Efficacy of Fine Needle Aspiration and Cytology in Solitary Thyroid Nodule

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Authors’ contributions

This work was carried out in collaboration among all authors. Authors SAH and SM designed the study, wrote the protocol and wrote the first draft of the manuscript. Authors MSL and AAL review the literature and guidelines. Author MURL performs the data analysis. All authors read and approved the final manuscript.

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ABSTRACT

Objective: To determine the efficacy of fine needle aspiration and cytology (FNAC) in the solitary thyroid nodules at tertiary care Hospital.

Materials and Methods: This study was conducted in department of general surgery at Liaquat University Hospital Jamshoro/ Hyderabad during one year from June 2015 to May 2016. The study included all subjects of any gender and age who had a solitary nodule that was confirmed clinically or through thyroid scan. To achieve a tissue diagnosis before surgery, the study participants experienced fine needle aspiration cytology (FNAC). The resected specimens were submitted for histopathology investigation postoperatively. Diagnostic accuracy of FNAC was assessed by cross tabulation by taking histopathology as gold standard. The data was gathered by using a self-made proforma and analyzed with SPSS version 20.

Results: Total fifty solitary thyroid nodules (STN) patients were studied. Mean age of the patients was 34.54±10.3 years. Of 50 patients, 46(92%) & 4(8%) were females and males respectively with
1. INTRODUCTION

The Solitary thyroid nodules (STN) is a clinically localized thyroid overgrowth with the remaining gland appearing normal. [1]. The incidence of thyroid nodule is 3-7% by palpation, 20-76% on basis of ultrasound and up to 50% at autopsy [1]. Prevalence also depends on the regional iodine deficiency. It is up to 50% of adults in iodine deficient areas. It is more frequent among females than males. Malignancy is encountered more frequently in solitary nodules than multinodular goiters, with reported higher incidence in childhood STN than in adults. Malignancy occurs in approximately 5% of all the thyroid nodules [1-4]. A detailed history and physical examination may reveal certain risk factors for malignancy, however, they are absent in vast majority of patients [5]. This fact puts the surgeon in the reliance of biochemical, imaging and cytological investigations in the decision making in the STN management [5]. For thyroid nodules' diagnosis, FNAC is regarded as a benchmark diagnostic test. [6]. FNAC is a low-cost procedure, which offers a precise diagnosis quickly and with fewer complications. Depending on cytology results, patients should be followed when there is a benign diagnosis and exposed to surgical procedure when there is a malignant diagnosis, thus reducing the rate of needless surgical procedure. [6]. To diagnose nodular thyroid disorder, fine-needle aspiration biopsies (FNAB) are frequently used. However, particularly in mixed or cystic nodules, the findings of blind FNAB are frequently inconclusive. [7]. Thyroid disorder is very prevalent in Pakistan and an STN poses a great diagnostic challenge for the surgeons treating it. [8]. The purpose of this research was to see how effective fine needle aspiration cytology (FNAC) was in treating solitary thyroid nodule at a tertiary care hospital.

2. MATERIALS AND METHODS

This cross-sectional study took place in Surgery Department of Liaquat University Hospital Jamshoro/ Hyderabad. Study duration was one year from June 2015 may 2016. The study involved all the subjects of any gender and age who had a solitary nodule that was confirmed clinically or through thyroid scan and ultrasound. All study subjects who had diffuse goiter, not fit for G/A, dominant thyroid nodule, and cystic nodules that settled on aspiration have been excluded. Patients who had thyroid swelling and clinical indications for FNAC and subsequent thyroid surgical procedure and were admitted to the wards of Surgery department during the period of study were evaluated for eligibility as per selection criteria. The study's purpose was explained to the study subjects who had solitary nodule, and all the study subjects signed an informed written consent. All patients underwent a clinical examination and complete medical history was taken. Findings were collected on a pretested and predesigned proforma. To establish tissue diagnosis preoperatively, the patients experienced FNAC. Moreover, the study subjects underwent surgical procedure based on their FNAC and clinical diagnoses. The resected specimens were submitted for histopathology inspection postoperatively. The FNAC findings were contrasted with the histopathological findings (a benchmark for diagnosis). Statistical software SPSS version 20 was utilized for analyzing the data.

3. RESULTS

Total 50 patients of solitary thyroid nodules were studied. Patients mean age was 34.54 ± 10.3 years and most of the patients were found in age group of 26-35 years and 36-45 years. Females were most common 92.0% and males were seen only 8.0%. As per presenting complains, swelling
in the thyroids was in 88.0% of the cases, followed by pain was in 8.0% cases and two patients were feeling discomfort, results showed in Table.1.

According to FNAC findings, nodular features were in 66.0% cases, followed by papillary carcinoma was in 10.0% cases and follicular carcinoma was found in 10.0% of the cases, cystic lesions was seen in 4% of the cases, neoplastic cystic lesions were observed in 2% cases and 2.0% cases evaluated with suspicion of malignancy. However as per histological findings, nodular occurrence was in 74% cases, papillary carcinoma was in 14% cases, 45 cases had follicular neoplasm, Hurthle cell changes/Neoplasm was seen in 2% cases, Hashimoto’s thyroiditis was observed in one patient and Follicular adenoma with Hurthle cell changes was also observed in one patient, as showed in Table 2

Diagnostic efficacy of FNAC was observed by taking histopathology as gold standard. FNAC showed sensitivity 83.3%, specificity 86.6% and diagnostic accuracy was 86% with positive predictive value of 66.6% as showed in Table 3.

4. DISCUSSION

Thyroid diseases are a common clinical problem worldwide, and other investigations such as thyroid function, ultrasound, thyroid scan, and antibody levels, are done aiming to select the patients who can be managed conservatively and patients who need surgery.[9] When contrasting the benefits of FNAC for thyroid swelling before surgery with histopathology following surgery to reach a consensual protocol as a simple method for diagnosis and an ideal management of thyroid disorders, FNAC is increasingly becoming a more effective component in decision making before surgery. [9]. In the present study, 50 study subjects with a STN were evaluated for various outcomes and their mean age was 34.54 ± 10.3 years.

In this study most of the patients were females with male to female ratio was 1:11.5. Similarly, Attia R et al [9] reported that the study population was female predominant, represented by 73 (91.25%) patients, with age ranging from 18 to 65 years. On the other hand Kanwar Singh Goel et al [10] also reported that there were 33 (78.57%) female patients and 9 (21.43%) male patients with ratio of female to male patients is 3.67:1.00. Further Kanwar Singh Goel et al [10] reported that Right side (22 patients, 52.38%) was little more involved than left side (16 patients, 38.09%) and was involved in 4 (9.52%) patients, these findings were near to this study.

In this study, Swelling anterior to the neck was the most frequent symptom. Thyroid swelling was present in 44 study subjects. Besides thyroid swellings, 4 patients had pain and 2 had irritation

| Variables                  | Frequency | Percentage |
|----------------------------|-----------|------------|
| Age groups                 |           |            |
| 15-25 years                | 08        | 16.0%      |
| 26-35 years                | 08        | 16.0%      |
| 36-45 years                | 17        | 34.0%      |
| 46-55 years                | 13        | 26.0%      |
| 56-65 years                | 03        | 6.0%       |
| >65                        | 01        | 2.0%       |
| Gender                     |           |            |
| Male                       | 04        | 8.0%       |
| Female                     | 46        | 92.0%      |
| Presenting complains       |           |            |
| Swelling in the thyroid    | 44        | 88.0%      |
| Pain in the swelling       | 04        | 8.0%       |
| Discomfort in the neck     | 02        | 4.0%       |
| Site of swelling           |           |            |
| Right lobe                 | 28        | 56.0%      |
| Left lobe                  | 19        | 38.0%      |
| Isthmus                    | 03        | 6.0%       |

Mean age: 34.54 ± 10.3 years
Table 2. Result of fine needle aspiration cytology and histology n=50

| FNAC findings                      | Frequency | Percentage |
|------------------------------------|-----------|------------|
| Nodular                            | 33        | 66.0%      |
| Papillary Carcinoma                | 05        | 10.0%      |
| Follicular neoplasm                | 05        | 10.0%      |
| Hurthle cell changes/Neoplasm      | 03        | 6.0%       |
| Cystic lesions                     | 02        | 4.0%       |
| Neoplastic cystic lesions          | 01        | 2.0%       |
| Suspected Malignancy               | 01        | 2.0%       |

| Histological findings              |           |            |
|------------------------------------|-----------|------------|
| Nodular                            | 37        | 74.0%      |
| Papillary Carcinoma                | 07        | 14.0%      |
| Follicular neoplasm                | 03        | 6.0%       |
| Hurthle cell changes/Neoplasm      | 01        | 2.0%       |
| Follicular adenoma with Hurthle cell changes | 01 | 2.0% |
| Hashimoto’s thyroiditis            | 01        | 2.0%       |

Table 3. Statistical analysis for benign and malignant lesions in solitary thyroid nodule n=50

| Test being evaluated | Reference standard test |          |
|----------------------|-------------------------|----------|
| (FNAC)               | (Histopathology)        | Negative |
| Positive ± suspicious| A=10                    | B=5      |
| Negative             | C=2                     | D=33     |
| Sensitivity          | \(\frac{a}{(a+c)}\times100=83.3\%\) |
| Specificity          | \(\frac{d}{(b+d)}\times100=86.8\%\) |
| Accuracy             | \(\frac{a+d}{(a+b+c+d)}\times100=86\%\) |
| False positive result| \(\frac{b}{(a+b)}\times100=33.3\%\) |
| False negative result| \(\frac{c}{(c+d)}\times100=5.71\%\) |
| Positive predictive value| \(\frac{a}{(a+b)}\times100=66.6\%\) |
| Negative predictive value| \(\frac{d}{(c+d)}\times100=94.28\%\) |

In their throats. On the other hand Hassan MQ et al [11] reported that there was pain in the nodule (8%) and dysphagia (6%). Bhamre S et al [12] also mentioned that the most common presenting feature was swelling (100%) followed by pain (14.3%) and discomfort (11.4%). Dysphagia was seen in 5.7% cases. Sharma R et al [13] also reported that the common presenting complaint (99.5%) was swelling in thyroid region and associated pain, and discomfort was present in few cases.

In this study FNAC observed to be a highly useful in detecting thyroid malignancies in solitary thyroid nodules with sensitivity of 83.3% and specificity of 86.8%. Which was similar to the results of Surriah MH, et al [14] as the sensitivity of fine needle aspiration cytological diagnosis was found to be 75%, specificity was 100% while efficiency was 98%. However Reza Hemmati H et al [15] also mentioned that The sensitivity and specificity of the FNA were 96.9%, and 81.7% respectively, with the 73.8 % PPV, 98 % NPV, and 86.9% accuracy. Sanjari et al., studied 218 subjects of FNA and found that the cytological findings indicated 57.8% study subjects as benign and 19.7% subjects as malignant, while 20.2 % of study subjects were suspected for malignancy and non-diagnostic cases were 1.4 %. FNA had sensitivity, specificity and accuracy of 72.5%, 83% and 76.5% respectively. Furthermore, their test had 19 % and 24% false negative and false positive rates respectively. Ali FH et al [16] also reported that the sensitivity or true positive rate is 92%, Specificity or true negative rate is 94%, PPV is 72%, NPV is 98%, accuracy rate is 94%. False negative FNA cytology result was found in only one of our patients which is less as compared to other studies where the values range from 1-16%. n the study by Moosa et al. [17], sensitivity was 77.7% and specificity was 98.9%; Abu-Salem revealed 99% specificity and 93% sensitivity; Tariq et al [18] reported 75% sensitivity and 97.6% specificity.
5. CONCLUSION

In the conclusion of this study the FNAC observed to be a highly useful in detecting thyroid malignancies in solitary thyroid nodules with sensitivity of 83.3% and specificity of 86.8%. It is simple, safe, reliable, and remains a powerful diagnostic tool for thyroid lesions.

In this study, Fine needle aspiration cytology was found to be a useful diagnostic option for patients with a STN. It allows clinicians to reach an affective diagnosis in large number of cases with less time and expense, and to prevent needless surgery in many cases. It is secure, simple to use, precise, and low-cost. Learning the aspiration procedure and interpreting the cytological results takes only a small amount of practice. FNAC is an excellent tool for detecting thyroid malignancy in solitary thyroid nodule. The pathologist and clinician would, however, work closely together. It may provide useful information as well as, in the majority of cases, a precise diagnosis. We recommend the clinicians to use this evaluation process in the treatment of patients with solitary thyroid nodules.

CONSENT AND ETHICAL APPROVAL

The research received ethical approval from the Ethical Committee of Liaquat University of Medical and Health Sciences Jamshoro. The purpose of this study was explained to the eligible study subjects who had solitary nodules, and they signed an informed written consent form.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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