often containing flat central ulcers), sessile polyps with a smooth or slightly lobulated contour, or focal irregularities of the oesophageal wall.

Superficial spreading carcinoma is another form of early oesophageal cancer characterized by poorly defined nodules or plaques that merge with one another, producing a confluent area of disease. [9, 10]

2) ADVANCED OESOPHAGEAL CARCINOMAS WITH TYPES :

Usually appear as infiltrating, polypoid, ulcerative or less commonly, varicoid lesions.

3) INFILTRATING CARCINOMAS: manifest as irregular luminal narrowing with mucosal nodularity or ulceration and abrupt shelflike borders.



BARIUM SWALLOW:

Irregular tight stricture at lower oesophagus and gastroesophageal junction

4) POLYPOID CARCINOMAS:

appear as lobulated intraluminal masses or as polypoid ulcerated masses.

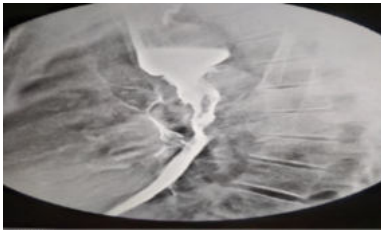
5) PRIMARY ULCERATIVE CARCINOMAS:

are seen as giant meniscoid ulcers surrounded by a radiolucent rind of tumor.



BARIUM SWALLOW AP :

Irregular narrowing of mid thoracic esophagus with proximal shouldering.

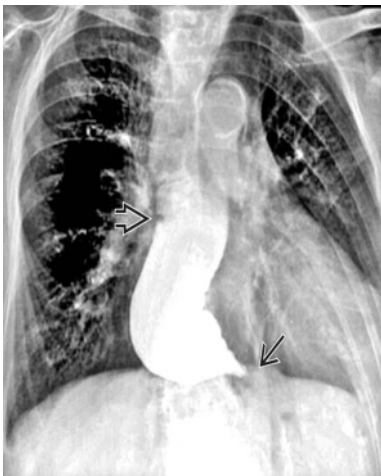


BARIUM SWALLOW LATERAL :

Irregular narrowing of mid thoracic esophagus with proximal shouldering.

ACHALASIA :

Single contrast barium study : shows dilated proximal oesophagus with absent of primary peristalsis. Symmetrical tapered narrowing of distal oesophagus extending to gastroesophageal junction giving bird beak appearance.



DIFFUSE OESOPHAGEAL SPASM:

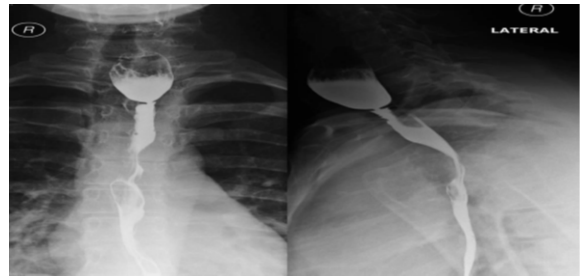
Single contrast barium study : shows repetitive contractions showing corkscrew or rosary bead appearance of oesophagus.



Uncoordinated peristalsis with simultaneous contraction of esophagus at multiple points.

OESOPHAGEAL WEB:

Webs are thin folds of mucosa seen along anterior wall of hypopharynx and proximal cervical esophagus.[11] On barium swallow, they manifest as shelf-like filling defect (1-2 mm in thickness) along the anterior wall of cervical esophagus . In cases of partial obstruction, jet phenomenon can be seen[12, 13]. Occasionally, prominent cricopharyngeal muscle, seen as protrusion from posterior pharyngeal wall, can be confused for esophageal web.



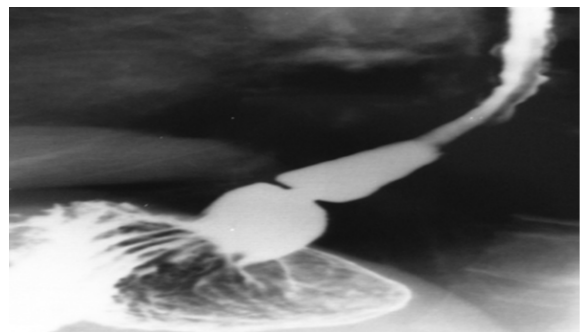
Single contrast study reveals circumferential radiolucent web in upper esophagus.

RINGS

Lower esophageal rings are a common finding on barium swallow, mostly being asymptomatic. Schatzki's ring is a symptomatic esophageal ring, presenting as dysphagia. It is thought to develop from scarring in cases of reflux esophagitis.

On barium swallow, ring manifests as smooth concentric segment of luminal narrowing (2-3 mm in thickness), usually located above hiatal hernia. [14]

Rings more than 20 mm in diameter are asymptomatic, whereas rings having diameter less than 13 mm invariably cause dysphagia. [14]



OESOPHAGEAL DIVERTICULUM:

Diverticulæ of esophagus have been categorized as pulsion diverticulæ, traction diverticulæ, and intramural pseudodiverticulosis.

Pulsion diverticulæ occur in lower esophagus and are usually associated with motility disorders of esophagus. These are false diverticulæ, lacking the muscular layer. On barium swallow, they manifest as broad-based contrast-filled outpouchings showing barium retention after emptying of esophagus. [15]

Traction diverticulæ on the other hand are true diverticulæ, seen in mid esophagus. They are usually caused by scarring in perihilar lymph nodes caused by tuberculosis or histoplasmosis.[15] On barium swallow, traction diverticulæ have a triangular and tented appearance and show emptying with collapse of esophagus [15]

Esophageal intramural pseudodiverticulosis can be associated with esophageal strictures or occur in isolation. When occurring alone, it is asymptomatic. Intramural pseudo

diverticulosis is dilatation of ducts of esophageal deep mucosal glands. On barium swallow, it appears as multiple contrast-filled outpouchings parallel to long axis of esophagus. [16]



BARIUM SWALLOW :

Retropharyngeal oesophageal outpouching with retention of contrast agent during swallow.

OESOPHAGEAL VARICES

Uphill varices:

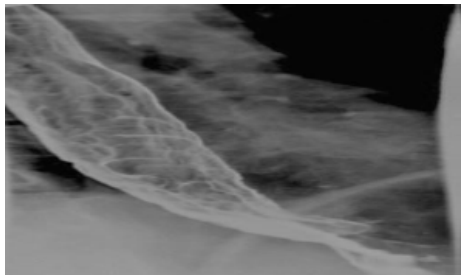
Caused by portal hypertension with hepatofugal flow through dilated oesophageal collateral vessels to the superior vena cava.

Downhill varices:

Caused by superior vena cava obstruction with downward flow via dilated oesophageal collateral vessels to the portal venous system and the inferior vena cava.

Mucosal-relief views:

Such varices typically appear as serpentine longitudinal filling defects.



Double contrast barium swallow shows multiple serpiginous filling defect in lower esophagus.

CONCLUSION

Barium study is the initial imaging modality of choice for evaluation of suspected esophageal diseases. Barium study can be used as a diagnostic tool and more accurate for most of the cases of overall oesophageal pathology including both benign and malignant pathology. Besides providing excellent mucosal detail, it helps in functional evaluation of esophagus and accurate diagnosis of a variety of neoplastic and non-neoplastic conditions. Radiologist should be familiar with standard techniques and protocols of the procedure and imaging findings of various esophageal diseases on barium swallow.

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