

IODINATED GASTROINTESTINAL CONTRAST MEDIA IN ADULTS: INDICATIONS AND GUIDELINES

Conventional Fluoroscopy Indications

Barium sulfate contrast media continue to be the preferred agents for opacification of the gastrointestinal tract. They provide greater delineation of mucosal detail, are more resistant to dilution, and are less expensive than water-soluble iodinated contrast media. The current use of iodinated contrast media is primarily limited to those situations in which the administration of barium sulfate is contraindicated: 1) suspected or potential intestinal perforation or leak (including bowel abscess, fistula, or sinus tract); 2) administration before surgical or endoscopic procedures involving the bowel; and 3) confirmation of the position of percutaneously placed bowel catheters.

Water soluble contrast media are absorbed rapidly from the interstitial spaces and peritoneal cavity, a feature that makes them uniquely useful in examining patients with a suspected perforation of a hollow viscus. No permanent deleterious effects from the presence of aqueous contrast media in the mediastinum, pleural cavity, or abdomen have been shown. If an initial study with iodinated contrast medium fails to demonstrate a suspected perforation, a repeat study with barium can be performed. Small leaks that are undetected with water-soluble media may be more readily demonstrated by barium sulfate media.

In those patients for whom barium sulfate is contraindicated, guidelines for the use of low-osmolality contrast media (LOCM) rather than high-osmolality contrast media (HOCM) for aqueous contrast media include oral administration to adults who are at risk for aspiration.

When aspirated, LOCM are much less likely to cause pulmonary edema than HOCM

because of their lower osmolality. Iso-osmolality nonionic contrast media may be used in children at risk for aspiration and for evaluation of tracheoesophageal fistula. Water-soluble media are completely absorbed from the lungs, unlike barium which if not completely expectorated, can remain indefinitely and may cause inflammation.

While aspiration of full strength HOCM can cause severe morbidity and mortality, aspiration of LOCM is well tolerated.

Therapeutic Uses

HOCM have been used successfully for the treatment of postoperative adynamic (or paralytic) ileus, barium impaction, and adhesive small-bowel obstruction (see dose in the Administration section below).

Contraindications

Known prior moderate or severe reaction to iodinated contrast media is an at least theoretical contraindication to oral administration of these agents. A small percentage of iodinated contrast media (approximately 1% to 2%) is normally absorbed and excreted in the urine after oral or rectal administration. Mucosal inflammation, mucosal infection, or bowel obstruction increases the amount absorbed by several fold. It is common to see opacification of the urinary tract in such patients.

Because anaphylactoid reactions are not considered to be dose related and can occur with less than 1 ml of intravenous (IV) contrast media, reactions can theoretically occur even from the small amount of contrast medium absorbed from the gastrointestinal tract. There are, however, only very rare reports of moderate or severe

idiosyncratic reactions to orally or rectally administered iodinated contrast media.

HOCM are contraindicated for patients at risk for aspiration. Nonionic LOCM are safer for these patients.

HOCM in hypertonic concentrations should be avoided in patients with fluid and electrolyte imbalances, particularly the very young or elderly patients with hypovolemia or dehydration. The hypertonic HOCM solutions draw fluid into the lumen of the bowel, leading to further hypovolemia. Preparations made from nonionic LOCM are preferable for these patients because for any given required radiographic density, the LOCM version will have lower osmolality. Again, when there is a risk of aspiration, nonionic contrast media is safer than ionic contrast media.

It has been theorized, although not shown, that a small amount of iodine can be absorbed from orally administered iodinated contrast media and may interfere with studies involving protein-bound and radioactive iodine uptake, as well as with spectrophotometric trypsin assay.

Administration

Ionic and nonionic contrast media concentrations are expressed in milligrams of iodine per milliliter of solution (see Appendix A). A 290 to 367 mgI/ml solution is recommended for fluoroscopic evaluation of the esophagus, stomach, or small bowel in adults.

Computed Tomography Indications

Orally administered contrast media are used for routine gastrointestinal opacification during abdominal computed tomography (CT). In comparison to conventional fluoroscopic imaging, there is no significant difference in the diagnostic quality of CT examinations obtained with HOCM, LOCM, or barium agents, all of which are administered at low concentration. In the

United States, approximately 35% of abdominal CT examinations are currently performed using iodinated gastrointestinal contrast media.

Like conventional fluoroscopic imaging, there are a few specific clinical situations in which water-soluble contrast agents are strongly favored for use in CT over barium agents: suspected gastrointestinal perforation, administration before bowel surgery, and as a bowel marker for percutaneous CT-guided interventional procedures.

Contraindications

The aqueous contrast solutions used for CT are very dilute and hypotonic (78 mOsm/kg for HOCM). Therefore, aspiration and hypovolemia are not specific contraindications to their use. Idiosyncratic reactions remain a theoretical risk, and are felt to be more relevant to patients with active inflammatory bowel disease.

Administration

Various iodine concentrations of aqueous contrast media ranging from 4 to 48 mgI/ml have been suggested for bowel opacification with CT. Because the dilute, hypotonic contrast solutions become concentrated during their passage through the bowel, the concentration used for oral administration is a compromise between lower Hounsfield unit opacity in the proximal bowel and higher Hounsfield unit opacity in the distal bowel. In general, a solution containing 13 to 15 mgI/ml is recommended for oral and rectal administration in adults.

Suggested Reading (Articles that the Committee recommends for further reading on this topic are provided here.)

1. Halme L, Edgren J, von Smitten K, Linden H. Increased urinary excretion of iohexol after enteral administration in patients with ileal Crohn's disease. A

- new test for disease activity. *Acta Radiol* 1993; 34:237-241.
2. Miller SH. Anaphylactoid reaction after oral administration of diatrizoate meglumine and diatrizoate sodium solution. *AJR Am J Roentgenol* 1997; 168:959-961.
 3. Ott DJ, Gelfand DW. Gastrointestinal contrast agents. Indications, uses, and risks. *Jama* 1983; 249:2380-2384.
 4. Raptopoulos V. Technical principles in CT evaluation of the gut. *Radiol Clin North Am* 1989; 27:631-651.
 5. Seltzer SE, Jones B, McLaughlin GC. Proper choice of contrast agents in emergency gastrointestinal radiology. *CRC Crit Rev Diagn Imaging* 1979; 12:79-99.
 6. Swanson DP, Halpert RD. Gastrointestinal contrast media: barium sulfate and water-soluble iodinated agents. In: Swanson DP, ed. *Pharmaceuticals in Medical Imaging*. New York, NY: Macmillan; 1990:155-183.