INTRODUCTION
Case Report
A 50 year old man with chronic, heavy alcohol use was referred to the hepatology clinic for evaluation. The patient had some baseline enceopahlopathy and elevated transaminases that were consistently in the 2-3x ULN range. A right upper quadrant ultrasound examination was consistent with some degree of cirrhosis. Hepatitis serologies and other tests for metabolic or genetic abnormalities were negative. The patient was referred for EGD to rule out and treat any varices and to undergo simultaneous liver biopsy by endoscopic ultrasound (EUS).

On EUS, the liver was diffusely hyperechogenic and somewhat nodular at its borders, both findings were felt to be consistent with cirrhosis. (Figure 1) There was trace ascites in the abdomen. Doppler ultrasound was used to identify and avoid any interposed vessels. A 19 gauge EUS FNA needle was used to perform liver biopsy. (Figure 2) Three passes were made into the left lobe of the liver using a transgastric approach. Several solid cores were obtained as well as some fragments (continued on page 44)
sedation is often not used when taking the liver biopsy. Bleeding and puncturing other organs can also occur because percutaneous liver biopsy is a “blind” biopsy method. Limitations from taking a liver biopsy from the transjugular route included neck hematoma, hepatic arteriovenous fistula, and intraperitoneal hemorrhage.

Liver histology is an important part of assessing various hepatic parenchymal diseases. Liver histology can be collected via a percutaneous, transjugular, or surgical route. A new method of collecting liver histology is via endoscopic ultrasound (EUS) guided liver biopsy. Doppler is also used so that blood vessels can be visualized (and avoided) as well. Using real time ultrasound and Doppler images the endoscopist is able to advance an aspiration needle into the hepatic tissue while avoiding vessels, bile ducts, and other interposed structures. This allows the endoscopist to obtain the necessary liver histology while theoretically limiting complications for the patient.

A 2009 study by Dewitt at al. evaluated EUS-guided liver biopsies. In this study patients underwent an EUS-guided liver biopsy if their hepatologist referred them to have one. The patients in this study were referred for reasons such as: unexplained chronic (> 6 months) increased liver function tests, suspected hepatic steatosis, and jaundice without evidence of intrahepatic or extrahepatic biliary duct obstruction. Twenty-one patients had a liver biopsy taken with a 19 gauge spring loaded Quick-Core needle and Doppler examination was conducted before the needle pass to ensure that no vasculature or large bile ducts were punctured. A median of 3 passes per patient was taken with a range of 1-4 passes. 18 patients had their left lobe biopsied while 3 patients had both their left and right lobe biopsied. A definitive diagnosis was established from the histology specimens in 19 (90%) out of the 21 patients. All of the patients were watched for 90 minutes after their procedure to make sure that no complications arose. There were no complications during or after the procedure reported in this study.

A 2016 study by Pineda at al. compared histological samples retrieved from an EUS approach to those obtained via percutaneous and transjugular methods. This was a retrospective study that included 175 patients that underwent either percutaneous, transjugular, or EUS-guided liver biopsy from November 2011 to September 2013. Abnormal liver function tests of undetermined etiology, possible biliary obstruction, and imaging that showed fatty liver disease were the main indications for liver biopsy. Twenty-seven patients had a percutaneous liver biopsy while 38 had a transjugular liver biopsy and 110 had an EUS-guided liver biopsy. The EUS-guided liver biopsy specimens were collected with a 19 gauge FNA needle that was passed 2-6cm into the liver with suction from a 20mL syringe applied while the endoscopist made 7-10 actuations. This process was counted as one pass and there was a range of 1-4 passes per patient. The average total specimen length (TSL) from the EUS liver biopsy group was 38mm (Range: 24-81mm) and the average number of complete portal tracts (CPT’s) was 14 (Range: 9-27). The transjugular liver biopsy specimens were collected by interventional radiologists. Two to three needle passes into the liver were taken with an 18 or 19 gauge needle to obtain the specimens under the guidance of fluoroscopy. The average TSL from the transjugular liver biopsy group was 34mm (Range: 24-48mm) and the average number...
concluded the diagnostic yield of EUS-guided liver biopsy is comparable to other liver biopsy methods such as the transjugular approach and the percutaneous approach. The fact that EUS-guided liver biopsy provides adequate tissue samples and can provide a real time sonographic view lead the authors to state their belief that EUS-guided liver biopsy should be the preferred choice of liver biopsy technique. From a cost point of view, the authors showed that a percutaneous liver biopsy is roughly estimated to cost $815.30 while an EUS-guided liver biopsy is estimated to cost $1581.27, although EUS-guided liver biopsy allows other maneuvers to be performed at the same time (EGD, EUS, biopsies, banding, etc) so the costs are somewhat difficult to compare.\(^3\)

A 2012 study by Stavros at al. described the cost effectiveness of EUS-guided liver biopsy when combined with EUS to excluded biliary obstruction. Between July 2008 and July 2011, 31 patients were referred for EUS to rule out biliary obstruction after their liver function tests were found to be abnormal. If a biliary obstruction was found during the EUS a same session ERCP was performed. If no evidence of biliary obstruction could be found an EUS-guided liver biopsy was performed. Twenty-two (71%) of the 31 patients had no evidence of a biliary obstruction and therefore underwent a same session EUS-guided liver biopsy. A 19 gauge FNA needle was used to obtain the liver histology with the endoscopist taking a median of 2 passes per patient (Range: 1-3). The median specimen length obtained was 36.9mm (Range: 2-184.6mm) and the median CPT’s was 9 (Range: 1-73). The cause of the abnormal liver function tests could be determined via the liver histology collected in 20 (91%) out of 22 patients. There were no procedural complications associated with EUS-guided liver biopsy. The authors concluded the diagnostic yield of EUS-guided liver biopsy is comparable to other liver biopsy methods such as the transjugular approach and the percutaneous approach. The fact that EUS-guided liver biopsy provides adequate tissue samples and can provide a real time sonographic view lead the authors to state their belief that EUS-guided liver biopsy should be the preferred choice of liver biopsy technique. From a cost point of view, the authors showed that a percutaneous liver biopsy is roughly estimated to cost $815.30 while an EUS-guided liver biopsy is estimated to cost $1581.27, although EUS-guided liver biopsy allows other maneuvers to be performed at the same time (EGD, EUS, biopsies, banding, etc) so the costs are somewhat difficult to compare.\(^3\)

A 2015 study by Diehl at al. observed the diagnostic yield and safety of EUS-guided liver biopsy across eight different centers. One hundred and ten patients underwent EUS-guided liver biopsy between November 2011 and September 2013 in the eight different centers. The indication for liver biopsy in these patients was previous serological and/or cross sectional imaging which were non-diagnostic for their underlying presentation and a desire for further evaluation. Each patient started with an EUS and if a biliary obstruction was found during the EUS a same session ERCP was performed and if no evidence of biliary obstruction could be found an EUS-guided liver biopsy was performed. Twenty-two (71%) of the 31 patients had no evidence of a biliary obstruction and therefore underwent a same session EUS-guided liver biopsy. A 19 gauge FNA needle was used to obtain the liver histology with the endoscopist taking a median of 2 passes per patient (Range: 1-3). The median specimen length obtained was 36.9mm (Range: 2-184.6mm) and the median CPT’s was 9 (Range: 1-73). The cause of the abnormal liver function tests could be determined via the liver histology collected in 20 (91%) out of 22 patients. There were no procedural complications associated with EUS-guided liver biopsy. The authors concluded the diagnostic yield of EUS-guided liver biopsy is comparable to other liver biopsy methods such as the transjugular approach and the percutaneous approach. The fact that EUS-guided liver biopsy provides adequate tissue samples and can provide a real time sonographic view lead the authors to state their belief that EUS-guided liver biopsy should be the preferred choice of liver biopsy technique. From a cost point of view, the authors showed that a percutaneous liver biopsy is roughly estimated to cost $815.30 while an EUS-guided liver biopsy is estimated to cost $1581.27, although EUS-guided liver biopsy allows other maneuvers to be performed at the same time (EGD, EUS, biopsies, banding, etc) so the costs are somewhat difficult to compare.\(^3\)

A 2015 study by Diehl at al. observed the diagnostic yield and safety of EUS-guided liver biopsy across eight different centers. One hundred and ten patients underwent EUS-guided liver biopsy between November 2011 and September 2013 in the eight different centers. The indication for liver biopsy in these patients was previous serological and/or cross sectional imaging which were non-diagnostic for their underlying presentation and a desire for further evaluation. Each patient started with an EUS and if a biliary obstruction was found during the EUS a same session ERCP was performed and if no evidence of biliary obstruction could be found an EUS-guided liver biopsy was performed. Twenty-two (71%) of the 31 patients had no evidence of a biliary obstruction and therefore underwent a same session EUS-guided liver biopsy. A 19 gauge FNA needle was used to obtain the liver histology with the endoscopist taking a median of 2 passes per patient (Range: 1-3). The median specimen length obtained was 36.9mm (Range: 2-184.6mm) and the median CPT’s was 9 (Range: 1-73). The cause of the abnormal liver function tests could be determined via the liver histology collected in 20 (91%) out of 22 patients. There were no procedural complications associated with EUS-guided liver biopsy. The authors concluded the diagnostic yield of EUS-guided liver biopsy is comparable to other liver biopsy methods such as the transjugular approach and the percutaneous approach. The fact that EUS-guided liver biopsy provides adequate tissue samples and can provide a real time sonographic view lead the authors to state their belief that EUS-guided liver biopsy should be the preferred choice of liver biopsy technique. From a cost point of view, the authors showed that a percutaneous liver biopsy is roughly estimated to cost $815.30 while an EUS-guided liver biopsy is estimated to cost $1581.27, although EUS-guided liver biopsy allows other maneuvers to be performed at the same time (EGD, EUS, biopsies, banding, etc) so the costs are somewhat difficult to compare.\(^3\)
difference between the entire study population and the
groups that had only one lobe biopsied for both total
specimen length and CPT’s. One hundred and eight
procedures (98%) yielded specimens adequate for
diagnosis. In this study, complications were defined as
any deviation from the expected post-procedure clinical
course such as: bleeding, perforation, pneumothorax,
bile leak, or infection. One patient (0.91%) out of the
110 experienced a complication. This one complication
occurred in a patient that was both coagulopathic
and thrombocytopenic. The patient presented with
abdominal pain post procedure and after receiving a
CT scan was found to have a pericapsular hematoma.
An angiogram was performed and showed that there
was no active bleeding so angioembolization was
not required. The authors argued that in their opinion

Figure 4. Low power view on H+E revealing fragmented liver biopsy adjacent hemorrhage; significant fragmentation most likely due to cirrhosis

Figure 5. Low power view on H+E demonstrating greater than 39.72 mm of tissue obtained from biopsy
the high diagnostic yield combined with the low complication rate makes EUS-guided liver biopsy the preferred method of collecting liver histology.  

A 2013 study by Gor et al. investigated the adequacy of histology taken by a 19 gauge non-Tru-Cut FNA needle in 10 patients. Four men and 6 women underwent an EUS-guided liver biopsy between February and June 2012. All 10 patients were undergoing an EGD for reasons other than an EUS-guided liver biopsy with the two most common indications being EUS to exclude biliary obstruction and EGD to rule out varices in patients with suspected liver disease. EUS-guided liver biopsy was not the primary reason for the upper endoscopy but the added procedure only added 4 minutes (on average) to the overall procedure time. Each patient only had their left lobe biopsied with three actuations per pass and three passes per procedure. A histological sample was obtained from every patient. The average specimen length was 14.4mm (Range: 6-23mm) and the average number of CPT’s per sample was 9.2 (Range: 6-15). All of the samples collected were determined to be adequate because they all lead to definitive diagnoses. No complications occurred during or after the procedures that were included in this study. The samples collected in this study are comparable to those collected via the percutaneous or transjugular route leading these authors to believe that EUS-guided liver biopsy with a 19 gauge non-Tru-Cut needle should be considered as an acceptable way to collect liver histology, although the Tru-Cut needle is not widely utilized at this time.

Overall, EUS guided liver biopsy appears to be a viable and safe means for assessing liver histology. Limited data suggests that EUS-guided approaches can also determine portal pressures and, when this is combined with EUS-guided liver biopsy and all of the diagnostic and therapeutic potential of an EGD and EUS, demonstrate that EUS directed liver evaluations are likely to only become more widely adopted with time.  

The authors wish to thank Dr. Kajsa Affolter for her help with the preparation with the pathologic figures for this manuscript.

References


