Hepato-biliary Scintigraphy in diagnosis of Biliary Atresia

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Abstract

Background: Biliary Atresia and Neonatal Hepatitis are the two major causes of Persistent Neonatal Jaundice. Differentiation is done by biochemical and radiological tests. Radiological investigations use intra-or extra-hepatic biliary dilation for diagnosing biliary atresia but this is not always reliable.

Methods: 14 neonates with persistent conjugated hyperbilirubinemia who had undergone hepato-biliary scintigraphy were retrospectively evaluated and those having Extrahepatic Biliary Atresia were analyzed with reference to operative findings.

Results: 11 out of 14 had Extrahepatic Biliary Atresia during operation whereas 3 proved to be false positive.

Conclusion: Mebrofenin hepato – biliary scintigraphy is a simple, safe, accurate and cost effective investigation for diagnosis of biliary atresia.

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Key Words: Biliary Atresia; Neonatal Jaundice; Hepato-biliary scintigraphy

Introduction

Most cases of neonatal jaundice are due to Biliary Atresia (BA) or Neonatal hepatitis [1]. The differentiation of BA from other causes of Persistent Neonatal Jaundice, holds the key to survival of neonates suffering from BA with a variety of ^{99m}Tc labelled iminodiacetic acid (IDA) agents and its analogues have been used in the past [2-4]. Lately, ^{99m}Technetium-trimethyl bromo-iminodiacetic acid (TBIDA/generic name Mebrofenin) has been shown to have better hepatic uptake and excretion [5].

Material and Methods

All Mebrofenin hepato-biliary scans performed on neonates with persistent conjugated hyperbilirubinemia and diagnosed to have BA in the period Aug 98 to Jul 03 at Army Hospital (R&R), Delhi Cantt were retrospectively reviewed. 14 infants (8 boys and 6 girls) had undergone Hepato-biliary scans. Age at investigation ranged from 41 days to 6months.

All patients underwent clinical examination, biochemical tests (including Liver Function Tests) and abdominal USG before Scintigraphy. Each patient was given an intravenous injection of 37 MBq ^{99m}Tc-Mebrofenin. Imaging was carried out on a Single Head Gamma Camera using a high resolution collimator with the patient in supine position. Serial anterior static images were acquired at 15 min, 30 min, 45 min and hourly for three hours. If no radiotracer was detected in the bowel till 3 hours, a delayed scan was taken at 24 hr. All scans were reviewed and considered positive for Biliary Atresia (Fig. 1) if the scans showed good liver uptake with no intestinal activity till 24 hr [6] or reduced background activity. These

patients were then subjected to laparotomy and operative cholangiography and the findings correlated with scintigraphy.

Results

Per-operative cholangiogram was carried out on all 14 patients. Biliary flow seen in 3 scintigraphic false positive cases (21%) was due to Bile Plug Syndrome. The remaining 11 (79%) in whom bile flow was not visualized during operative cholangiography were operated upon and hepato porto-enterostomy performed.

Discussion

Though the causes of persistent conjugated hyperbilirubinemia in infants are many, BA and Neonatal Hepatitis (secondary to CMV, HAV, HBV, Rubella and Toxoplasma infection) account for 70-80%. BA is the commonest fatal liver disorder in children [7]. It is a developmental anomaly due to fibrosis/atresia of extra – hepatic bile ducts. It occurs presumably due to an intra-uterine insult during hepatic duct development by rheovirus type III. 10-25% of patients have associated anomalies like polysplenia, pre-duodenal / absent portal vein, Trisomy 18, intestinal malrotation, congenital heart disease, anomalous hepatic artery and choledochal cyst. It usually presents by 1-2 months of age with persistent direct hyperbilirubinemia and icterus. Both sexes are affected equally.

No single test has proven 100% reliable in diagnosing BA [8,9]. Accurate diagnosis is of paramount importance before 8 weeks of age since at this stage hepato-

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Fig. 1 : Hepato biliary scan

portoenterostomy (Kasai's procedure) has a 90% success rate whereas beyond 3 months success rate drops to 20% [10,11]. ^{99m}Tc trimethylbromoiminodiacetic acid is considered best for Hepato-biliary Scintigraphy because of its 98% hepatic extraction and urinary excretion of 1.5% [3,12]. In neonates extraction of Mebrofenin by the liver is prompt and uniform distribution is reached within 5 minutes. Gall bladder is seen as early as ten minutes and Bowel activity is by 30-40 minutes. The presence of tracer within the small bowel excludes BA [12]. Most reviews report sensitivity of hepato-biliary scintigraphy for the diagnosis of BA between 97-100% and the specificity from 33-91% [3,6]. The present study being retrospective is not structured to yield comparable data. However, in our series the accuracy for detection of EHBA is 79%. The overall accuracy of hepato-biliary scintigraphy for detection of cystic duct obstruction is 95% [13]. 3 patients with Bile Plug Syndrome were false positive for EHBA in our study. In most cases differentiation from Biliary Atresia on scintigraphy is not possible [7]. In a larger prospective study, Cox et al [14] reported that one third of the patients with patent biliary tracts had no detectable tracer excretion at 24 hrs, falsely indicating biliary atresia. These patients suffered from Transient Cholestasis associated with TPN now referred to as Bile Plug Syndrome. Our study with Mebrofenin has showed 21% false positive results compared to 33% reported by Cox. There may be some rationale for using Urso-deoxy cholic acid, a bile chelating agent that improves biliary excretion to reduce the false-positive rate [12]. Nagel & Javiad reported that hepato-biliary scintigraphy with Tc-labelled agents performed after phenobarbitone premedication showed increased diagnostic accuracy [15]. Other authors reported that premedication with phenobarbitone may not be necessary [13].

To summarize, prompt and accurate diagnosis of EHBA is of utmost importance in neonates as the success of surgical procedure is inversely related to age.

Fig. 2 : Mebrofenin scintigraphy - result

Mebrofenin hepato-biliary scintigraphy is a simple, non-invasive and accurate diagnostic tool for suspected Biliary Atresia.

References

- Balistreri WF. Neonatal Cholestasis. *J Pediatr* 1985; 106: 171-84.
- Nadel HR. Hepatobiliary Scintigraphy in children. *Semin Nucl Med* 1996;26:25-42.
- Majd M, Reba RC, Altman RP. Hepato-biliary scintigraphy with ^{99m}Tc -PIPIDA in evaluation of neonatal jaundice. *Paediatrics* 1981;67:142-5.
- Hitch BC, Leonard JC, Psyher TJ. Differentiation of Cholestatic Jaundice in infants. Utility of Diethyl IDA. *Am J Surge* 1981; 142:671-7.
- Krishnamurthy GT, Turner FF. Pharmacokinetics and clinical application of Technetium 99m labelled Hepatobiliary agents. *Semin Nucl Med* 1990;20:130-49.
- Gerhold JP, Klingensmith WC, Kuni CC et al. Diagnosis of biliary atresia with radionuclide Hepato-biliary imaging. *Radiology* 1983;146:499-504.
- Howman – Giles R. Hepatobiliary scintigraphy in infancy. *J Nucl Med* 1998;39:311-9.
- Thaler MM, Gellis SS. Studies in Neonatal Hepatitis and Biliary Atresia. *Am J D is Child* 1968;116:262-70.
- Mowat AP. Current developments in chronic liver disease. In: Hull D, editor. *Recent Advances in pediatrics*. Edinburgh: Churchill-Livingstone, 1980;145.
- Kasai M, Kimura S, Asekura Y et al. Surgical Treatment of biliary atresia. *J Paediatr Surg* 1968;3:665-75.
- Karrer FM, Lily JR, Stewart BA et al. Biliary Atresia Registry 1976 – 1989. *J Paediatr Surg* 1990;25:1076-81.
- Johnson K, Alton HM, Chapman S. Evaluation of Mebrofenin Hepatoscintigraphy in neonatal onset jaundice. *Paediatric Radiology* 1998;28:937-41.
- Kaplun L, Weissmann HS, Rosenblatt RR, Freemann LM. The Early Diagnosis of Common Bile Duct obstruction using Cholescintigraphy. *JAMA* 1985;254:2431-4.
- Cox KL, Stadalnik RC, McGahan JP, Sanders K, Cannon RA and Ruebner BH. Hepatobiliary scintigraphy with Technetium – 99m Disofenin in the evaluation of neonatal Cholestasis. *Journal of Paediatric Gastroenterology and Nutrition* 1987;6:885-91.
- Nagel RA, Javiad A, Meire HB. Liver disease and Bile duct abnormalities in adults with cystic fibrosis. *Lancet* 1989;2: 1422-5.