Hepatobiliary Scintigraphy – British Nuclear Medicine Society

Hepatobiliary Scintigraphy

1. Purpose

This guideline should be read in conjunction with the BNMS Generic guidelines.

The purpose of this guideline is to assist specialists in nuclear medicine and radionuclide radiology in recommending, performing, interpreting and reporting the results of hepatobiliary scintigraphy. This guideline may be used to assist individual departments to formulate their own local protocols.

2. Background

Tc99m-labelled N-substituted iminodiacetic acid (IDA) compounds are used to demonstrate the anatomic distribution of functioning liver tissue, to illustrate the formation and secretion of bile, and to follow the passage of bile through the biliary tree, gall bladder and bowel. Dynamic acquisition allows the measurement of indices of hepatobiliary function such as liver clearance rate and gall bladder ejection fraction.

3. Common Indications

3.1 Investigation of suspected bile leaks and fistulae.

3.2 Investigation of suspected biliary atresia, choledochal cysts and other anomalies of the biliary tree.

3.3 Investigation of suspected acute cholecystitis.

3.4 Assessing gall bladder function, eg in suspected biliary dyskinesia.

3.5 Detecting bile reflux into stomach and/or oesophagus.

3.6 Detecting afferent loop obstruction.

3.7 Investigating suspected biliary tract obstruction.

3.8 Differentiation of hepatocellular tumours from other solid liver lesions.

4. Contra-indications

4.1 Absolute – none.

4.2 Relative – with impaired liver function, the hepatic extraction of IDA is reduced and more of the tracer is excreted by the kidney, so the technique is less effective.
5. Procedures

5.1 Patient Preparation

The patient should be fasting for a minimum of 2 hours - preferably 4 hours or overnight - otherwise the gall bladder may not fill.

6. Radiopharmaceutical

Tc99m-labelled mebrofenin is given intravenously. The ARSAC diagnostic reference level is 150 MBq for adults. For infants and children, the activity should be scaled down according to body surface area, but will be in the region of 2-3 MBq/kg with a minimum activity of 15-20 MBq.

7. Image Acquisition

7.1 Large field of view camera with low energy general purpose or high resolution collimator is suggested.

7.2 Patient positioning – the patient may be seated or supine. Infants may be positioned prone over the collimator.

7.3 Imaging:

7.31 Dynamic acquisition in the anterior or right anterior oblique view is recommended. Acquisition begins at or immediately before the time of injection, and serial images are obtained up to 45 minutes.

7.32 If acute cholecystitis is suspected and the gallbladder is not seen at 45 minutes, delayed images should be obtained up to 4 hours, or until the gall bladder is demonstrated.

7.33 In patients with biliary obstruction or severe liver impairment, delayed images up to 18-24 hours may be needed.

7.34 Additional oblique, right lateral and erect views are helpful if the gall bladder overlaps the duodenum in the anterior view.

7.35 If a hepatocellular tumour is suspected, multiple views of the liver should be obtained within the first 10 minutes after injection. Alternatively, SPECT imaging may be carried out in the 10-15 minutes following injection in such cases.

7.36 In post-operative patients, drainage bags should be included within the field of view.

7.37 If gastric reflux is seen or suspected, the patient may be given a drink of water to confirm
gastric location of activity by demonstrating immediate dilution of the gastric contents.

8. Interventions

8.1 Sincalide, the synthetic equivalent of cholecystokinin (CCK) may be given as an intravenous infusion during the study to provoke emptying of the gall bladder. The initial part of the study is carried as normal (above) but once the gall bladder is clearly visible, a further acquisition of 20-30 minutes at 1-2 frames per minute is set up to coincide with the start of infusion of Sincalide (0.01-0.02 micrograms per kilogram given over at least 5 minutes). Ejection fraction may be calculated as described in reference 2.

8.2 Fatty meal – if a qualitative assessment of gall bladder function is required, a proprietary fatty meal may be used instead of the above, and an approximate indication of gall bladder emptying obtained by comparing images obtained before and 20 minutes after the meal.

8.3 Phenobarbitone – infants in whom biliary atresia is suspected may be pre-treated for 3-5 days prior to the imaging study with 5mg/kg per day of oral phenobarbitone. This enhances biliary excretion of the tracer and increases the specificity of the test.

9. Data Analysis

Indices of hepatic clearance and gall bladder ejection fraction may be calculated from dynamically acquired frame data using regions of interest placed over the liver parenchyma and gall bladder. Normal ranges for these measurements will vary according to the radiopharmaceutical chosen, the rate of infusion of Sincalide, and the interval over which measurements are made.

10. Interpretation and Reporting

10.1 Normal features include –

10.11 Homogenous hepatic uptake with rapid and uniform clearance.

10.12 Segmental ducts just visible on good quality images with normal anatomic branching pattern.

10.13 Common ducts outlined by 15 minutes after injection.

10.14 Activity in small intestine by 30 minutes after injection.

10.15 Gall bladder filling no later than 60 minutes after injection.

10.16 No leakage, hold up, or extraluminal accumulation of activity.

10.17 Gall bladder empties partially or completely in response to Sincalide or a fatty meal.
11. Problems and Pitfalls

11.1 In patients not starved – the gall bladder may not fill.

11.2 In patients starved for prolonged period (days to weeks) particularly with intravenous alimentation, the gall bladder may not fill.

11.3 In patients with impaired liver function, the biliary tract may not be visualised. Excretion to bowel may be shown only on delayed images.

11.4 Activity pooling in the first part of duodenum may mimic the gall bladder – obtain oblique and lateral views.

11.5 Gall bladder and bile ducts fill normally, but no activity reaches duodenum by 30 minutes – give a fatty meal to exclude obstruction.

12. Controversies

12.1 The rate of infusion for Sincalide which best discriminates between normal and abnormal gall bladder function has not been established. In general, slower rates of infusion produce more emptying but whether this correlates better with the incidence of symptoms and response to surgery is unclear.

12.2 The “normal” response to Sincalide after cholecystectomy, and the use of this test for diagnosis of sphincter of Oddi dysfunction remains uncertain.

References


12. Date Agreed / Approved
13. Date for Review / Update

April 2005

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These guidelines do not constitute a formal protocol but highlight the aspects of a study where variation in practice may significantly affect the quality of outcome of the study.