

# A COMPARISON BETWEEN ULTRASOUND-GUIDED PLUGGED PERCUTANEOUS LIVER BIOPSY AND TRANSJUGULAR LIVER BIOPSY

A Retrospective Study in a Tertiary Single Centre



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## INTRODUCTION

Percutaneous liver biopsy is commonly performed in our day to day practice for guidance of treatment in those with focal or diffuse liver disease. It is generally a safe procedure with common major complications being mortality, hospitalisation, major bleeding and moderate/severe pain. Biopsy tract plugging with Gelfoam materials is used to reduce the risk of bleeding, known as plugged percutaneous liver biopsy (PPLB). In the Koh. et al retrospective study of 543 patients in a single centre, up to 16.2% patients in the non-tract embolisation group experienced major or minor bleeding events. Whereas the track embolisation group only experienced major or minor bleeding events in 4.8% patients. Transjugular liver biopsy (TLB) is another safe and reliable alternative method for patients with a high bleeding tendency and/or ascites.

Hence, we aim to review and compare the complication rate, technical success rate and other major outcomes of PPLB and TLB that were performed in our centre.

## METHODS AND MATERIALS

In the form of retrospective study, we analysed data of both PPLB and TLB procedures performed in this single centre. Between 1st June 2023 to 30th June 2024, 97 consecutive ultrasound-guided PPLB were performed in this 1-year period. Between 1st April 2012 to 30th April 2024, 55 consecutive TLBs were performed in this 12-year period. Total of two patients were excluded from each of the groups due to inadequate documentation.

The demographics including the mean age, gender, platelet and INR levels of the two groups are summarised in Table 1.

Table 1. Demographic and laboratory details of the two groups

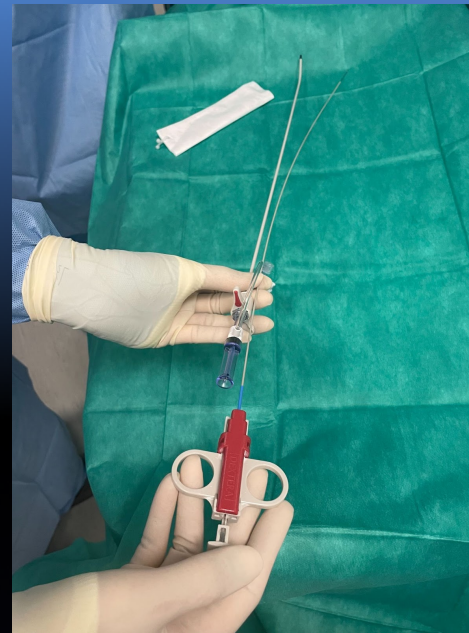
	TLB	PPLB
Number	55	97
Female (percentage)	18 (48.6)	52 (53.6)
Age (yrs)	52 ± 15.5; 5-86	65 ± 12.7; 29-91
PLT level (x10 <sup>9</sup> /L) (mean ± S.D. ; range)	114 ± 95; 19-456	239 ± 105; 50-593
INR level (mean ± S.D. ; range)	1.4 ± 0.4; 0.9-2.9	1.1 ± 0.1; 0.9-1.3

INR: international normalised ratio; PLT: platelet

The mean number of radiologists was 1.36 ± 0.5 (range from 1-2) in the PPLB group, and 1.9 ± 0.5 (range from 1-4) in the TLB group. The mean number of tissue samples was 2.7 ± 0.76 (range from 1-5) in the PPLB group and 2.3 ± 0.75 (range from 1-4) in the TLB group. The length, number of complete portal tracts and fragmentation rates of tissue samples were not documented in the clinical records within our centre and therefore not available for analysis.

All the PPLB were performed with a combination of co-axial system and Temno needle, with a size used according to the operating radiologist's preference. All patients were administered with local anaesthesia prior to the procedure. The gelatin slurry was prepared by cutting gelatin sponge into cubes <5mm and mixing them with normal saline solution. Injection of gelatin sponge slurry continuously into the biopsy track under US guidance until the needle exits the skin surface.

In the TLB group, all the cases punctured the right IJV under ultrasound guidance. A Terumo guide-wire (150cm) was introduced via the needle and placed into the IJV to the inferior vena cava. A 5Fr catheter was inserted to the right hepatic vein where a venography was performed to confirm the catheter position. Then a Stiff Terumo wire was (150cm) placed into the right hepatic vein. Our current protocol utilises the TLAB® Transjugular Liver Biopsy System which is placed into the right hepatic vein through the guide wire. Biopsy sheath was then turned anteriorly and a total of three passes of biopsy were made. Majority of the cases cannulated the right hepatic vein (78.5%). The rest cannulated the middle hepatic vein (17.1%) and the left hepatic vein (4.9%). Control venography and post procedural ultrasound were performed for demonstration of any acute complications.



TLAB® Transjugular Liver Biopsy System

## RESULTS

Technical success was defined as successful completion of biopsy procedure and collection of liver specimens. In this case series, the percentage of technical success rate is higher in the PPLB group when compared to the TLB group (100% vs. 74.5% respectively). The reasons for failure in TLB groups were due to failure to catheterise the hepatic veins (namely acute angulation of the hepatic vein), failure to puncture right internal jugular vein (IJV) and termination of examination due to complications (Table 2.).

When using logistic regression to adjust for confounding factors including age, gender, PLT and INR levels, PPLB method was found to be a significant

Table 2. Reasons for technical failure in the TLB group

Reasons for failure	Number	(%)
Failure to catheterize hepatic veins	9	16.4
Failure to puncture right IJV	2	3.6
Termination of examination secondary to complications	2	2.6
Unknown	1	1.8

Table 3. Histopathological Results of Tissue Samples

Histopathological results	PPLB Number (%)	TLB Number (%)
Metastases	19 (20.0)	01 (2.4)
Hepatocellular carcinoma	11 (11.4)	00 (0)
Carcinoma	27 (28.1)	01 (2.4)
Dysplastic nodule	03 (3.1)	00 (0)
Cirrhosis	03 (3.1)	05 (12.2)
Steatosis	11 (11.5)	02 (4.9)
Hepatitis	08 (8.3)	05 (12.2)
Benign liver tissue	04 (4.2)	02 (4.9)
Fibrosis	02 (2.1)	03 (7.3)
Siderosis	02 (2.1)	04 (9.8)
Cholestasis	03 (3.1)	08 (19.5)
Acute cellular rejection	00 (0)	01 (2.4)
Miscellaneous	03 (3.1)	04 (9.8)
Non-specific changes	03 (3.1)	03 (9.8)
Non-diagnostic specimen	00 (0)	04 (9.8)

The higher technical failure rate could be attributed to our relatively small study sample. And in those procedures which failed, alternative methods such as utilising left IJV, trans-femoral, transcaaval approaches were not explored by individual radiologists within the same session.

Positive histopathology rate was defined when adequate samples are obtained for histopathological evaluation. This was achieved in all patients (100%) in the PPLB group and 90.2% of patients in the TLB group. When using logistic regression to adjust for the confounding factors including age, gender, PLT, INR levels and number of tissue samples obtained, PPLB method was found to be a significant predictor in histopathological positive rate ( $p = 0.037$ ).

Table 4. Complications in PPLB and TLB group

	PPLB	TLB	Significance
Major complications	0	0	-
Bleeding related minor complications	2	2	0.626
Non-bleeding related minor complications (transient tachycardia, fever)	2	1	1

Using the existing classification of complications by the Society of Interventional Radiology (SIR), complications were categorised into major and minor complications. No major complications were encountered in both PPLB and TLB groups. All patients were discharged home the day after the procedure. There were also no other types of major complications, such as anaphylaxis, infections, or hepatic/ venous reflux noted.

Bleeding related minor complications such as localised bleeding at puncture site and along needle track were encountered in 2 out of 97 patients in PPLB group (2.1%) and 2 out of 55 patients in TLB group (3.8%). None of the cases resulted in clinically significant or delayed bleeding. There was no significant difference in bleeding and non-bleeding related minor complications between the two groups.

## DISCUSSION

Percutaneous liver biopsy is a widely used procedure to obtain tissue samples to guide diagnosis and treatment. It is a generally safe procedure, but in patients with high bleeding risks such as coagulopathy, it can be associated with severe haemorrhage. McGill et al, found that in 9212 liver biopsies performed there were up to 10 fatal and 22 nonfatal haemorrhages (0.11% and 0.24%, respectively).

Transjugular liver biopsy is an alternative method that can reduce the bleeding risk as the biopsy needle is directly inserted to the liver parenchyma via the hepatic veins without puncturing the liver capsule. However, studies have shown that TLB often results in fragmented and inadequate liver tissue samples. Moreover, TLB has been reported to be more technically demanding where it often necessitates well-trained interventional radiologists, a longer procedural time and a higher overall cost. A modification of percutaneous liver biopsy has therefore been introduced.

Percutaneous liver biopsy with plugging of the needle track was first described by Riley et al. in 1984. It described the injection of Gelfoam upon withdrawal of the biopsy needle. It is a safe alternative to patients with coagulopathy where bleeding risks can be minimised. Gelatin sponge (Gelfoam) is a commonly used embolic agent in interventional radiology. It is an absorbable bioprosthetic material that is prepared from purified pork skin gelatin. The resultant complex is capable of absorbing up to 45 times its weight in blood. Bleeding is stopped by formation of an artificial clot and by providing a structural support that facilitates and hastens clotting.

This series shows that PPLB is a significant predictor in technical success and histopathological positive rate when compared to the TLB group. In the Sawyerr et. al randomised study comparing TLB and PPLB approaches within 117 patients, it was found that PPLB was proven to be quicker, easier and with larger samples obtained. The study did note that PPLB had more patients with haemorrhage compared with the TLB group (3.5% vs. 0%), which did not reach clinical significance. Our study also demonstrated that there was no significant difference in both bleeding and non-bleeding complications rates between the two groups.

Therefore, further information with regards to procedural time, patient's experience, costs is needed to consider whether patients with coagulopathy should undergo PLB instead of TLB. At present time, there seems to be a lack of clear in-house protocol in our department whether patients with coagulopathy, especially those with mildly impaired coagulation, should undergo PPLB or TLB. A review and revision of the protocol would be beneficial in the future.

The limitation of this study is its small study size and that it was also conducted within a single centre. It is a retrospective study without a control group, a future randomised controlled study could help validate the results.

## CONCLUSION

When comparing transjugular liver biopsy with plugged percutaneous liver biopsy, PPLB showed a higher technical success and histopathological positive rate. There was no significant difference in bleeding complications between the two groups. Both groups however were shown to be safe without major complications observed.

## References

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