Ultrasound guided fine needle aspiration using 25G needle as a new technique for a wide range of pathological conditions

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ABSTRACT

Objective: This study is to report on the use of 25 gauge (G) needle in ultrasound (US) guided fine needle aspiration (FNA), as a new technique for a wide range of pathological conditions, and to assess the yield of positive tissue material and the complications compared to those reported in the literature using larger needles.

Methods: One hundred and seventy-two patients presented consecutively at King Saud University Teaching Hospitals, Kingdom of Saudi Arabia, during the period 2000 to 2002, with various pathological conditions, underwent US guided FNA using 25G needle. The adequacy of the tissue obtained, and the pathological outcome were tabulated. The patients were discharged in the same day and followed for 4-6 weeks for complications.

Results: Adequate tissue was obtained from 165 (96%) patients. Seven (4.1%) patients had to be examined twice, to obtain a sufficient sample. The 172 patients also included 14 patients (8.1%) who had repeated procedure on the request of the clinician, who needed confirmation of the pathological diagnosis. Adequate sampling was obtained in the first attempt in 89%, in liver problems, and in other regions, and 86.8% in lung problems. The percentages of diagnostic categories revealed by the cytological analysis are similar to those obtained by other larger fine needles.

Conclusion: No complications have been encountered. The technique can safely be repeated if the amount is inadequate or diagnosis is inconclusive, to reach 100% correct sampling. The results of positive findings are comparable to other studies using larger needles. The use of 25G needle is recommended for use under ultrasound guidance.

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Needle biopsy or aspiration is a well tried, and time tested procedure in use for many years with first reports of fine needle aspiration (FNA) from Scandinavia.[1] The decision to use a large or a skinny needle is based on the type of information needed from the pathological sample.[2] Using a large needle requires pertinent laboratory, clinical and anatomical information in addition to history of medication. The cost benefits of FNA have been reported from both developing[3-5] and developed[6,7] countries. With ultrasound (US) guided technique the pathological lesion is visualized in real time, accurately localized, and satisfactorily diagnosed with minimum cost,[4,8,9] The procedure is known to be safe, can be carried out as an outpatient with only 1-2 hours observation, and fewer complications[4,5,8,10,11] than with larger needles. These included pneumothorax, hemorrhage, infections.[4,5] Major complication rate reached 1% in one study.[11] Large needles are typically 14-19 gauge(G), while fine needles are typically 20-22G.[2] This is a report of the results of US-guided FNA using even a smaller needle (25G) to further minimize hospital

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stay and complications and the effect of such size on the yield of adequate material for diagnosis. With US guidance, this technique has not been attempted before, as far as we are aware of the literature.

Methods. One hundred and seventy-two individuals, presented consecutively, at King Saud University Teaching Hospitals, where the author works, during the period 2000 through to 2002, with masses at different sites in their body, were included for US guided FNA using spinal needle 25 G (25Gx3.5 in.: Terumo, Tokyo, Japan). The study has been carried out during the years 2000 and 2001. The procedure was the same as in our previous study.[4] Informed consent has been obtained and filed in the hospital documents. The site of needle penetration was sterilized with 70% alcohol. The transducer was sterilized with iodine solution. In addition, sterilized acoustic coupling gel was also used. The surface marking of the underlying lesion was inked on skin and 2ml of 2% lignocaine were infiltrated sub-cutaneously with 5 ml disposable syringe into the area. The 2% lignocaine was preferred, since it improves patient confidence, causes relatively no pain and permits repeated needle passage if necessary without any discomfort. The needle was inserted vertically and angled in a fan like manner throughout the lesion, using hand free technique. Simultaneously minimum suction was applied to the plunger of the syringe while the needle was being moved. Suction was terminated before needle was withdrawn. The syringe was immediately sent for cytological examination. After removing the needle the site was dressed with antiseptic cream. The specimens were immediately examined by pathologist. If an adequate specimen was not obtained, another pass can be made for a maximum of 3-4 passes. The patients were sent home within 8-hours of the procedure. The follow up was carried out in the outpatient's clinic and non reporters were contacted to assess any late complications of the procedure. The patients have been followed up for confirmation of diagnostic outcome and management choices.

Results. There were a total of 172 cases comprising of 105 (61%) males and 68 (39%) females. Their ages ranged from 5 months to 90 years, with a median of 48.33-years. A wide range of pathological conditions has been diagnosed during the specified period. In 7 patients (4.1%) the specimens obtained contained inadequate material, and had to be repeated, US guided FNA allowed obtaining adequate material for all patients in the repetition. In 14 other patients (8.1%) FNA repetition has been carried out on the request of the clinicians who were not convinced with the pathological findings. The initial diagnosis has been

Table 1 - Various liver pathology diagnosed by ultrasound-guided 5G in 44 cases.

Pathology	First attempt	Second attempt	Total (%)
Normal	3	0	**3**
Benign lesions			
Adenoma	4	0	**4**
Hepatitis	5	0	**5**
Biliary obstruction (stasis)	3	0	**3**
Cyst/abscess	2	0	**2**
Granulomatous inflammation	3	1	**4**
Others	1	2	**3**
Malignant lesions			
Hepatocellular carcinoma	14 (87.5)	2 (12.5)	**16 (100)**
Adeno (cholangio) carcinoma	2	0	**2**
Metastasis	2	0	**2**
Total (%)	**39 (89)**	5 (11)	**44 (100)**

Table 2 - Lung pathology diagnosed by ultrasound-guided 25G fine needle aspiration in 29 cases.

Pathology	First attempt	Second attempt	Total (%)
Benign lesions			
Acute inflammatory reaction/pneumonia	5	1	**6**
Adenoma	1	0	**1**
Cyst/abscess	2	0	**2**
Granulomatous inflammation	3	1	**4**
Others	2	1	**3**
Malignant lesions			
Non-small cell carcinoma	5	1	**6**
Bronchoalveolar	1	0	**1**
carcinoma	3	1	**4**
Lymphoma	1	0	**1**
Metastasis	1	0	**1**
Total (%)	**24 (86.8)**	**5 (14.2)**	**29 (100)**

Table 3 - Other regions with miscellaneous pathology diagnosed by ultrasound-guided 25G fine needle aspiration in 99 cases.

Pathology	First attempt	Second attempt	Total (%)
Normal	3	0	**3**
Abdominal and pelvic masses	16 (84)	3 (16)	**19 (100)**
Spine and paravertebral regions lesions	12 (86)	2 (14)	**14 (100)**
Mediastinal masses	8	1	**9**
Thyroid lesions	6	0	**6**
Renal and adrenal masses	7	1	**8**
Pancreatic masses	5	1	**5**
Retroperitoneal masses	5	0	**5**
Others (pleura, prostate, joints, pleural and other collections)	27	3	**30**
Total (%)	**88 (89)**	**11 (11)**	**99 (100)**

The total abdominal and pelvic lesions (including pancreatic, renal, adrenal, prostatic and retroperitoneal masses) were 38 (22.1%).

Table 4 - Summary to pathological conditions diagnosed by ultrasound-guided 25G fine needle aspiration in 172 cases.

Pathology	n	(%)
Normal tissues	6	(3.5)
Acute inflammatory processes	8	(4.7)
Chronic inflammatory processes	64	(37.2)
Granulomatous	35	
Tuberculous	7	
Non-tuberculous	28	
Non-granulomatous	29	
Benign tumors	17	(9.9)
Malignant	68	
Primary	49	
Metastatic	19	
Others	9	(5.2)
Total	**172**	**(100)**

confirmed as a definitive diagnosis in all these except one case of lung mass, shown in second aspiration to be granulomatous inflammation. In total of 151 (87.8%) of procedures gave adequate material and served conclusive diagnoses. In 21 patients (12.2% of total) one or 2 repetition attempts have to be carried out. Adequate sampling was obtained in 44 liver cases and correct diagnosis has been reached in 39 cases (89%) in the first attempt of FNA **(Table 1)**. Eighty-seven point five percent of cases (14 out of 16) of hepatocellular carcinoma could be detected in the first attempt. Of 29 lung problems, adequate sampling and diagnosis could be reached in 24 cases (86.8%) in the first attempt of FNA **(Table 2)**. In other regions of the body, including abdominal, pelvic, mediastinal, renal, thyroid and retroperitoneal masses, 88 cases (89%) could be sampled and diagnosed in the first attempt **(Table 3)**. In the abdominal and pelvic masses, sampling and diagnosis were accurate in 16 cases (84%), and in 12 cases (86%) in spine and paravertebral regions. Cytological analysis of the aspirated tissues showed that benign and malignant tumors and inflammatory (acute and chronic) conditions were 17 (9.9%), 68 (39.5%) and 64 (37.2%), **(Table 4)**. Six (3.5%) biopsies were normal tissues; all were suspected conditions, with no definite imaging diagnosis. Not a single case of post procedure complication was reported after 4-6-weeks of follow up.

Discussion. In developing countries, where the cost of medical care is escalating to unaffordable limits, safe and quick diagnostic methods, such as ultrasound-guided FNA with a 25G needle, are very much needed. They allow prompt diagnostic decisions, reduce cost due to short post procedure and hospital stay, and cause only insignificant trauma to the patient. The availability of ultrasound in many a district hospital in developing countries, is in favor for such procedures. Even in the developed world, various reviews and clinical trials, carried out internationally, have proven that the cost of ultrasound guided FNA is much lower than the cost of CT guided technique.[7,12] In this study, definitive follow up data were available for all cases. The success of acquiring adequate tissue for cytological diagnosis by US guided FNA was 96 %. In 4% of cases the amount of tissue obtained was inadequate or scanty for diagnosis. Repetition of this safe procedure has allowed correction of this problem in same, next or other day, to achieve 100% sufficient material. This improvement is in contrast to the previous work where success of getting adequate tissue, using endoscopic US guidance (EUS), and essentially was around 73.2%.[9,13] The most common complications of FNA are pneumothorax, hemorrhage and infections, depending upon site. In our study, however, we found no post procedure complications, unlike in the previously reported studies, which also included one death.[4,5,8,10,11,14] This may be due to use of smaller gauge needle in the present study and also the improved training of the junior laboratory staff. The patients were discharged the same day and no complication was observed in patients follow up for a period of 4-6 weeks. Endoscopic US-FNA recorded 4% complications including one death.[11] It has been shown that the use of larger needles is associated with higher percentages of complications, reaching up to 25%.[18] The location of the tissue mass, if near vital organs especially the chest cavity, has a role in the possibility of post-operative complications which become greater compared to other locations in the body. Special care and patience is needed in those regions. The higher percentage of repetition in lung lesions in the present study (14.2%) supports this statement. In the present study acute inflammation cases were 4.7%, chronic inflammation 37.2%, benign tumors 9.9%, malignant tumors 37.2%. This is close to the findings in a similar study,[4] in which 5.1% were acute cases, 32.9% chronic, 8.2% benign tumors and 42.3% malignant tumors, although the study has been confined to solitary pulmonary lesions. In this study we have made an attempt to classify chronic inflammatory tissues into granulomatous and non-granulomatous lesions. It is interesting to note that 20% (7 out of 35) of granulomatous lesions yielded *Mycobacterium tuberculosis* with no apparent signs. Tissue aspiration under US with FNA technique can be used to get tissue sample for culture and help in its diagnosis. Other studies have reported higher cases of tuberculous diagnoses; however, those studies were carried out on cases of lymphadenitis and pulmonary lesions.[5,15,16] Abdominal masses were 17.6% in a study carried out at one center[13] as compared to abdominal and

pelvic masses of 22.1% in this study, suggesting that the safe small needle allows reaching findings similar to those obtained with larger needles. Metastatic cancers occurred in 11% (19 out of 172) in this study lower than the findings[17] at the Anderson Cancer Centre (17%), from a similar number of cases. This can be explained by the fact that the Cancer Center has also a higher malignancy rate 57.5% than in the present study 39.5%. Benign tumors, however, were more in this study 9.9% as compared to their 5.6%. The only technique strongly competing with US guided FNA is CT guided technique. Relevance of US to patients in developing countries has been described above. In addition, the risk of ionizing radiation, as seen in CT guided technique[4,18] is another deterrent, unless the lesion is inaccessible to ultrasound. The use of 25 G needle will make it safer, highly effective with the possibility of repetition, comfortable to patients, and economical to both patients and health systems.[4,19] Many studies have detailed the low cost of FNA[19,20,21] with various methods of calculating the cost. This area, using ultrasound, has to be specifically addressed in our future research in order to influence a positive impact on the health system and policies, in spite of the difficulty of applying similar accounting algorithms to those in Europe and the United States of America.

In conclusion, the US guided FNA using 25G needle proved to be a reliable and safe method for acquiring adequate tissue sample to enable pathologist to distinguish a wide range of inflammatory, benign and malignant lesions. The diagnostic yield is similar to those found in previous studies, using larger needles. Added benefits include the absence of post procedural complications, and only few hours of hospital stay. It is suggested here that 25 G needle should be used in US guided FNA as an initial diagnostic procedures. Studies on the cost of such procedures and their impact on health systems should be addressed in future research, since costing methodologies are not, so far, accurately addressed in this rapidly developing country.

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