Republic of Iraq
Ministry of Higher Education
Al-Mustaqbal University
Radiology Techniques Department
Second Stage \ Special Radiological Procedures-1

Lecture No. (2)

Methods of Imaging the Gastrointestinal Tract

(*Contrast Swallow*)

By

Dr. Samer Adnan

M.RT Ali Hani

M.RT Hussein Ayyed

Methods of Imaging the Gastrointestinal Tract

1. Plain film
2. Barium swallow
3. Barium meal
4. Barium follow-through
5. Barium enema
6. Ultrasound (US):
7. Computed tomography (CT)
8. Magnetic resonance imaging (MRI)
9. Angiography
10. Radionuclide imaging:

WATER-SOLUBLE CONTRAST AGENTS

*There are numerous **water-soluble contrast agents** available such as g**astrografin** and LOCM

***Gastrografin** is an **aniseed-tasting**, high osmolarity contrast agent (HOCM) containing a wetting agent for oral or rectal use.

*Although primarily used in **diagnosis**, its **high osmolarity** is exploited to help achieve bowel catharsis in CT colonography, and to diagnose and treat meconium ileus and adhesive small bowel obstruction.

***It is diluted **one-part Gastrografin** to **four parts water** for rectal administration.

Indications

1. Suspected perforation.
2. Meconium ileus.

* Low osmolar contrast media (LOCM) is advised if the patient is vulnerable to aspiration (hyper osmolar Contrast media (HOCM) can precipitate pulmonary oedema if aspirated)

Gases

1. Ca**rbon dioxide** used in conjunction with barium achieves a '**double contrast'** effect.
2. For the **upper gastrointestinal tract (oesophagus**, **stomach** and **duodenum)** CO_2 is administered orally in the form of **gas-producing granules/powder** (sodium bicarbonate) mixed with fluid (citric acid) **Carbex**.

2. For **Large bowel**— CO_2 is administered rectally pressure-regulated CO_2 **insufflating pumps** for the large bowel are widely available and *produce* **optimal distension** with **continuous delivery of CO_2** at 15–25 mmHg.

***Carbon dioxide** can also be administered by **hand pump**, but this tends to resorb quickly and produces **inferior bowel distension** when compared with **air**.

-Room air administered per rectum via a **hand pump** attached to the enema tube is **less desirable**. **Peaks and troughs in pressure**

associated with manual insufflation are more likely to cause **discomfort** and be associated with **perforation**.

BARIUM

The use of barium has declined in the last decade, **superseded** by **cross-sectional imaging (CT).**

-There are many preparations of barium **suspensions** in use. Preparations are diluted with water to reduce the density and must be **shaken** well immediately **before use**.

Advantages

1. The main advantage of barium over water-soluble contrast agents is better coating resulting in better mucosal detail.
2. Low cost.

Disadvantages

1. **Precludes accurate** subsequent abdominal **CT interpretation** with potential delays of up to 2 weeks to allow satisfactory **clearance** of the barium.
2. High morbidity associated with **barium** entering the peritoneal cavity.

Complications

1. **Perforation. Water-soluble contrast medium** should be the initial agent used for any investigation in which there is a **risk or suspicion of perforation**.
2. **Aspiration**.
3. **Conversion** of a partial large bowel obstruction **into** a complete obstruction by the **impaction of barium**

4. **Intravasation**. This very **rare complication** may result in a barium **pulmonary embolus**, which carries a **mortality of 80%.**

Contrast Swallow

Indications: Suspected Oesophageal Pathology

1. Failed upper GI endoscopy
2. Dysphagia or odynophagia (painful swallow)
3. Motility disorders (dysmotility)
4. Globus sensation
5. Assessment of tracheo-oesophageal fistulae
6. Diffuse esophageal spasm

Contraindications

None.

Contrast Medium

1. Barium: E-Z HD **200%–250%** or Baritop **100%** w/v, 100 mL (or more, as required)
2. **Water-soluble contrast agent** if perforation is suspected (e.g. Gastrografin or LOCM)
3. **LOCM** (approx. **300 mg** I mL−1) is safest if there is a risk of aspiration
4. **Gastrografin** should **NOT** be used for the investigation of a **tracheo-oesophageal fistula** or when aspiration is a possibility. Use LOCM instead.
5. **Barium** should NOT be used initially if perforation is suspected. If perforation is not identified with a **water-soluble contrast agent**,

then a barium examination should be considered.

Equipment

Rapid fluoroscopy images, rapid exposures **(6 frames s−1)** or **video recording** may be required for assessment of the **laryngopharynx** and upper **oesophagus** during **deglutition**.

Patient Preparation

None (but as for **barium meal if** the stomach is also to be examined).

Technique

1. Start with the patient in the erect position, right anterior oblique (RAO) position **to project the oesophagus clear of the spine**.

An ample mouthful of barium is swallowed and this bolus is observed under fluoroscopy for dynamic assessment to assess the **function of the oesophagus**.

Then further mouthfuls with spot exposure(s) to include the **whole oesophagus** with dedicated anterior posterior (AP) views of the **gastro-oesophageal junction**.

2. Dynamic coned views of the **hypopharynx** with a frame rate of **3–4 s−1**, in AP and lateral, and views during patient swallowing.

3. The patient is placed semiprone in a '**recovery position'** in a left posterior oblique (LPO) position. A distended single-contrast view while drinking *identifies* hernias, subtle mucosal rings and varices.

4. Modifications may be required depending on the clinical indication.

(a) If **dysmotility** is suspected, **barium** should be **mixed** with **bread** or marshmallow bolus and observed under fluoroscopy correlating symptoms with the passage of the bolus in the erect position.

(b) If **perforation** is suspected, a CT with quadruple strength oral contrast (100 mL **Omnipaque** 300 made up to 1 L with water) is more sensitive and provides improved anatomical location of **perforation**.

(c) To demonstrate a **tracheo-oesophageal fistula** in **infants**, a 'pull back' **nasogastric tube** oesophagogram may be performed if the standard oesophagogram is negative. This technique is particularly useful in patients known to **aspirate**.

-Suction and nursing support should be available should aspiration occur.

*The patient is positioned prone with the a**rms up** and the **table** may be tilted slightly head down.

-A nasogastric tube is introduced into the stomach and then withdrawn to the level of the **lower** oesophagus under **lateral** screening guidance.

***10 to 20 mL** of LOCM is syringed in to distend the oesophagus, which will force the contrast medium through any **small fistula** which may be present. The process is repeated for the **upper** and **mid** oesophagus.

-It is important to actively monitor for aspiration into the airway from overspill, which can lead to diagnostic confusion.

Aftercare

1. The patient should be advised to **eat and drink normally but with extra fluids** to avoid barium impaction. Occasionally laxatives may also be required.
2. The patient must **not drive** until any **blurring of vision** produced by the Buscopan has resolved. This usually occurs within 30 minutes.
3. The patient should be warned that their **bowel motions** will be white for a few days after the examination and may be **difficult to flush away**.

Complications

1. Leakage of barium from an **unsuspected** perforation
2. Aspiration
3. **Conversion** of a partial large bowel obstruction into a complete obstruction by the impaction of barium
4. Barium appendicitis, if barium impacts in the appendix (very rare)
5. Side effects of the pharmacological agents if used.