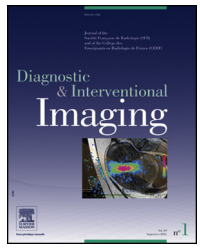
Diagnostic and Interventional Imaging (2015) **96**, 571—577



ORIGINAL ARTICLE /*Digestive*

# Major complications due to transjugular liver biopsy: Incidence, management and outcome

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**KEYWORDS**
Interventional radiology;
Transjugular liver biopsy;
Liver biopsy

**Abstract**
*Purpose:* The purpose of this study was to retrospectively evaluate the incidence of intraperitoneal bleeding and other major complications of transjugular liver biopsy (TJLB) and analyze their outcome and management.
*Materials and methods:* The clinical files of 341 consecutive patients who had TJLB were retrospectively analyzed. There were 237 men and 104 women (mean age: 51.38 ± 12.8 years; range: 17—89 years). All patients had TJLB because standard percutaneous transhepatic biopsy was contraindicated. Patients' files were reviewed to search for major and minor procedure-related complications during or immediately after TJLB.
*Results:* TJLBs were technically successful in 331/341 patients (97.07%; 95%CI: 94.67—98.58%). Major complications consisted exclusively of intraperitoneal bleeding due to liver capsule perforation and were observed in 2/341 patients (0.59%; 95%CI: 0.07—2.10%). They were treated using transcatheter arterial or venous embolization with a favorable outcome. The most frequent minor complications were abdominal pain (35/341; 10.26%; 95%CI: 7.25—13.99%) and supraventricular arrhythmia (15/341; 4.40%; 95%CI: 2.48—7.15%). No cases of inadvertent injury of the carotid artery were observed.
*Conclusion:* Major complications during TJLB are extremely rare and can be managed using arterial or venous embolization with a favorable outcome. Our results reinforce the general assumption that TJLB is a safe and well-tolerated technique.



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http://dx.doi.org/10.1016/j.diii.2015.02.006

Transjugular liver biopsy (TJLB) is used for obtaining high-quality histological samples from patients with acute or chronic liver disease who have severe coagulation abnormalities or ascites for whom standard percutaneous biopsy of the liver is contraindicated [1—13]. It is well-established that in patients with severe coagulation abnormalities or ascites, standard percutaneous liver biopsy is associated with a high risk of hemoperitoneum, which can be life-threatening and even fatal [7,11]. To avoid these risks TJLB is a satisfactory alternate option [2,6,9,14—17].

Biopsy of hepatic parenchyma via the venous system reduces the risks of bleeding, because the basic concept behind TJLB is that this sampling technique is performed without penetrating the liver capsule (*i. e.*, the capsule of Glisson), which is not perforated during the procedure [1,11,16]. However, there were some reports that described severe and potentially life-threatening complications during TJLB [1,2,6,8,18].

Although, in theory, the capsule of Glisson is not perforated during TJLB, this may happen, resulting in hemoperitoneum of varying severity in approximately 0.2% of the procedures [8,11]. In most reported studies, probably because of a limited number of patients, there were no cases of intraperitoneal hemorrhage due to TJLB [13—15,19—21]. To date, a few studies have specifically placed a special emphasis on this severe complication but the majority of them did not provide details regarding management [2,22,23]. In addition, most of reported cases were single case reports so that the actual incidence of this complication is not well known [24,25].

Accordingly, the purpose of this study was to retrospectively evaluate the incidence of intraperitoneal bleeding and those of other major complications during TJLB and analyze their management and outcome.

## Materials and methods

### Patients

This retrospective study was performed on the medical records of 341 consecutive patients who underwent TJLB using ultrasonographic guidance for right internal jugular vein (RIJV) puncture and an automated device (Quick-Core, Cook, Bloomington, IN) for liver biopsy in our department between April 1995 and September 2014 inclusively. The retrospective data analysis was approved by our review board and informed consent was obtained from all patients.

There were 237 men and 104 women, with a mean age of 51.38 ± 12.8 years (S.D.; range: 17—89 years). During the same period, five patients who were scheduled to undergo TJLB had thrombosis of the RIJV as evidenced by duplex and color Doppler ultrasonography and were excluded from retrospective data analysis because they did not undergo TJLB.

Percutaneous liver biopsy was contraindicated in all patients because of severe coagulopathy (221/341; 64.81%), ascites alone (20/341; 5.86%) or both (100/341; 29.33%). Severe coagulopathy was defined by a prothrombin time 6 s greater than control time or by a platelet count $<70 \times 10^9$/L. Marked ascites was defined as a large amount of free-fluid around the liver as evidenced by ultrasonography or computed tomography (CT) of the abdomen.

Indications for TJLB were as follows: 155/341 patients (45.46%) had a known viral hepatitis and liver biopsy was performed to determine if a specific treatment was needed; 144/341 patients (42.23%) were known alcohol abusers and liver biopsy was needed to evaluate the severity of the disease ($n = 88$) or to determine if associated acute alcoholic hepatitis was present ($n = 56$); 19/341 patients (5.57%) had suspected nonalcoholic steatohepatitis (NASH syndrome), 10/341 patients (2.93%) had suspected toxic hepatitis, 4/341 patients (1.17%) had suspected autoimmune hepatitis, 3/341 patients (0.88%) had suspected hepatic lymphoma, 3/341 patients (0.88%) had Wilson disease, 1/341 patient (0.29%) had suspected azathioprine-related nodular regenerative hyperplasia, 1/341 patient (0.29%) had suspected hepatic tuberculosis, and 1/341 patient (0.29%) had suspected hepatic candidiasis. No patients had TJLB because intrahepatic bile duct dilatation contraindicated standard percutaneous biopsy.

### Technique

All procedures were performed by an experienced operator under mild analgesia. After local anesthesia with 1% lidocaine, the RIJV was punctured with an 18-G needle-catheter under ultrasound guidance using a 7.5-MHz dedicated probe. A 9-Fr, 49 cm long introducer (Radifocus, Terumo, Tokyo, Japan) was placed in the RIJV using a Seldinger technique using a 0.035-inch J-tipped guide wire (Angiodyn, Braun, Melsungen, Germany). Catheterization of the right hepatic vein was performed with a hydrophilic 0.035-inch angled guide wire (Radifocus, Terumo) and a 5-Fr end-hole catheter. To confirm optimal placement in the right hepatic vein, a quick-check angiogram was obtained with 10 mL of iodinated contrast material injected by hand. A 0.035-inch, 180-cm long super-stiff Amplatz guide wire (Boston Scientific, Miami, FL, USA) was used to further introduce a curved rigid 7-Fr catheter that was placed into the right hepatic vein. Finally, the 18-G, 60-cm long Quick-Core automated biopsy device was introduced coaxially and liver biopsy was performed.

TJLB was performed using intermittent fluoroscopy control and electrocardiographic monitoring. The tip of the biopsy device was placed not too close to the liver capsule because the biopsy system advanced the needle tip 24 mm into the liver parenchyma when fired. The right hepatic vein was used as the biopsy site in all patients to better control the distance between the needle tip and the liver capsule. In patients with ascites, the location of the capsule was estimated on ultrasonography and/or CT images before TJLB. After biopsy, tissue samples were visually examined by the operator who decided if another specimen and further biopsy was needed. Mild sedation was obtained two hours before TJLB. During the procedure, vital signs (*i. e.*, cardiac status and arterial blood pressure), were continuously monitored. After TJLB, the patients rested in bed for 24 hours and the skin puncture site and the abdomen were clinically examined every four hours. Abdominal ultrasonography and hemoglobin levels were performed only when a complication was suspected on clinical symptoms.