

The Role of Hepato-biliary Scintigraphy in Differentiation of Biliary Atresia from Other Causes of Neonatal Jaundice

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Professional paper

SUMMARY

Goal: The goal of this study was to assess the diagnostic value of hepatobiliary scintigraphy using a ^{99m}Tc-MBIDA compound to differentiate intrahepatic cholestasis from extra hepatic forms during the first months of life. **Material and methods:** Dynamic hepatobiliary scintigraphy was done in 12 neonate patients with extremely elevated values of total and direct bilirubinemia. After intravenously administration of 37 MBq ^{99m}Tc-MBIDA, static images were carried out every 5 minutes during the normal predefined study and further controls images in cases with absence of radioactivity in extra hepatic ducts and bowel were performed after 1, 3, 24, 48 and 72 hour. Three neonates with suspected biliary atresia, before re-

peated scintigraphy were premedicated with cholecystokinin, 20ng/kg, intravenously during the three consecutive days. **Results:** Extremely high value of total (>200µmol/L) and direct bilirubinemia were registered at all 12 neonates (>100 µmol/L) and gamma glytaryl transpeptidase GGT (>100 U/L). All neonates were suspected for biliary atresia. During the normal predefined hepatobiliary scintigraphy, the radioactivity in extra hepatic biliary ducts and small bowel was noticed in one patient, whereas the absence of radioactivity in bowel and extra hepatic ducts were noticed in 11 patients). Eight patients of them were confirmed to be neonatal hepatitis because the minimal radioactivity in bowel were registered after 1 hour (one patient), 3 hours (3 patients) and 24 hour (two patients), whereas in

three other patients the radioactivity in bowel were absence even after 24, 48 and after 72 hours. Three registered cases with absence of radioactivity in bowel even up 72 hours were suspected for biliary atresia. In repeated scintigraphy after premedication with CCK, we noticed intestinal activity in one patient, whereas in other two cases the intestinal radioactivity was absent even after 72 hours. One of them was confirmed as intrahepatic biliary atresia, while another patient was confirmed as extra hepatic biliary atresia. **Conclusion:** Biliary scintigraphy represents a straightforward and non-invasive diagnostic method which enables the permeability of the biliary tract to be assessed in subjects with jaundice.

Key words: neonatal jaundice, biliary atresia, hepato-biliary scintigraphy.

1. INTRODUCTION

Neonatal hepatitis and biliary atresia are the most frequent causes of neonatal jaundice (1, 2, 3, 4, 5, 6, 7). Biliary atresia is the most important surgical cause of cholestatic jaundice in this age-group (8, 9, 10, 11, 12, 13). The common histopathological picture is one of inflammatory damage to the intra and extra hepatic bile ducts with sclerosis and narrowing or even obliteration of the biliary tree (14). The reported incidence of BA varies from 5 / 100,000 live births in the Netherlands (11), to 32/100,000 in French Polynesia (12, 15). The differentiation of biliary atresia from other causes of neonatal jaundice is important in planning the appropriate diagnostic and

therapeutic procedures. The lot of radiological techniques currently used for investigation of biliary atresia, such as ultrasonography, computed tomography, magnet resonance imaging, percutaneous transhepatic cholangiography and endoscopic cholangio-pancreatography, some of them are invasive and some of them do not provide a functional evaluation of anatomic lesions. Radionuclide hepatobiliary scintigraphy as one non-invasive techniques as well as morphological changes can provides a functional evaluation of anatomical and physiological changes. Based in reported data ^{99m}Technetium Tc^{99m}-MBIDA N (3-bromo-2, 4, 6-trimetyloacetanilido) iminodiacetic acid has been shown to have

better hepatic uptake and excretion than Iminodiacetic agents and its analogues used in the past. Untreated, this condition leads to cirrhosis and death within the first years of life. Surgical treatment usually involves an initial attempt to restore bile flow: the Kasai portoenterostomy which is performed as soon after diagnosis as possible. Later, liver transplantation may be need for failure of the Kasai operation or because of complications of cirrhosis (14). Biliary atresia remains the commonest indication for paediatric liver transplantation throughout the world.

2. MATERIAL AND METHODS

During 2009-2010 in our Depart-

ment of nuclear medicine were referred 12 infant patients with persistent conjugated hiperbilirubinemia. All patients underwent clinical examination, biochemical tests and abdominal ultrasonography in Department of Pediatrics. In our department each patient was done dynamic hepatobiliary scintigraphy in the moment of intravenous administration of 37 MBq Tc99m-MB-rIDA N (3-bromo-2, 4, 6-trimethylacetanilido) iminodiacetan. Scintigraphy was carried out on a Dual Head-Siemens gamma camera using a High resolution collimator. All patients during the dynamic scintigraphy were positioned in supine position. Dynamic imaging of the abdomen in the anterior projection at

Sex	Group	Age	Total bilirubinemia	Direct bilirubinemia	Gamma glytamyl transpeptidase
	N	X (week)	X ($\mu\text{mol/L}$)	X ($\mu\text{mol/L}$)	X (U/l)
Male	7	2.7	209	134	114
Female	5	2.9	221	151	121
Total	12	2.8	215	142.5	117.5

Table 1. General data about study group

Classifications	Number of patients	Registration of radioactivity in small bowel						
		N	Normal 60 min.	After 1 hour	After 3 hour	After 24 hour	After 48 hour	After 72 hour
Non obstructive	1	1	0					
Partially obstruction	8	0	3	3	2			
Complete obstruction	3	0	0	0	0	0	0	
After CCK stimulation	3	0	0	1	0	0	0	

Table 2. Radioactivity in extra hepatic bile ducts and small bowel

cases where at the end of the study weren't registered radioactivity in extra hepatic ducts or bowel, im-

3. RESULTS

General data about our study group were presented in Table 1. Our study group was consisted from seven male and five female patients with average age of 2.8 weeks. The value of total bilirubinemia, direct bilirubinemia and gamma glytamyl transpeptidase were extremely high at all cases. According to the hepatobiliary scintigraphic data presented in Table 2, our patients were classified into three groups: (1) non obstructive group (patients with delayed flow but presentation of radioactivity into the bowel; (2) partially obstruction, delayed presentation of radioactivity into the bowel more than 60 minutes and (3) complete obstruction (when noticed absence of the radioactivity into the intestine even 24 hour. During the normal predefined hepatobiliary scintigraphy the radioactivity in extra hepatic biliary ducts and small bowel was noticed in one patient, whereas the absence of radioactivity in bowel and extra hepatic ducts were noticed in 11 patients (Table 2). Eight patients of them latter were confirmed to be neonatal hepatitis because the minimal radioactivity in bowel were registered after 1 hour (one patient), 3 hour (3 patients) and 24 hour (two patients), whereas in three other patients the radioactivity in bowel were absent even 24, 48 and 72 hour. Three registered cases with absence of radioactivity in bowel even up 72 hours were suspected for biliary atresia. Also in these three cases were noticed delayed extractions of radioac-



Figure 1. Case one. Gamma camera images. Normal hepatobiliary 99mTc MB-rIDA scintigraphy in male neonates with extremely high level of bilirubinemia. The radioactivity was noticed in liver and extra hepatic biliary ducts during the normal study (images in the right). The radioactivity in the bowel were registered one hour after (images in the left)

60 s/frame for 60 minutes was performed immediately after the injection of radioactivity dose. Serial anterior static images were acquired at 2, 5, 10, 15, 30, 45 and 60 minutes. In

aging was repeated after 3, 48 and 72 hours. Whereas in three unclear suspected cases where distinguishing of biliary atresia from biliary dysfunction were difficult, we per-

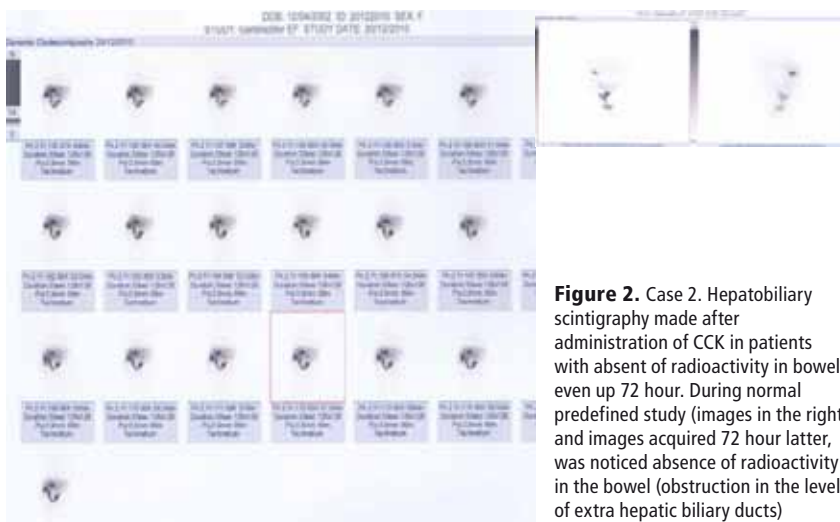


Figure 2. Case 2. Hepatobiliary scintigraphy made after administration of CCK in patients with absent of radioactivity in bowel even up 72 hour. During normal predefined study (images in the right) and images acquired 72 hour latter, was noticed absence of radioactivity in the bowel (obstruction in the level of extra hepatic biliary ducts)

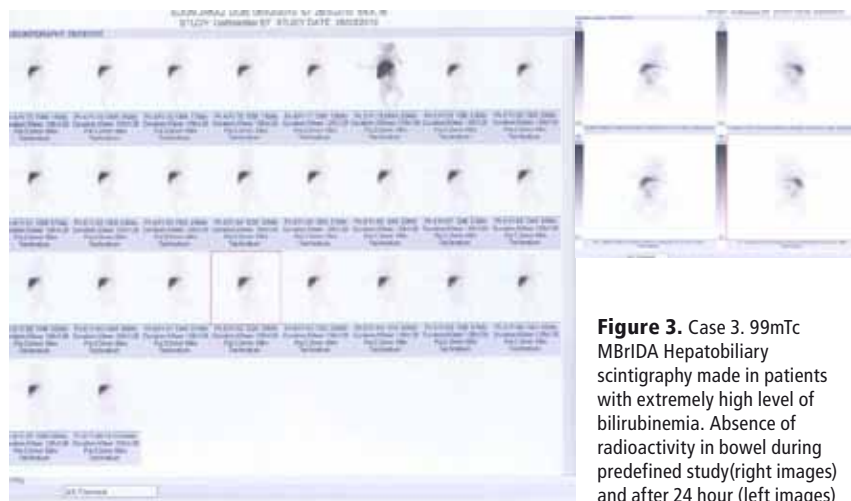


Figure 3. Case 3. ^{99m}Tc MBIDA Hepatobiliary scintigraphy made in patients with extremely high level of bilirubinemia. Absence of radioactivity in bowel during predefined study (right images) and after 24 hour (left images)

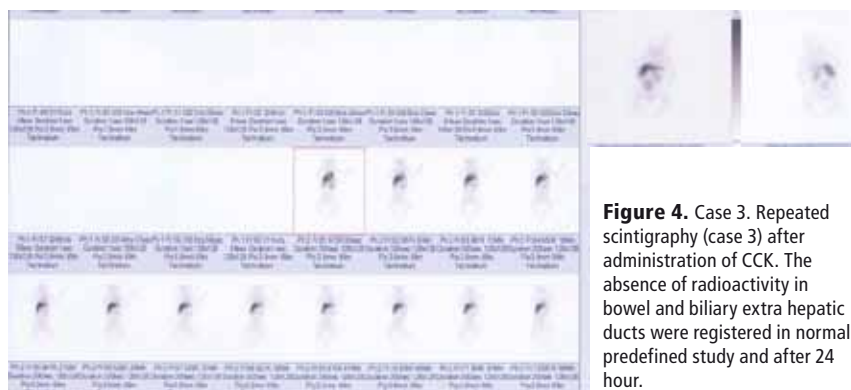


Figure 4. Case 3. Repeated scintigraphy (case 3) after administration of CCK. The absence of radioactivity in bowel and biliary extra hepatic ducts were registered in normal predefined study and after 24 hour.

tivity from blood to the hepatocytes and were registered remnant radioactivity in heart (characteristic sign for biliary atresia). In two cases were noticed the visualisation of the gall bladder which exclude the intrahepatic biliary atresia, while in one case the visualisation of gall bladder were absent but were registered the radioactivity in the area of hilus which is significant for intrahepatic biliary atresia. In repeated scintigraphy after premedication of patients with cholecystokinin 20ng/kg (after 3 consecutive day intravenously administration), we noticed intestinal activity only in one patient, whereas in other two patients the intestinal radioactivity was absent even up to 72 hours after injection. At first case obstruction was noticed at the level of the liver (Figure 3), while in another patient, obstruction was noticed at the level of common biliary duct (Figure 2). These two cases with persistent absence of activity in the small bowel underwent surgical treatment and later were confirmed as neonatal biliary atresia at first case, respectively as neonatal

choledocus obstruction in second case, while another patient with a positive response in cholecystokinin test was confirmed as neonatal cholestasis (neonatal cholangitis).

4. DISCUSSION

According the reported data the hepatobiliary atresia and neonatal hepatitis are two the most causes of neonatal jaundice (15). Accurate differentiation of these two forms that cause neonatal jaundice, though it is vitally important is quite difficult. Radiological techniques used today for differentiation of neonatal hepatitis from biliary atresia are inadequate and inefficient (1, 4, 5, 13). The using of ^{99m}Tc DISIDA or ^{99m}Tc BIDA hepatobiliary scintigraphy reported to represents a considerable advance in distinguishing complete from partial cholestasis in neonates (1, 3, 4). In our study we confirmed that the value of hepatobiliary scintigraphy using ^{99m}Tc MBIDA in distinguishing of neonatal hepatitis from complete cholestasis were considerable, whereas stimulation test with CCK can distinguish complete from partial bili-

ary cholestasis. The visualisation of gall bladder, radioactivity in the region of hilus in correlation with biliary scintigraphy were reported as signs whose can help in distinguishing of neonatal hepatitis from intra hepatic or extra hepatic obstruction (1, 2, 3, 4, 7, 8, 10, 12, 13). In our study also were confirmed that hepatobiliary scintigraphy as non invasive diagnostic method is very important in distinguishing of intra hepatic from extra hepatic biliary obstruction.

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