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Precise Localization of a Bile Leak with Hepatobiliary Scintigraphy

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Abstract:

Hepatobiliary scintigraphy (HBS) is widely used modality to diagnose biliary injury. In patients with a history of trauma or surgery, the common presentations of bile leaks on HBS are a progressive collection of radiotracer outside of the biliary system. However precise localization of a bile leak is usually not conveyed by non-invasive techniques including computed tomography (CT) or Ultrasound or even HBS. This case study of a patient with liver trauma demonstrates a direct bile leak sign leading to recognition of an exact bile leakage site from the left intrahepatic duct. This diagnosis helped clinicians perform less invasive management.

Introductory paragraph:

HBS is widely used modality to diagnose biliary injury (1). In patients with a history of trauma or surgery, the common presentations of bile leaks on HBS are a progressive collection of radiotracer outside of the biliary system (2). However precise localization of a bile leak is usually not conveyed by non-invasive techniques including CT or Ultrasound or even HBS [3, 4]. This case study of a patient with liver trauma demonstrates a direct bile leak sign leading to recognition of an exact bile leakage site from the left

intrahepatic duct. This diagnosis helped clinicians perform less invasive management.

Case report:

A 16 year-old male (who along with his parent gave permission to use the data from his studies for our article) presented with injuries from a motor vehicle accident. A CT scan of the abdomen/pelvis with contrast demonstrated central hepatic laceration with extension into gallbladder fossa and peritoneal fluid. HBS was required to determine whether a biliary injury was present or not.

Following intravenous administration of Tc-99m-mebrofenin, sequential dynamic abdominal images were obtained over the 60 minutes (Figure 1). It showed an area with decreased activity over the region between the two hepatic lobes, corresponding with the known hepatic laceration seen on the CT (Figure 2). Over time, there was a progressive accumulation of tracer outside the biliary system over the inferior left hepatic lobe. A couple of lines of tracer uptake connected this abnormal focal area to the left intrahepatic duct. Eventually, this abnormal tracer accumulation spread

throughout the abdomen. These findings indicated an exact bile-leaking site at the left intrahepatic duct.

Subsequently an endoscopic retrograde cholangiopancreatography with initial cholangiogram confirmed the findings of the HBS (Figure 3). Sphincterotomy and placement of two CBD stents were performed. Soon after, a diagnostic laparoscopy further confirmed a bile leak from the left hepatic duct, and a laparoscopic lavage and intraperitoneal drainage were performed. The patient did well postoperatively and was discharged with no extravasation of contrast in the follow-up endoscopic retrograde cholangiopancreatography with cholangiogram post CBD stents removal.

Discussion:

Bile leaks can occur following surgery or trauma. Imaging modalities used to detect bile leaks are CT, endoscopic retrograde cholangiopancreatography, magnetic resonance cholangiopancreatography (MRCP), ultrasound and HBS. Among these, only HBS and MRCP, non-invasive studies, can identify abnormal fluid collection as bile. However, there are limitations to emergency MRCP, including lack of readily-available MRI equipment,

technologists, personnel experienced with interpreting MRCP and higher cost (4). Therefore, HBS is the commonly used modality to diagnose biliary injury (1).

HBS is a highly sensitive imaging modality and useful for early diagnosis of bile leaks. HBS can determine whether a fluid collection seen on ultrasound or CT is of biliary origin (1, 2). HBS can determine the rate of leakage and can be used as a follow-up tool (1, 2). A common finding of a bile leak is the radiopharmaceuticals progressive accumulation outside of the biliary system, either localized (bilomas) or diffuse. An accurate localization of a bile leak is difficult by HBS due to lack of anatomical details. However, this localization is important because of the shift in management strategy from very invasive to minimally invasive [3].

This case demonstrates a direct bile leakage sign, bile communication tracks connecting a left intrahepatic duct to a biloma over the inferior left hepatic lobe. This direct sign leads to recognition of an exact bile-leaking site in the left hepatic duct and helps determine a bile leak type. A management approach can be selected based on the bile leak's type (5). In our case, a less invasive management was used based on the HBS findings.

Accurate localization of the site of bile leak through a direct sign, bile communication tracks, can be obtained with HBS as shown in this case. Knowing this will further increase opportunities to detect an accurate bile leakage site in improved HBS with single photon emission computed tomography (SPECT/CT). The HBS SPECT/CT provides both anatomic and functional information and overcomes the lack of specificity of CT alone or detailed anatomic information of HBS alone [3].

Conclusion:

Although the precise site of a bile leak is often difficult to detect with non-invasive techniques, it is possible with HBS. Awareness of this will increase opportunities to detect the direct sign of a bile leak in advanced HBS with SPECT/CT. This is vital given the change in approach regarding management of a bile leak from more invasive to less invasive.

References:

1. LeBedis CA, Anderson SW, Mercier G, et al. The utility of CT for predicting bile leaks in hepatic trauma. Emerg Radiol. 2015; 22(2): 101-107.
2. Ziessman HA, O'Malley JP, Thrall JH, et al. Nuclear Medicine: The Requisites: 4th ed. Philadelphia, PA: Saunders, an imprint of Elsevier Inc. 2014: 152-153.
3. Sharma P, Kumar R, Das KJ, et al. Detection and localization of post-operative and post-traumatic bile leak: hybrid SPECT/CT with 99m Tc-Mebrofenin. Spinger Science + Business Media, LLC 2012.
4. Mujoomdar M, Russell E, Dionne F, et al. CADTH optimizing health system use of medical isotopes and other imaging modalities. , Ottawa, Ontario: Canadian Agency for Drugs and Technologies in Health. 2012: 60-88.
5. Kapoor S and Nundy S. Bile duct leaks from the Intrahepatic biliary tree: A review of its etiology, incidence, and management: a review article. Hindawi Publishing Corporation. HPB Surgery. 2012; 1-9.

Figure 1. HBS over the 60 minutes shows an area with decreased activity over the region between the two hepatic lobes, corresponding with the known hepatic laceration seen on the CT (a black arrow). Over time, there is a progressive accumulation of tracer outside the biliary system over the inferior left hepatic lobe (a pink arrow). A couple of lines of tracer uptake (red arrows) connected this abnormal focal area to the left intrahepatic duct. Eventually, this abnormal tracer accumulation spreads throughout the abdomen (blue arrows). These findings indicate an exact bile-leaking site at the left intrahepatic duct.

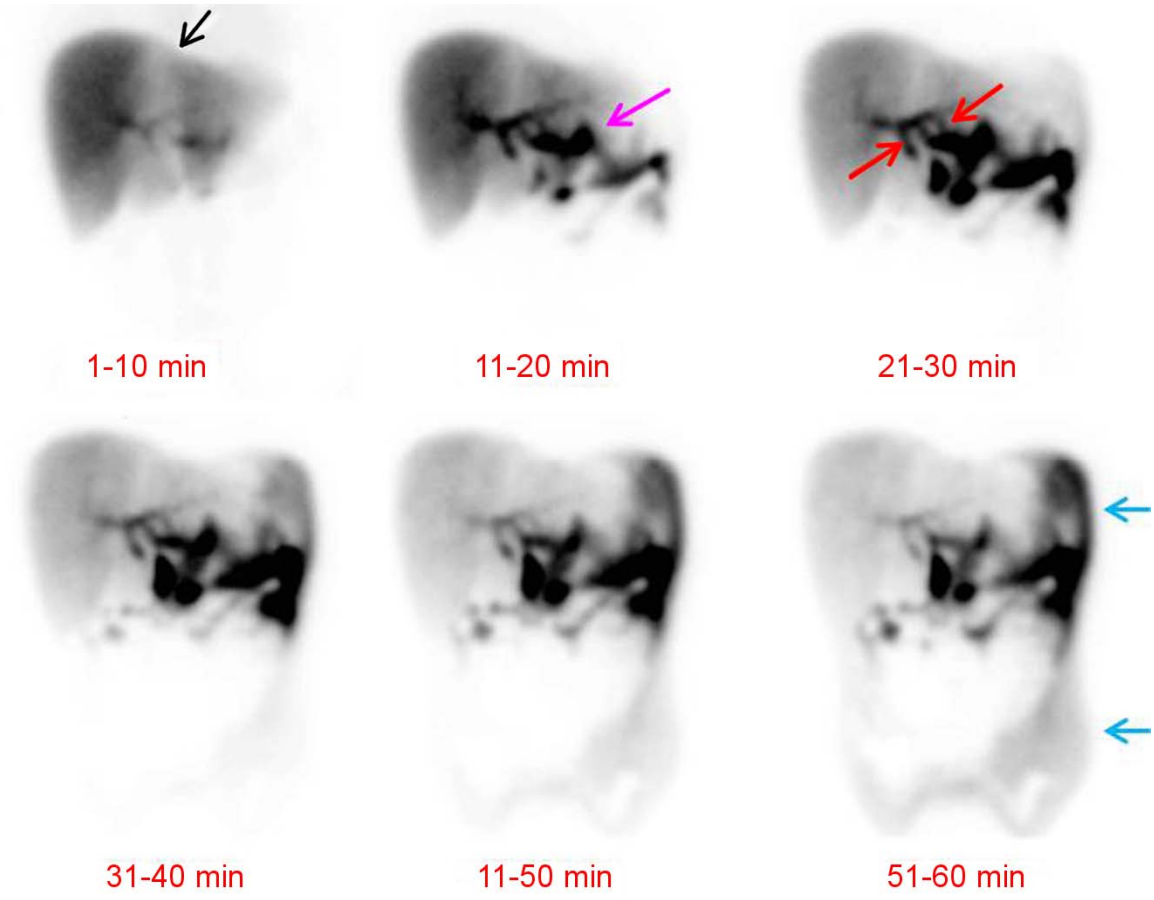

Figure 2. CT images of the abdomen/pelvis with contrast demonstrate central hepatic laceration.

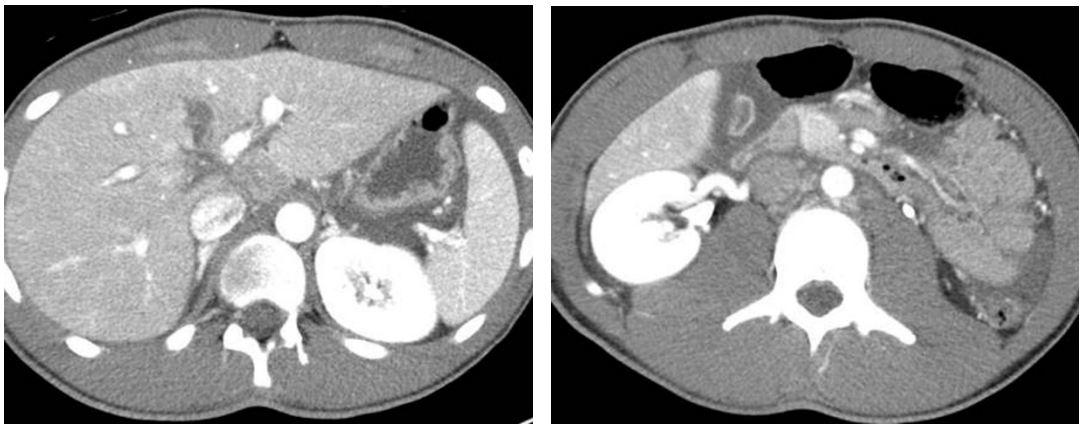

Figure 3. An endoscopic retrograde cholangiopancreatography with cholangiogram shows accumulation of contrast outside the biliary system over the inferior left hepatic lobe (yellow arrow). A line of contrast (red arrows) connects this abnormal focal area to the left intrahepatic duct.