ISSN 1009－3095 *Journal of Zhejiang University SCIENCE* V.3, No.3, P.374－377, July－Aug., 2002
http://www.periodicals.com.cn; http://www.zju.edu.cn/English

http://www.zjupress.com; http://lib.zju.edu.cn/eindex.htm; jzu_s@mail.hz.zj.cn

Ultra-Cut biopsy guided by ultrasonography for liver lesions: experience of 392 clinical cases

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Received Dec.26, 2001; revision accepted Jan.21, 2002

Abstract: We conducted a retrospective study of the accuracy of liver biopsies in 392 patients with liver lesions. Postbiopsy diagnosis was 297 cases of primary liver cancers, 79 cases of secondary malignant tumors, 2 cases of non-Hodgkin's lymphoma, 10 cases of focal nodular hyperplasia, 2 cases of chronic inflammation, 1 tuberculosis case and 1 schistosomiasis case. Biopsy provided histological diagnosis in 100% of cases, sensibility and specificity of Ultra-Cut biopsy was 98.95% and 100% for the diagnosis of malignancy respectively; positive predictive value, 100%; negative predictive value, 71.43%; and accuracy, 98.98%. We identified no major procedure related complications despite the presence of thrombocytopenia in 37.5% of cases. Pain was the only reported adverse effect of liver biopsy (10.97%), and 11 patients required analgesics. We concluded that Ultra-Cut liver biopsy was a safe and effective technique, and was invaluable in the investigation and management of patients with liver lesions.

Key words: Liver, Neoplasms, Biopsy, Ultrasonography
Document code: A **CLC number:** R575

INTRODUCTION

Although great effort has been spent on developing imaging techniques and serological investigations to improve the accuracy for detection and characterization of focal hepatic lesions, percutaneous needle biopsy of the liver remains a valuable tool in accurately diagnosing liver diseases (Ward et al., 1999; Ahmad et al., 2001; Hosten et al., 1999). The basic technique, described by Sherlock, has changed little over the past 50 years. Needles for percutaneous liver biopsy are broadly categorized as suction needles (Menghini needle, Klatskin needle, Jamshidi needle), cutting needles (Vim-Silverman needle, Tru-cut needle), and spring-loaded cutting needles (Ultra-Cut needle) that have a triggering mechanism. The cutting needles require a longer time in the liver during the biopsy, which may increase the risk of bleeding. Death, serious haemorrhagic complications, pneumothorax and biliary peritonitis were more frequent after biopsy with the Trucut needle than after biopsy with spring-loaded cutting needles (Bravo et al., 2001). The purpose of our study was to determine the safety and accuracy of Ultra-Cut needle biopsy guided by ultrasonography in diagnosing malignant neoplasms for liver lesions.

MATERIALS AND METHODS

Clinical data

This was a retrospective study including 392 patients (303 male patients and 89 female patients; mean age, 51.4 years; age range, 16 to 80 years) who were admitted to Sir Run Run Shaw Hospital since 1997 for percutaneous biopsy of liver lesions. All patients had clinical suspicion of hepatic malignancy that needed to be confirmed histologically or staged prior to making decision regarding treatment. Every patient should have complete blood count (CBC), Prothrombin time (PT), APTT, α-fetoprotein (AFP), liver function, renal function, abdominal ultrasonography and computed tomography (CT) scan before percutaneous liver biopsy.

Ultra-Cut needle

The biopsy device used was the Ultra-Cut instrument with an 18-gauge, 14-cm-length needle (22-mm penetration, 16.6-mm sample notch), which was an automated, disposable system designed by MEDICAL DEVICE TECHNOLOGIES INC. Special features included throw selection, dual firing triggers with safety, ergonomic design and echogenic needle tip.

Methods

All patients received abdominal ultrasonography before a percutaneous biopsy was performed. This identified liver mass lesions and defined the anatomy of the liver and the relative positions of the gallbladder, lungs, large vessels, stomach, and kidneys. In our institution, liver biopsies were performed by medical oncologists with or without a fellow-in-training in the ultrasonography department. Each sample was filled with 10% buffered formalin and stained with hematoxylin-eosin for light microscopic evaluation and for pathologic assessment . The duration of observation after liver biopsy was at least 6h for each patient. If patients had moderate abdominal pain due to liver biopsy, they were given analgesics such as acetaminophen, bucinnazine or pethidine.

RESULTS

All patients had prothrombin times not exceeding the control value by $>3-5$ sec, and bleeding time prolongation less than 10min. Although 147 patients (37.5%) with thrombocytopenia (platelet count of 145 cases $<100\times10^3/mm^3$, of 2 cases $<50\times10^3/mm^3$); we identified no major procedure related complications. Abdominal discomfort and pain was the only reported adverse effect of liver biopsy (10.97%); 6 patients with abdominal pain took acetaminophen, and 3 patients required bucinnazine, 2 patients received pethidine. There was no patient with bleeding, hypotension and subcutaneous seeding of cancer after percutaneous needle biopsy.

Biopsy provided enough tissue for histological diagnosis in 100% of cases. Postbiopsy pathology revealed 297 (75.76%) primary liver tumors (267 hepatocellular and 26 cholangiocellular carcinomas), 79 (20.15%) secondary malignant tumors, 2 (0.51%) non-Hodgkin's lymphoma, 10 (2.55%) cases of focal nodular hyperplasia, 2 (0.51%) cases of chronic inflammation, 1 tuberculosis case (0.26%) and 1 schistomiasis case (0.26%) (Table 1).

Table 1 The accuracy of liver biopsies in 392 patients with liver masses

Diseases	Postbiopsy diagnosis(Num.)	Final diagnosis(Num.)
Primary liver tumors		
Hepatocellular	267	271
Cholangiocellular	30	30
Secondary malignant tumors		
Metastatic gastric cancers	24	24
Metastatic pancreatic carcinomas	17	17
Metastatic colon cancers	16	16
Metastatic lung cancers	11	11
Metastatic esophageous cancers	6	6
Metastatic rectal cancers	3	3
Metastatic ovary cancers	2	2
Non-Hodgkin's lymphoma	2	2
Benign diseases		
Focal nodular hyperplasia	10	6
Chronic inflammation	2	2
Tuberculosis	1	1
Schistosomiasis	1	1

Through closely following up, 4 of 10 focal nodular hyperplasia cases were diagnosed as primary liver cancer within 6 to 12 months. Thus, there were 378 true-malignant and biopsy-malignant lesions, 4 true-malignant but biopsy-malignant lesions, zero true-benign but biopsy-malignant lesions, and 10 true-benign and biopsy-benign lesions. The diagnostic discriminating of percutaneous biopsy in diagnosing malignant tumors in the present series of liver lesions was as follows: sensibility and specificity of Ultra-Cut biopsy was 98.95% and 100% for the diagnosis of malignancy respectively; positive predictive value, 100% (378 of 378 cases); negative predictive value, 71.43% (10 of 14 cases); and accuracy, 98.98% (388 of 392 cases).

DISCUSSION

This report summarized the experience of Ultra-Cut Biopsy guided by ultrasonography for 392 clinical cases with liver lesion. All patients should have ultrasonography before a liver biopsy to identify asymptomatic mass lesions and to define the anatomy of the liver with the relative positions of the gallbladder, lungs, and kidneys. We routinely used ultrasonography to mark the site for percutaneous biopsy. Ultrasound guidance when performing liver biopsies could avoid major structures including gallbladder, lung (most often a sliver of pleura), large vessels and bowel.

In order to decrease the complications caused by percutaneous biopsy, certain criteria must be considered in selecting the appropriate site for liver biopsy. These included suitable training of operators and appropriate care after the procedure. Contraindications included uncooperative patient, history of unexplained bleeding (PT$\geqslant$3 - 5 sec more than control, platelet count $<$ 50 000/mm^3, prolonged bleeding time$\geqslant$10min, use of nonsteroidal antiinflammatory drug within previous 7 - 10 days), blood for transfusion unavailable, suspected hemangioma and other vascular tumor, inability to identify an appropriate site for biopsy by ultrasonography, suspected echinococcal cysts in the liver (Brown et al., 2000).

Physician judgment was required if we considered liver biopsy for patients with bleeding disorders, or taking anti-coagulant medications. Monitoring after percutaneous liver biopsy was vitally important in the early recognition of complications because at least 60% of complications occurred 1 - 3 hours soon after the procedure was completed. We believed that observation and monitoring of patients and a rapid diagnostic evaluation by ultrasonography or CT of any suspected complications were an integral part of the procedure. It was a routine practice at our institution to keep the patients at bed rest overnight after biopsy for observation. Although the liver had a rich vascular supply, complications associated with percutaneous liver biopsy were rare, these included pain requiring hospital admissions (15%), failure to obtain tissue (2%), bleeding requiring transfusion (0.3%), bleeding requiring surgery (0.04%), pneumothorax requiring treatment (0.35%), and obtaining tissue other than liver (0.5%). Approximately 1 to 3 percent of patients required hospitalization for complications after liver biopsy (Janes et al., 1993; Piccinino et al., 1986). In our practice, patients who complained of pain during or immediately after liver biopsy guided by ultrasonography were promptly given analgesics. The choices of drug (acetaminophen, bucinnazine, pethidine, etc.) and dosage were based on the patient's body weight and clinical condition. Complications were dealt with in consultation with the referring clinician.

Ultra-Cut needle could get enough tissue for pathologic diagnosis (Mladinich et al., 1992). On some occasions, more than one pass was required to get a specimen of adequate core size or a sample adequate for immunohistochemistry. Although biopsy provided histological diagnosis in 100% of cases, sensibility and specificity of Ultra-Cut biopsy was 98.95% and 100% for the diagnosis of malignancy respectively in this study, we found eventually that 4 of 10 focal nodular hyperplasia cases were diagnosed as primary liver cancers within 6 to 12 months. Percutaneous biopsy under ultrasonography guidance was highly accurate in providing a definitive

histological diagnosis of malignant neoplasms for small hepatic lesions (≤1cm) if measures for ensuring precise and effective lesion sampling are taken (Yu et al., 2001), but we still suggested that every patient should be followed up closely every 3 months by routine examination and AFP test if postbiopsy diagnosis was focal nodular hyperplasia and abdominal ultrasonography and CT scan showed single or multiple small nodules (less than 1cm in diameter) in the liver.

CONCLUSIONS

Ultrasonography was useful for marking the site for percutaneous biopsy, Ultra-Cut liver biopsy was a safe and effective technique, and was also invaluable in the investigation and management of patients with liver lesions.

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