LETTER TO THE EDITOR

Successful treatment of haemothorax following percutaneous liver biopsy using interventional radiology: importance of arterial anatomical variations

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We report on a case of massive haemothorax following percutaneous liver biopsy (PLB) due to an injury of both the right posterior intercostal artery (RPIA) and the inferior right phrenic artery (IRPA). Successful interventional radiology could be achieved only by complete mapping of the territories of all major arterial branches of the abdominal aorta.

A 53-year old man underwent liver transplantation for HCV-related cirrhosis. He was re-transplanted on day 7 following massive acute rejection, refractory to additional treatment with steroids and OKT3. Early outcome of the second graft was good, and he was discharged on day 29. He needed a PLB on day 44 following a major elevation of ALT (8×), total bilirubine (6×), and GGT (29×); platelet count at PLB was 29 000 mm^3, INR 1.64. PLB was performed through the intercostal route, after infusion of platelets; fresh frozen plasma was not given, as we consider PLB safe as long as INR is <2. At our institution, PLB is not routinely performed under ultrasound guidance for reasons related to the difficulty in co-ordinating two independent departments (transplant and radiology). Though, sonographic exploration of vascular anatomy is always warranted before every procedure, to identify the best access route in order to avoid vascular injury. The transjugular approach is not proposed for logistic matter, unless specifically required.

Two hours after PLB, patient showed signs of severe shock in the presence of a lowering of the Hgb level to 4.1 g/dl and the platelet count to 23 000 mm^3. During angiography, an active bleed originating from the tenth RPIA was detected. After selective catheterization with a 2.4-F microcatheter (Progreat®; Terumo Corp., Japan) and occlusion with four Hilal microcoils (Cook®; Bjaverskov, Denmark), no residual bleeding was apparent (Fig. 1). The procedure was completed by thoracic drainage of the blood collection. Two hours later, his clinical condition again deteriorated, while the output of the thoracic drains raised to 200 ml hourly. Repeat angiography confirmed the occlusion of the embolized RPIA; no bleeding source could be identified in the territories provided by the major branches of the celiac trunk or superior mesenteric artery. After a tedious angiographic mapping of all side branches of the abdominal aorta, the origin of the second bleed could finally be located at the level of the IRPA. Catheterization of the right renal artery allowed staff to visualize, via the ipsilateral inferior suprarenal artery (ISRA), the injured vessel. IRPA could indeed not be visualized directly given the occlusion of its aortic ostium. Selective embolization of the IRPA, achieved with 100–300 micron particles via the right renal artery, finally permitted control of the bleeding (Fig. 2). The residual haemothorax was drained surgically.

PLB showed cholestatic type HCV recurrence. Patient eventually died 9 months after the transplant, from HCV recurrence. Re-transplantation was not considered given the severely progressive cholestatic form of HVC recurrence.

Liver biopsy, the gold standard for the assessment of liver diseases, was introduced in the clinical practice by Erlich in 1883. Its use became widely accepted following the development of the percutaneous technique by Sherlock in 1945, and the refinement of the biopsy needle by Menghini in 1958 [1]. Several technical improvements, such as the anterior subcostal or laparoscopic approach, ultrasound guidance, and conversion to transjugular biopsy in the presence of particular circumstances such as ascites, and the introduction of safety measures (namely, minimal platelet count of 50 000 mm^3 and INR <2), substantially reduced the complication rate of PLB [2–6].

Morbidity and mortality rates of PLB are currently estimated between 0.06% and 30%, and between 0.009% and 0.33% respectively [2–7]. Pain and/or discomfort (30%), intrahepatic haematoma (23%), vaso-vagal reaction with hypotension (3%), penetration of abdominal viscera with or without peritonitis (0.01–0.1%), haemobilia with or without secondary acute pancreatitis and/or cholecystitis (0.05%), infection, reaction to anaesthetic, breakage of the biopsy needle, liver rupture, formation of arteriovenous fistula, and death have all been reported after PLB [7,8]. Complications can be minor or major, and they may appear immediately or present after some delay. Bleeding still remains the most life-threatening condition.

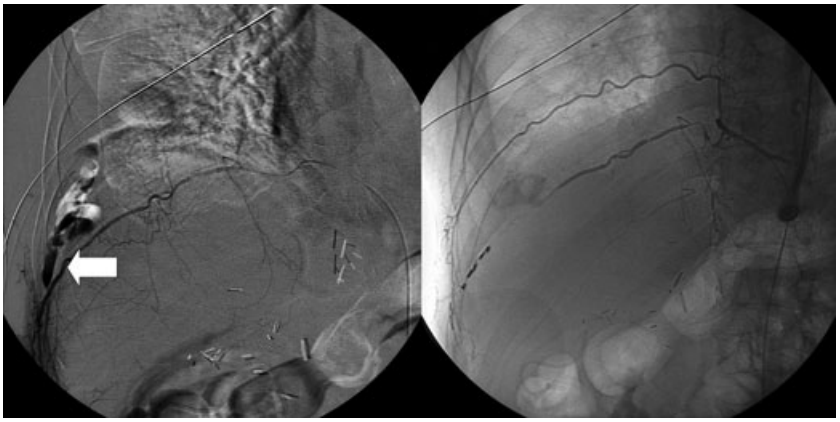

Figure 1 Bleeding originating from the distal end of the 10th dorsal right intercostal artery (*left panel – white arrow*) and successful treatment with embolization (*right panel*).

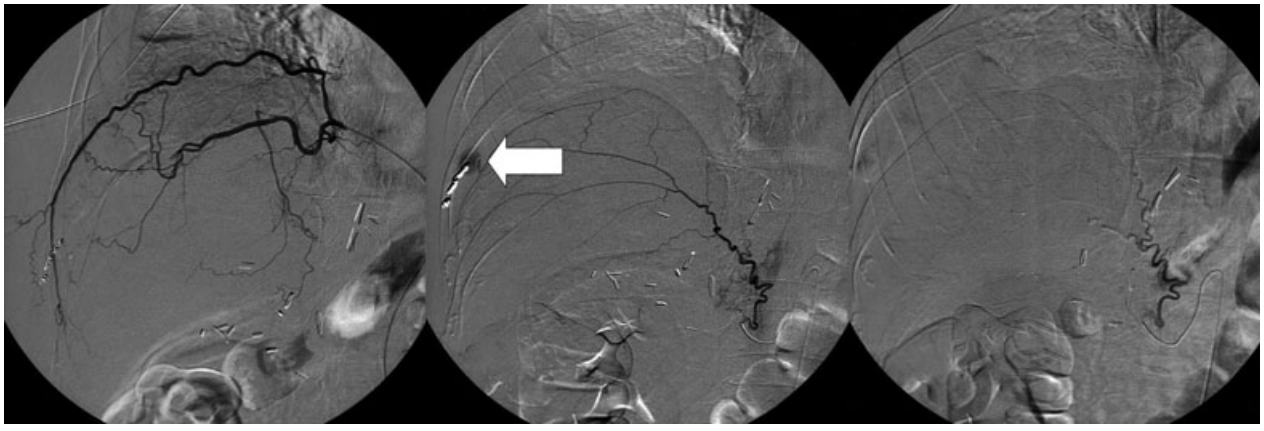

Figure 2 Inferior right phrenic artery fed by the right renal artery via the inferior suprarenal artery (*left panel*). Bleeding of the distal end of the phrenic artery (*middle panel – white arrow*). Control after embolization with micro-particles (100–300 microns) (*right panel*).

Sixty percent of bleeds occur within 2 h. This is the reason for providing 6-h in-hospital observation after biopsy. Almost all cases of bleeding (96%) occur within the first 24 h, which reinforces the need for medical control the day following PLB. About 3% of patients will need to be hospitalized due to the occurrence of a complication [4,5].

In order to avoid or minimize bleeding complications, awareness of the vascular anatomy of the thorax and abdomen is of paramount importance [8]. The rich vascular thoracic network arises from the subclavian artery via the internal thoracic artery, the thoracic aorta through the posterior intercostal and superior phrenic arteries, and from the abdominal aorta via the inferior phrenic and anterior intercostal arteries. The proximal ends of the inferior phrenic arteries give rise to the superior suprarenal arteries, which connect with the middle and inferior suprarenal arteries, arising respectively from the abdominal aorta and the renal arteries. As the intercostal arteries run along the inferior costal margin, the biopsy needle must be positioned at the superior border of the rib to avoid any vessel injury. It should be kept in mind that costal anomalies, narrowing of the intercostal space, or presence of vascular variants may still be responsible for an increased risk of bleeding, despite the use of proper technique during the procedure. The presence of arterial variants should also be considered because these may be responsible for a significant delay not only in diagnosing, but also in treating the cause of the bleeding. In our experience, the obstruction of the aortic ostium of IRPA significantly delayed the detection and treatment of the bleeding source. The bleeding source could be identified only by visualization of the different side branches originating from the aorta.

When dealing with bleeding after PLB, interventional radiologists should be aware of vascular variations and

anomalies, and provide a complete arterial cartography, including the intercostal arterial network and all major side branches of the abdominal aorta proximal to the superior mesenteric artery.

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References

1. Menghini G. One-second needle biopsy of the liver. *Gastroenterology* 1958; **35**: 190.
2. McGill DB, Rakela J, Zinsmeister AR, Ott BJ. A 21-year experience with major hemorrhage after percutaneous liver biopsy. *Gastroenterology* 1990; **99**: 1396.
3. Tobkes AI, Nord HJ. Liver biopsy: review of methodology and complications. *Dig Dis* 1995; **13**: 267.
4. Mayoral W, Lewis JH. Percutaneous liver biopsy. What is the current approach? Results of a questionnaire survey. *Dig Dis Sci* 2001; **46**: 118.
5. Bravo AA, Sheth SG, Chopra S. Liver biopsy. *N Engl J Med* 2001; **344**: 495.
6. Rossi P, Sileri P, Gentileschi P, *et al.* Percutaneous liver biopsy using an ultrasound-guided subcostal route. *Dig Dis Sci* 2001; **46**: 128.
7. Grant A, Neuberger J. Guidelines on the use of liver biopsy in clinical practice. British Society of Gastroenterology. *Gut* 1999; **45**(Suppl.): IV1.
8. Chahal PS, Ready J. Hemothorax after percutaneous liver biopsy: an unusual complication. *AJG* 2002; **97**: 1068.

