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A Modified Menghini Technique for Percutaneous Liver Biopsy in a Resource Constrained Setting

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Abstract:
Liver biopsy (LB) is a very commonly performed procedure in the management of liver diseases. It provides specimen for diagnosis, classification and staging of liver diseases. In areas of high Hepatitis B virus (HBV) endemicity, liver diseases are prevalent making liver biopsy an important tool in their management. Unfortunately, the required resources are not always available in resource constrained settings. I have described a modification of the Menghini needle that is low coat, easily available and reasonably safe that will hopefully increase liver biopsy rates to improve patient management and outcome. This technique was used to biopsy 27 adults aged 20 -70 years; consisting of 19 males and 8 females in the evaluation of liver disease. The specimens were reported as adequate in all 27 samples of which 67% consisted of the complex of hepatitis, cirrhosis/primary liver cell cancer (PLCC).

Keywords: *Liver biopsy, modified Menghini technique, low cost*

1. Introduction

Liver biopsy (LB) is the most commonly performed procedure in the management of liver diseases. It is invaluable in the diagnosis, grading and monitoring of therapy and progression in diseases of the liver. LB is an invasive procedure and carries some risk of fatal outcome. The first recorded liver biopsy has been attributed to Paul Ehrlich in 1883 (Bingel 1923). Lb received a tremendous boost in 1958 with the introduction of the Menghini one second technique which greatly enhanced the safety of the procedure (Menghini 1958). With further advances in technology and imaging, the field has witnessed a vast development in modifications and refinements in the techniques, instruments, indications and safety of the procedure. Liver tissue specimens can be obtained using a variety of approaches notably the percutaneous, transvenous or intra-abdominal through laparoscopy or laparotomy. The percutaneous approach is the thrust of this paper.

1.1. Percutaneous liver biopsy (PLB)

Various types of percutaneous liver biopsy are described and can be classified according to the site of entry of the biopsy needle or whether the biopsy is performed blind or guided (Al KnawyandShiffman2007).
Transthoracic (transpleural or transparietal) liver biopsy; the liver is biopsied through the intercostal space
Subcostal liver biopsyif the patient has an enlarged liver extending below the costal margin, then the site of entry of the biopsy needle may be subcostal.
Blind needle biopsy BNB; there is no imaging of the liver immediately prior to the procedure.
Guided needle biopsy means that the biopsy is performed immediately after imaging of the liver using ultrasound (US), computer tomography (CT) or magnetic resonance imaging (MRI). This can be Ultrasound-assisted Biopsy (UAB) when the US is performed immediately prior to the liver biopsy to mark the biopsy site or Ultrasound-guided Biopsy (UGB) where the biopsy is performed in real time
Some reviews have shown the ultrasound guided biopsy (UGB) to be superior to and carried less risk for major complications, post biopsy pain and biopsy failure compared to blind needle biopsy (BNB)(Synet al 2007). However, the blind percutaneous liver biopsy is a safe and effective if indications and contraindications are considered carefully and the biopsy is performed by a skilled and experienced operator (Aleksandra et al 2012). Others observers found no difference in complication rate between BNB and UGB (Naser et al 2015).
PLB were once exclusively performed on inpatients. Studies have established the safety of outpatient PLB once the recommended guidelines are followed. They could therefore be done safely as day cases (Garcia-Tsao et al 2007).

1.2. Liver Biopsy Needles

Available liver biopsy needles are of two main types (Al Knawy and Shiffman 2007).Aspiration or suction-type needles *(*Menghini, Jamshidi and Klatskin)

Cutting needles: Tru-cut and Vim-Silverman and the Spring-loaded automatic cutting needles
Tru-cut needles are superior to aspiration-type needles in patients with fibrosis or cirrhosis. Which needle is selected is often a result of physician preference and experience.

1.3. Quality of Liver Biopsy Specimens
Specimens obtained at liver biopsy represents only approximately 1/50 000 of the total liver volume (Bravoet al2001).The tissue obtained has to be of good quality to be useful in the staging and assessment of disease severity, progression and treatment. This is determined by the length, width, fragmentation and number of complete portal tracts (CPTs) present (Bravo et al2001).The recommendation that optimal specimens should be at least 20-25 mm long and or contain more than 11 CPTsis not easy to obtain in clinical practice without appreciable increase in the complication frequency (Evangelos et al 2006).The Royal College of Pathologists recommended that specimens should be at least 1 cm long and contain a minimum of six portal tracts (Colloredo G, et al 2003).Even these modest requirements were not easy to fulfill in practice as evidenced by the study of Chanmet al (2010).To fulfill this guideline, the biopsy needle should be at least16G and the length 15 mm rather than 10 mm (Chanm et al 2010).

1.4. Complications
Complications from PLB could be minor (pain and transient hypotension) or major. Pain is the most common complication of liver biopsy and occurs in up to 30-50% of cases and could be moderate in 3% and severe in 1.5%(Perrault et al.1978;Rustagi etal 2010).Major refers to complications which are life threatening, require prolonged hospitalization or result in persistent or significant disability. Significant hemorrhage (indicated by a drop in hemoglobin of >2 g/l) occurs in 0.35–0.5% of all procedures and is the major cause of death following PLB (Gilmore et al1995).Subclinical bleeding however, occurs in a much higher percentage of patients, with up to 23% of patients having intrahepatic or subcapsular hematomas detectable by ultrasound 24 hours after biopsy. These hematomas are generally small and are not associated with significant hemodynamic compromise.
The frequency of complications increased with use of large bore needles, the number of needle passes performed the presence of cirrhosis or malignant disease[0] and the age of the patient. Complications have reported to be slightly more frequent with the transthoracic (4.1%) than the subcostal route (2.7%).Most of the complications occur in the first few hours after PLB. In one review, 61% of complications occurred in the first two hours, 82% in the first 10 hours, and 96% in the first 24 hours (McGill et *al*.1999)).

2. Material and Methods

2.1. Biopsy Needle
Adult Menghini needle (Fig 1) is available in different sizes (40-70 mm long, (inside diameter 2.1 mm); 14 G - 40 mm long (inside diameter 1.2 mm); 18 G. It has a cutting atraumatic tip slightly convex towards the outside and a retaining device at its proximal end. The needle used is this presentation is the needle that comes with the 14G intravenous (iv) cannula making the needle itself no more than 16 G (OD: 1.651mm and ID; 1.194mm); Figure 1. In our practice, we are faced with a number of challenges. Pioneers of clinical hepatology introduced and used exclusively the Menghini needle. Experience with the cutting type needles is low. The Menghini needle has however endeared itself to practitioners because of the very short duration of the intrahepatic phase of the procedure (one second) as described in the original paper. Before the patient had time to gasp or move, the operator was truly out of the liver greatly minimizing the potential for tearing the liver capsule. The Menghini needles available are non disposable, old and blunt causing technical difficulties for the operator. Reusable equipment is problematic in areas of high HBV and HIV endemicity where sterilization of equipment cannot always be guaranteed. This paper presents the adaptation of the needle from the everyday intravenous cannula which is easily available as a child of necessity to get around these difficulties (Table 1and Figure 1). The retaining device is prepared by twisting off both ends of a sterile 21G needle and bending one end of the piece into a short loop with an artery forceps.

Parameter	Menghini needle	iv cannula needle
Size	14-16G	14-16G
Length	40-70mm	45/55mm
Needle tip	cutting, atraumatic	sharp, short bevel
Cost/piece	$9.80 - $61.33	$O.195
Disposable	yes and no	yes

Table 1: Biopsy needle characteristics

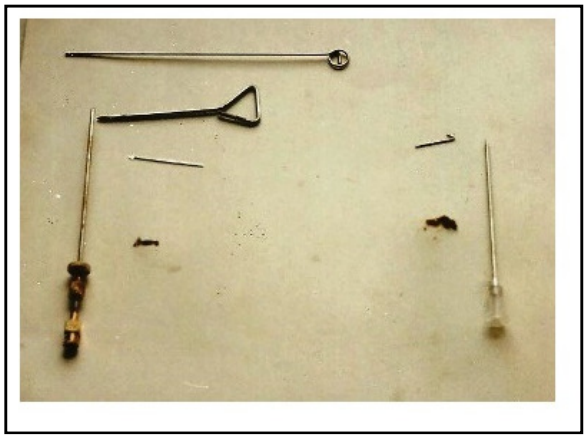

Figure 1: Visual comparison of Menghini and 14G cannula needles

2.2. Legend

The left side of the picture shows the traditional Menghini ensemble. The right side shows the 14 G cannula needle with the adapted retaining device. The tiny lumps are liver tissue obtained by biopsy

The first problem presented by the cannula needle adopted is obviously the sharp point especially in the light of the fact that liver laceration and significant hemorrhage is the single major cause of mortality following PLB. This problem was circumvented by staying under the skin and moving straight into the liver during the breath holding phase. The other intermediate steps in the original procedure were simply set aside. The briefness of the procedure helped a lot. The needle is short and does not need a restraining device and is unlikely to go so far as to puncture other intra-abdominal structures. It served well for normal to big sized livers. However, small sized livers may not be accessible to the needle. With this needle, there is no need to make any skin nick with a scalpel because of the sharp point. Indeed, the needle point of entry is barely visible after the procedure. The tissue yield is adequate. One other advantage of the needle is that it can biopsy cirrhotic livers of sufficient size quite easily due to the sharp point. One could feel and indeed hear the grittiness as it went into the liver.

2.3. Prebiopsy Preparation

Preparation for, the biopsy procedure itself and after care followed the generally recommended guidelines including informed consent (Rockey et al 2009). All patients with suspected liver disease had abdominal ultrasound as part of their initial work up to assess liver size, detect the presence of ascites, cysts and focal lesions. Liver function tests, hematological and coagulation profiles were carried out to determine eligibility for liver biopsy. Patients were adjudged eligible for liver biopsy if they had a hemoglobin level of >10g/dl, platelet count of 100 000/mm3, prothrombin time <4 seconds prolonged, and INR<1.4) ascites was moderate or less and the other usual contraindications were excluded. Patients presenting initially with prolonged PT and INR, were given parenteral vitamin K. The procedure could then be performed if the coagulation parameters normalized. Patients with painful livers received adequate analgesia in the normal course of their management before the biopsy was attempted.

2.4. Biopsy Procedure

Biopsies were done in the mornings both for inpatients and outpatients so that they could be under observation while work was in full session. Sedation and prophylactic antibiotics were not given because there was no indication for them.

The biopsies were done blind under local anesthesia using lignocaine. The procedure for the biopsy followed the Menghini technique with the notable exception that steps 2 and 3 which were bypassed. The maximum number of needle passes was three.

2.5. Post-Biopsy Observation

After the biopsy, the patients had a bed rest for monitoring. Vital signs were taken every 15 minutes for the first two hours, then every 30 minutes for two hours and then hourly for the rest of the remaining period. Outpatients were subsequently discharged home after 6 hours.

3. Results

PLB were performed in twenty seven (27) patients using this needle and the particulars are presented in Table 2. Of the 27 persons that underwent the procedure, 19 were males and 8 females. Their ages ranged from 20 to 70 years; with a mean of 49 years. The indication for the biopsy was principally for the evaluation of hepatitis and liver enlargement as reflected in the histology reports. Four samples returned normal liver specimen. A single case of tuberculous peritonitis (from a piece of peritoneum caught in the needle and non specific diagnoses accounted for the rest of the specimens. There was no major complication. The patients were adults and cooperative. The onlyadverse reaction observed was post biopsy pain in up to 50% of patients. The pain was mild requiring no analgesia except in two subjects. No late complications or deaths from the procedure were observed.

Patient parameters	Histological diagnosis
No, of case: 27	Hepatitis 7 (26%);
Age: 20–70 years (mean 48.8)	Cirrhosis/PLCC* 11 (41%);
	Nonspecific diagnosis 4 (15%)
Sex: males 19; females 8	Normal 4 (15%)
	Tuberculous peritonitis 1

Table 2: Subject parameters and histological diagnosis
**PLCC: primary liver call carcinoma*

4. Discussion

In regions of high HBV endemicity, medical practioners are often confronted with the triple consequence of this disease namely; hepatitis, liver cirrhosis and PLCC. Each of these entities requires liver biopsy for precise diagnosis, classification and staging. Successful liver biopsy requires the availability of suitable tools which often is not the case. I have described a simple low cost and easily available method of PLB which is able to obtain samples adequate for analysis without undue danger to the patient. The caveat and limitation of the needle are the sharp point (danger of liver laceration) and the short length which makes it only for fair sized livers. However the sharp point offers some unique advantages. There is no need to make a nick the skin with a scalpel blade prior to the procedure and the needle can biopsy cirrhotic livers. The operator keeps the needle point in the subcutaneous space and moves only in the breath holding phase to the actual puncture of the liver shortening the duration of the procedure. With this technique in adequately trained hands, liver biopsies can be performed anytime in any place and everyday as the simple 16-14 G iv cannula is readily available.

5. Conclusion

The liver biopsy rate is low in our practice due to several limitations. The technique described offers an avenue to obtain more liver biopsies at reasonable risk for improved patient management and outcome. This is important because oftentimes, other sophisticated methods of assessment of hepatobiliary disease including, imaging, biochemical and immunological studies are lacking.

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