

Evaluation of Thyroid Lesions Using Fine Needle Aspiration Cytology

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Background: Discrete thyroid swelling is common clinical presentation with prevalence rate of 4-7% in the general population. Now fine needle aspirate cytology (FNAC) is very important technique *for diagnosis of* thyroid nodules, as it is very simple, safe, less invasive technique.

Objective: To evaluate the diagnostic accuracy of FNAC in Thyroid Nodules.

Patients and Methods: Study carried out on patients who visited the Outpatient Clinic of General Surgery Department, Qena University Hospital complaining of thyroid nodules, in the period from April 2017 to July 2018

Results: Out of the 100 patients 76 were females and 24 males. The age ranged from 11-60 years.

FNAC showed overall diagnostic accuracy of 97.01% with specificity of 98.39 %, sensitivity of 80.00% for malignant lesions, positive predictive value of 80.00% for malignancy and negative predictive value of 98.39%.

Conclusion: FNAC is an invaluable and minimally invasive procedure for pre-operative assessment of patients with a thyroid nodule. FNAC has high sensitivity in picking up malignancy.

Keywords: Fine Needle Aspiration Cytology (FNAC), BETHEDA System, Thyroid, Histopathology

Introduction

Discrete thyroid swelling is common clinical presentation with prevalence rate of 4-7% in the general population. Now fine needle aspirate cytology (FNAC) is very important technique *for diagnosis of* thyroid nodules, as it is very simple, safe, less invasive technique. So FNAC is the first line quick screening test as well as diagnostic tool for triaging surgical and non-surgical goiter (*Bommanahalli et al., 2010*).

Practice guideline set by American Thyroid Association (ATA) and National Comprehensive Cancer Network (NCCN) State that FNA should be used as initial diagnostic test because of its superior diagnostic reliability and cost effectiveness (*Gupta et al., 2010*).

The main objective of FNAC is initial evaluation to distinguish benign nodules from malignant ones. Major load of unnecessary surgery can be avoided by perfection and routine use of FNAC in

solitary thyroid nodules (*Barroeta et al., 2006*).

Limitation of FNAC is mainly because of inadequate sampling, inexperience of the pathologist and overlapping cytological features mainly in samples obtained from hyperplastic nodule and follicular neoplasm (*Jagoi et al., 2005*).

Guidelines using standardized nomenclature for the interpretation of thyroid FNA cytology (FNAC) known as Bethesda system for reporting thyroid cytopathology (BSRTC) was laid down (*Bhartiya et al., 2016*).

The new recommendations included six diagnostic categories for thyroid FNAC; unsatisfactory/nondiagnostic (ND), benign, atypical follicular lesions of undetermined significance (AFLUS), suspicious of follicular neoplasm (SFN), suspicious for malignancy (SM), and malignant (*Bhartiya et al., 2016*).

Patients and Method

This is a prospective comparative study conducted at the Department of Pathology, Qena University Hospital (in the period from April 2017 to July 2018). Study carried out on patients who visited the Outpatient Clinic of General Surgery Department, Qena University Hospital complaining of thyroid nodules

Patients:

This study was conducted on 100 patients. With ages ranging from 11-60 years.

Inclusion criteria:

Any patient who presented clinically with: palpable thyroid nodules or thyroid nodules detected by ultrasonography

Exclusion criteria:

Any patient who has the previous inclusion criteria but she or he refused to participate in this study.

Methods:

Two fingers of the free (left) hand firmly grasp the nodule while the other hand holds 23-gauge needle fitted to a 5ml syringe. The needle is then rapidly inserted through the skin and into the nodule. gentle suction is applied while the needle is moved in and out within the nodule vertically (*Dean and Gharib, 2015*).

as soon as fluid or aspirate appears in the hub of the needle, the suction is released

and the needle is withdrawn (*Dean and Gharib, 2015*).

The appearance of fluid suggests that the nodule is cystic; suction is maintained and all the fluid is aspirated. It is important to release the syringe plunger and remove the vacuum before withdrawing the needle; this allows the aspirate to remain in the needle and not be sucked into the syringe. Next, the needle is detached from the syringe, and 5 mL of air is drawn into the syringe.

The needle is reattached to the syringe, and with the bevel facing down, one drop of aspirated material is forced onto each of several glass slides. It is important that all slides be labeled and placed in order on a nearby table before the aspiration. Smears are prepared by using a second glass slide in a manner similar to that of making blood smears.

The slides for wet fixation should be placed immediately in 95% alcohol for staining with the *Papanicolaou stain* and hematoxylin and eosin stain. For *Giemsa staining*, air-dried smears are necessary, and prepared slides are left unfixed and transported to the laboratory (*Dean and Gharib, 2015*).

Usually 3 to 6 aspirations are made, and some authors suggest at least 6 aspirations. Frequently, 8 to 10 slides are made for each nodule (*Solomon, 1993*).

For cystic lesions, the fluid should be completely aspirated and FNA attempted on residual tissue. Aspirated fluid should be placed in a plastic cup and saved for cytologic evaluation. We use a new needle and syringe for each biopsy (*Solomon, 1993*).

An adequate sample must be taken and in an adequate amount. Criteria proposed for adequacy of thyroid cytology is 5-6 groups of well-preserved follicular epithelial cells with ≥ 10 cell per group, the smear should be technically well prepared, the aspirate should be properly smeared to avoid clotting and lastly smears should be read in clinical context.

Statistical analysis

Data was analyzed using sensitivity, specificity, positive, and negative predictive

values derived from the receiver operating characteristic curve.

True positive (TP): Positive result in the FNA for malignancy and confirmed in the histological study.

False positive (FP): Positive result in the FNA for malignancy but not confirmed in the histological study.

True negative (TN): Negative result in the FNA for malignancy and no carcinoma in the histological study.

False negative (FN): Negative result in the FNA for malignancy but with a carcinoma in the histological study.

Sensitivity (S): Proportion of patients with associated carcinoma and a positive result in the FNA for malignancy, $S = TP / (TP + FN)$.

Specificity (Sp): Proportion of patients without associated carcinoma and with a negative result in the FNA for malignancy, $SP = TN / (TN + FP)$.

Positive predictive value (PPV): Proportion of patients with a positive results and histological confirmation, $PPV = TP / (TP + FP)$.

Negative Predictive value (NPV): Proportion of patients with negative results and without a carcinoma in the histological study, $NPV = TN / (TN + FN)$.

Diagnostic accuracy (DA): Proportion of patients diagnosed correctly by the diagnostic test, $DA = (TP + TN) / (FP + FN + TP + TN)$

Sensitivity, specificity, positive predictive value, negative predictive value and accuracy of FNAC relative to final histological diagnosis were analyzed by SPSS software.

Results

Out of 100 patients 76 were females and 24 males. The age ranged from 11-60 years with the mean age of 41.46 and standered deviation of 12.109 years.

Of the total 100 cases of FNAC, 82 cases were non-neoplastic and 18 cases were neoplastic lesions. Colloid goiter was the most common benign/non-neoplastic thyroid lesion diagnosed in 80 cases. The other benign lesion was thyroiditis in 2 cases. Of the malignant lesions on cytology, follicular neoplasm constituted a total of 13/100 cases, papillary

carcinoma diagnosed in 4 cases and medullary carcinoma in 1 case (Chart -1).

Histopathological diagnosis was available in 80 cases, 72/80 (90%) cases were non- neoplastic and 8 cases were neoplastic lesions. Papillary carcinoma was diagnosed in 4 cases histologically and follicular carcinoma was found in 3 cases, where medullary carcinoma was diagnosed in one case only. (Chart -2).

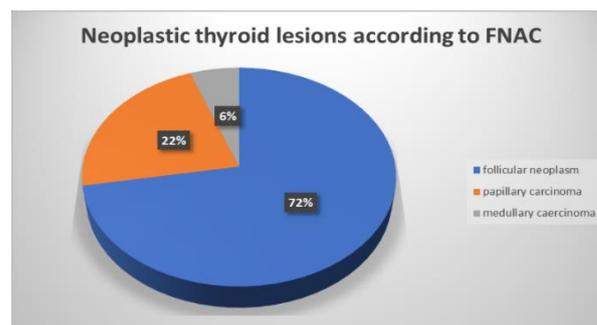


Chart (1): Neoplastic thyroid lesions according to FNAC

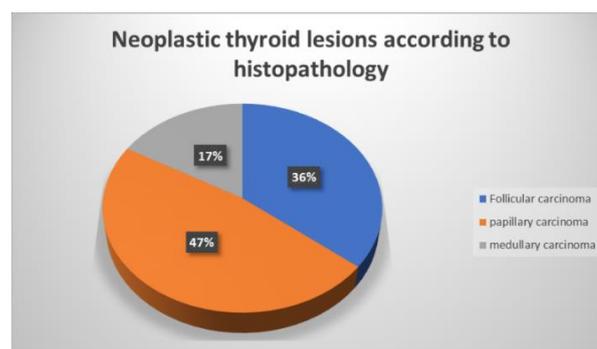


Chart (2): Neoplastic thyroid lesions according to histopathology:

Discussion

The clinical significance of the FNAC is it can define whether a recently emerged thyroid nodule should be managed medically or surgically, and can assist in selecting the appropriate surgical procedure when necessary (Cibas, 2010).

False negative FNAC results occurred in one of our patients. False negative rate in our study was 1.25%. This is also consistent with others in the literature who suggest the same false negative rate in thyroid lesions comparing the results of FNAC with those of histological examination (Gharib and Goellner, 1993).

False positive FNA cytology results are uncommon and were found in only one (1%) patient in this study. This finding is consistent with the study of *Goldstein et al. (2002)*, but in the study of *Gulia et al. (2010)* no False positive result was reported at all.

In the follicular group, 3 cases were found to be malignant, which was due to the limitations of thyroid cytology in distinguishing follicular adenoma from follicular carcinoma. This diagnosis requires detailed histological examination for vascular and capsular invasion and cannot be reliably made on routine FNAC specimens (*Baloch et al., 2002*).

Many papers reporting the diagnostic sensitivities and specificities for thyroid nodules exist in the literature. They showed a wide range of sensitivity (43-100%) and specificity (47-100%) in the study of *Bakhos et al., (2000)*, whereas the sensitivity ranged from 65% to 99% and specificities from 72% to 100% in the study of *Caraway et al., (1993)*.

In our study, the specificity for cytological diagnosis of neoplasia was 98.39%, sensitivity of 80.00%, positive predictive value of 80.00%, negative predictive value of 98.39 % and diagnostic accuracy of 97.01%. The results are comparable with the other studies.

Conclusion

FNA is the most recommended diagnostic procedure for the diagnosis of thyroid lesions since it allows the distinction between benign and malignant lesions and helps to design the treatment plans. Technical procedure for the aspiration and smear preparation is important steps for obtaining suitable smears.

Adequacy of the specimen (must be representative of the lesion), adequate in amount and read in clinical context will reduce false positive numbers. If the cytologic report is malignant, surgery is the recommended procedure; for suspicious lesion, re-aspiration

is required; for benign report no further, immediate diagnostic studies are required.

Hence, FNA is an invaluable tool in the management of thyroid lesions with a high degree of accuracy.

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