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EVALUATION OF SAFETY OF ULTRASOUND-GUIDED ASPIRATIONS AND FINE NEEDLE ASPIRATION BIOPSIES

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ABSTRACT

Objective: To evaluate the safety of ultrasound-guided aspiration and fine needle aspiration biopsies.

Study Design: An observational study.

Place and Duration of Study: The study was carried out in radiology department of Combined Military Hospital Kharian from Oct 2001 to Nov 2003.

Patients and Methods: A total of 143 ultrasound-guided procedures (106 aspirations and 37 FNAB) were performed in patients of both sexes and different age groups. Caliber of needle was decided according to type of procedure and nature of lesion. Most of Fine Needle Aspiration Biopsies (FNAB) were done with 22G needles. Cyst aspirations were performed using 20G to 22G needles. Abscess aspirations were done with 16G to 20G needles.

Results: No immediate or late complications were observed in any FNAB. In one patient of liver abscess, intra-abscess haemorrhage occurred during aspiration with 16G needle. All other aspirations were unremarkable. Complication rate was found to be 0.7%.

Conclusion: Ultrasound-guided aspirations and FNAB are safe procedures when optimum needle gauge and proper needle guidance technique is used.

Keywords: Ultrasound-guided, aspiration FNAB, complications, needle gauge

INTRODUCTION

Ultrasound is considered to be one of the most important discoveries of the twentieth century, which has revolutionized the field of diagnostic imaging. Interventional ultrasound is described as the use of ultrasound to guide needles into patient for various diagnostic and therapeutic purposes. Diagnostic uses include biopsy of solid and complex masses while therapeutic procedures encompass aspiration of fluid-containing masses (cysts and abscesses) and organ systems such as urinary or biliary tracts. The potential for ultrasonic needle guidance was recognized in the early days of ultrasound imaging and specialized interventional procedures became available in many advanced radiology centers [1]. It is the ability of ultrasound to give multi-sectional imaging of the abdominal and other viscera that makes possible its application to puncture guidance. Other imaging modalities that compete with ultrasound for this role are computed tomography, fluoroscopy and MRI. However the advantages of ultrasound like multi-sectional imaging, use of non-ionizing radiation, low cost and ready availability ensure that ultrasound is first choice method for needle guidance in most centers [2].

Complications of ultrasound-guided procedures have been quite worrying and source of apprehension for radiologists. Long

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lists of complication have been mentioned in the literature like bleeding, local infection, pneumothorax, perforation, bile leakage, peritonitis, and tumor seeding of biopsy tract [3,4]. However use of fine needles (20G and smaller) and proper image-guidance has made interventional procedures quite safe and there is little chance of complications in expert hands [5]. Complications of ultra-sound-guided procedures depend upon nature, size and depth of lesion, caliber of needle used, general condition of patient, quality of ultrasound equipment and experience of radiologist [6].

Purpose of this study is to alleviate the apprehension regarding complications of ultrasound-guided interventional procedures and to evaluate the safety of ultrasound-guided aspirations and FNAB.

PATIENTS AND METHODS

This study was carried out in radiology department Combined Military Hospital Kharian which is a 600-bedded hospital. This study was an observational and prospective study. Radiology department of Combined Military Hospital Kharian is equipped with Aloka ultrasound machine SSD 5500 having colour Doppler facility and 6 probes of various frequencies. LP needles of all calibers (25G to 16G), syringes of different sizes and emergency drugs are available in ultrasound room. Duration of study was two years (Oct 2001 to Nov 2003). During period of study 175 patients were referred from Out Paitent Departments (OPDs) and wards for interventional procedures (aspirations and FNAB). Exclusion criterion was devised and interventional procedures were not performed in patients with deranged coagulation profile, lack of safe needle access route, ascites (moderate to severe) and uncooperative patients. Aspirations and FNAB were performed in 143 patients and 32 patients were excluded due to contraindications mentioned in exclusion criterion. Out of 143 cases 116 were indoor patients and 27 were referred from OPD. After interventional procedure 20 out door patients were admitted for observation.

Whole procedure, its advantages and risks were thoroughly explained to each patient and consent was taken. I/V line were secured before all major interventional procedures. Lesion was localized and marked by ultrasound. 5ml local anaesthetic agent lignocarine) was injected prior to insertion of LP needle. Most of FNAB were done with 22G needle. However 23G needle was also used in high risk cases (i.e pulmonary lesion FNAB). Biopsy tissue was spread on 4 – 10 slides (depending upon quantity of tissue). Half of slides were put in alcohol and the other half were kept dry. All slides were sent to histopathlogy department soon after completion of procedure. For aspirations, gauge of LP needle was decided according to nature and thickness of fluid. Abscesses were aspirated with 16 to 20G needles depending upon thickness of pus. Cysts were aspirated mainly with 20G to 22G needles. Fluid from cyst and pus from abscess was sent to laboratory for routine examination and culture/sensitivity.

Protocol for Monitoring Complication

Haemorrhage is the most common and serious complication which can occur during or after aspirations or FNAB. Pneumothorax is another important complication which may occur after FNAB/aspiration of thoracic lesion. Haemorrhage during procedure was monitored by clinical features like pain at site of needle puncture, dizziness, sweating, weakening of pulse or drop in blood pressure. During aspiration, ultrasound of the collection was performed to see signs of haemorrhage. At the end of procedure (aspiration and FNAB) ultrasound examination was again done for sonographic evidence of haemorrhage. After interventional procedure, first 24 hours (especially first 2 hours) are important because haemorrhage mostly occurs during this period. Most of the patients in our study were admitted cases and they were closely

watched for signs and symptoms of haemorrhage during first 24 hours in the wards.

Outdoor cases after major interventional procedures were admitted for observation. OPD patients after minor procedures (i.e diagnostic aspiration of ascitic or pleural fluid) were observed for 1 – 2 hours in radiology department. Then these patients were sent home with advice to come back if they develop clinical features of complications (i.e severe pain, dizziness etc). Ultrasound examination was repeated in all patients (indoor and outdoor) after 24 hours to look for any sonographic evidence of complications like haemorrhage. X-Ray chest was done soon after all invasive procedures of chest to rule out pneumothorax.

STATISTICAL ANALYSIS

Data was entered in SPSS version 10.0 analyzed using percentages rates.

RESULTS

A total of 143 ultrasound-guided procedures (106 aspirations and 37 FNAB) were done during two years period from Oct 2001 to Nov 2003. There were 87 males and 56 females. Age of the patient ranged from 6 months to 80 years. 3 Aspirations and 4 FNAB were not successful.

FNAB

Thirty-seven ultrasound-guided FNAB were done mostly with 22G needles. In three patients 23G needle was used to minimize the risk of complications. Detail of FNAB is given in Table I. No immediate or late complication was observed in all these patients.

Aspirations

Variety of fluid aspirations were done under ultrasound-guidance including abscesses, simple cysts, pleural and peritoneal fluid collections, pancreatic pseudocysts, haematomas, bilomas and seromas (table-2). Abscesses were aspirated using 16 G to 20 G needles. Other fluid collections including cysts of various types were aspirated with 20 G to 23 G needles. Pleural and peritoneal fluid aspirations were done mostly for diagnostic purposes and were performed in those patients where fluid was small in amount and aspiration without ultrasound guidance was likely to be unsuccessful. In some patients pleural and peritoneal fluid was aspirated to characterize the nature of fluid (like blood, pus etc). A total of 106 ultrasound-guided aspirations were performed. One patient of liver abscess developed intra-abscess haemorrhage during aspiration, due to sudden movement of patient. Patient became drowsy and developed hypotension. Procedure was immediately terminated and patient was shifted to Intensive Care Unit. Patient became alright next day and ultrasound examination revealed haemorrhage limited to abscess cavity only. No complication (immediate or late) occurred in all other 105 aspirations.

So out of 143 ultrasound-guided interventional procedures only one patient of liver abscess developed intra-abscess haemorrhage. Percentage of complications in our study was 0.7%.

DISCUSSION

Ultrasound-guided interventional procedures have emerged as one of the most significant advances in radiology during the past two decades. FNAB is now widely accepted technique to establish the identity of masses detected in almost any location in the body [7]. Aspirations are performed for diagnostic as well as therapeutic purposes, resulting in better management of patients. However due to invasiveness, complications may occur during or after interventional procedure. Haemorrhage is the most common and serious complication [8]. Reported incidence of complications ranges from 0 to 10 % depending upon nature of lesion and type of needle used [9]. Majority of complications

(60%) occur in first 2 hours and 96% occur during first 24 hours, following procedures [10]. In one large study incidence of intraperitoneal hemorrhage was found to be 0.03 to 0.7 % following percutaneous liver biopsy [8]. In a multicentric study of 10766 ultrasound-guided FNAB of various abdominal organs, morbidity was 0.18% [11].

Complications of interventional procedures (aspirations and FNAB) are influenced by many factors. Most important factors are needle guage and guidance approach. LP needles are available from 14G to 25G. Larger is the gauge, thinner is the needle. So less complication are expected with fine needles (20G to 25G). One study showed complication rate of 0.3% with use of 21G needle and 3% with 15G needle [12]. Second important factor is size, site and depth of lesion. There are more chances of complications during FNAB of small, deep-seated lesion close to major vessel as compared to large superficial lesion away form vascular structures [13]. General condition and cooperation of the patient significantly affect the complication rate. Chances of complication in young, cooperative patient with stable vital signs are much less than in old, debilitated patient who is haemodynamically unstable. Experience of radiologist and quality of equipment are two vital factors which affect needle guidance. If proper needle guidance teachnique is used there is little chance of complications [6,14]. In our study, most of FNAB were performed with 22 G needle and there was no complication. Abscesses were aspirated with 16G to 20G needles and one patient developed intra-abscess haemorrhage during procedure. No complication occurred in aspiration of cysts and other fluid collections where we used 20 G to 22G needles. So out of 143 aspirations and FNAB, only one patient developed complication. This low percentage of complications (0.7%) in our study is attributed to careful selection of needle, proper ultrasound guidance technique and highly sophisticated ultrasound equipment.

Table-1: Ultrasound-guided fine needle aspiration biopsies.

Site of mass/lesion	No.
Liver Masses	12
Abdominal Masses	7
Renal Masses	6
Neck Masses	4
Pelvic Masses	2
Rib Lesions	2
Lung Mass	1
Mass in the calf	1
Mass in gluteal region	1
Mass in anterior abdominal wall.	1
Total	**37**

Table-2: Ultrasound-guided aspirations.

Abscesses	
Liver	22
Chest (Empyema)	7
Abdominal	3
Subphrenic	3
Anterior Abdominal Wall	3
Psoas	3
Thigh	1
Inguinal	1
Scrotal	1
Pelvic	1
Chest wall	1
Paraspinal (neck)	1
Intracranial (Infant)	1
Cysts	
Ovarian	6
Renal	3
Neck	2
Pleural Fluid Aspirations	
(Free and loculated)	24
Peritoneal Fluid Aspirations	
(Diagnostic)	18
Haematomas	2
Pseudopancreatic Cyst	1
Biloma	1
Seroma	1
Total	**106**

CONCLUSION

Ultrasound-guided aspirations and FNAB are quite safe procedures. These should be routinely performed whenever needed to help the clinicians in diagnosis and treatment of patients. However complications depend upon caliber of the needle, nature of the lesion, guidance approach used general condition and cooperation of the patient, quality of equipment and experience of radiologist.

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