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A SOLITARY NODULE THYROID- A CLINICOPATHOLOGICAL CORRELATION

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ABSTRACT

BACKGROUND:Swellings of thyroid are frequently encountered in surgical practice. Clinical evaluation helps in diagnosis but it is difficult to distinguish the early malignant lesions from the more prevalent benign goitres. USG can only differentiate solid from cystic swellings. Surgical excision has been the only means by which precise diagnosis of the swelling could be made based on HPE. An alternative approach other than operative is called for, since most swellings are benign. FNAC is a simpler and safer procedure, carried out in OPD with minimum equipment and has a good patient compliance.This study aims to assess the percentage of solitary thyroid nodule that are truly malignant by post-operative biopsy, and to assess the correlation between FNAC and Biopsy in cases of solitary thyroid nodule.

METHODS:A proforma will be drafted for the study of all patients, who present with palpable thyroid swellings and undergo surgery at this hospital. Clinical presentations, FNAC findings and HPE findings will be documented. Only those patients, whose specimen contains adequate material, will be included for the study. Patients in euthyroid state are included in this study.

RESULTS:150 patients who presented with palpable thyroid swellings during the study period from October 2017 to October 2019 were subjected to fine needle aspiration cytology. Of these 30 turned out to be unsatisfactory, as aspirate consisted non-specific material. Of the remaining 120 cases, 120 patients underwent surgery in this hospital. The histopathological diagnosis was compared withcytological diagnosis in these patients. The majority of the

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patients were in their 3rd, 4th, and 5th decades of life. 107 werefemales and 13 were males, the female to male ratio being 8.2:1.

CONCLUSION:The majority of our patients were in the third to fourth decade of life, females being predominant. The majority of the cases were benign, of which colloid goitre was the most common pathology (55.84%). Among the malignancies, the majority of the cases were papillary carcinomas (77.77%). The sensitivity, specificity and predictive value of positive smears were 73%, 86% and 95.6% respectively. FNAC was of greater help in the preoperative diagnosis of thyroid swellings. colloid goitres were easily diagnosed by FNAC, but confusion prevailed in cases of follicular adenomas. Difficulty was experienced in distinguishing Hashimoto's thyroiditis from hyperplastic nodular goitre. Majority of our patients were from rural areas, who cannot be followed up regularly and for long time, hence clinical suspicion of malignancy should be one of the indications of surgery, in spite of FNAC report being negative. FNAC is simpler, safer, quicker and more informative, compared to other sophisticated investigations in the diagnosis of thyroid lesions. It should be exploited to its maximum benefit on all thyroid swellings.

KEYWORDS: Thyroid swellings; Fine Needle Aspiration Cytology; BiopsyAccuracy; Positive predictive value

INTRODUCTION

Thyroid diseases are frequently encountered endocrine disorders in clinical practice. Majority of these are benign, of which goitre is the commonest. Only a few are malignant. The magnitude of the problem in South East Asia is evident by the recent estimates that 172 million people are affected by goitre in this region, and another 600 million are at risk for developing iodine deficiency disorders.[1]

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In Andhra Pradesh and Telangana, it is more prevalent in Mahbubnagar district and Costal areas. Presence of swelling causes much anxiety and cosmetic embarrassment, especially for females who are affected more than males, in addition to the morbidity associated with hypo or hyperthyroidism.

Clinical evaluation helps in diagnosis but it has limitations. Nevertheless, it is difficult to distinguish the early malignant lesions from the more prevalent benign goitres. A radionuclide scan with radioactive Iodine or Technetium delineates the functional status of nodules, but fails to establish its accurate histological nature of the currently available diagnostic armamentarium.

Ultra- Sonography can only differentiate solid from cystic enlargement. Thus, the distinction between benign and malignant nodule of the thyroid remains relatively unclear, despite the sophisticated tools with which the clinician is equipped today. Surgical excision has been the only means by which a precise diagnosis of the swelling could be made based on Histo-pathological examination, until recently. Since, most of the swelling being benign and some due to cysts and inflammatory lesions, indiscriminate surgery is obviously unjustified. Hence, an alternative approach other than operative is called for.

Fine needle aspiration cytology (FNAC) is a simple and safer procedure, devoid of any serious complications. It can be carried out in the outpatient department or in the laboratory with minimum equipment. It does not require any anaesthesia, has a good patient compliance and results can be known quickly within one hour.

This study aims to assess the percentage of solitary thyroid nodule that are truly malignant by post-operative biopsy, and to assess the correlation between FNAC and Biopsy in cases of solitary thyroid nodule .

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AIMSANDOBJECTIVES

1. Toassessthepercentageofsolitarythyroidnodulethosearetrulymalignantbypost-operativebiopsy.
2. ToassessthecorrelationbetweenFNACandBiopsyincasesofsolitary thyroidnodule.

MATERIALS AND METHODS

Study Setting and Participants

The research was carried out at the SVS Medical College and Hospital, Mahabubnagar, over a period of three years from October 2017 to October 2020. All the patients who presented with solitary thyroid swellings were encompassed in the study, wherein they underwent needle aspiration. The cytological diagnosis derived from this process was later corroborated with the histopathological diagnosis for patients who proceeded to undergo surgery at the aforementioned facility.

Inclusion Criteria

The study included patients who:

1. Presented with a clinically palpable non-toxic solitary thyroid nodule at the SVS Hospital within the study period.
2. Underwent surgery for the aforementioned condition.
3. Were in a euthyroid state at the time of the study.

Exclusion Criteria

Patients were excluded from the study if they:

1. Had clinically diagnosed multi-nodular goitre.

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2. Were diagnosed with toxic nodular goitre.
3. Were unfit or unwilling to undergo surgery.
4. Suffered from co-morbid conditions such as diabetes, cardiac diseases, or renal failure.

Materials Used

For the aspiration procedure, the following materials were employed:

1. A 10cc disposable syringe.
2. A 25G disposable needle.
3. Glass slides measuring 7.5 x 2.5 cm.
4. Fixatives including 95% isopropyl alcohol and ether, along with 2-5 drops of acetaldehyde.
5. Spirit swab for skin sterilization.
6. Stains, specifically:
    - Haematoxylin and Eosin stain (H&E).
    - Papanicolaou stain.

Notably, local anaesthesia was not administered to any patient during the procedure.

Technique of Aspiration

Patients were positioned in a recumbent pose with a pillow placed under their shoulders to facilitate neck hyperextension, limited in older patients to prevent vertebral artery occlusion. The skin was sterilized with an alcohol swab and was infiltrated with a 0.5% lidocaine solution, although some physicians deemed local anaesthesia unnecessary due to comparable discomfort levels between the anaesthesia administration and the procedure itself.

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A 1.5-inch 25G disposable needle, attached to a 10ml disposable syringe, was deemed optimal for the fine needle biopsy due to a balance in flexibility and size, minimizing specimen dilution and excessive bleeding. The needle was inserted perpendicularly into the nodule, stabilized by the opposite hand. Suction was created by withdrawing the plunger, following which the nodule was further stabilized for the remainder of the procedure.

Upon needle retraction, the syringe was detached, aspirated with a few ml of air, reattached, and the air was then expelled to release the specimen onto a glass slide. Suitable specimens comprised of a small amount of red-orange fluid, whereas excessively bloody samples were deemed generally unusable. The samples were then smeared on slides and immediately fixed to retain vital nuclear details for cytologic evaluation, using techniques that encouraged thin, evenly dispersed smears.

Fixation and Staining

The fixation method was chosen in tandem with the staining technique, often involving the use of 95% ethyl alcohol either through immersion or spray, with the latter preferred for its superior cytomorphology and nuclear detail maintenance. The staining process could involve either hematoxylin and eosin or Papanicolaou methods, each offering excellent cytomorphology and nuclear detail, although the latter was favoured for recognizing cytoplasmic differentiation.

Cytological Classification

Specimens were classified into categories based on their cytological features:

1. **Inadequate:** Samples that contained insufficient material for cytological analysis.
2. **Thyroiditis**: Characterized by the presence of lymphocytes, plasma cells, and neutrophils.

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3. **Benign**: Featured epithelial elements showcasing uniform size, shape, and nuclear structure, typically including goitres and adenomas.
4. **Suspicious**: Specimens where epithelial cells exhibited marked cellular alterations indicative of potential malignancy or had abundant but densely clumped cells inhibiting interpretation.
5. **Malignant**: Identified by a large number of non-cohesive epithelial cells with significant variations in size, shape, and nuclear structure, often with irregular and multiple nuclei.

Aiming to establish a precise cytological diagnosis, benign and malignant groups were further subclassified. Cytological evaluations were conducted without any influence from clinical signs or other laboratory investigations, facilitating an unbiased comparison between cytological and histological diagnoses, and validating the role of cytology as a pre-operative diagnostic tool. It was imperative that histological diagnoses were determined without prior knowledge of the cytological attributes of the cases.

RESULTS

In this study, FNAC was administered to 150 patients with thyroid swellings. Following the procedure, 100 patients underwent surgery, providing a substantial base for a correlational study between FNAC and biopsy results.

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Table 1: Overview of FNAC Procedures and Surgical Interventions

Parameter	Number of Cases
Total number of aspirations (FNAC)	150
Number of satisfactory smears	120
Number of unsatisfactory smears	30
Total number of patients who underwent surgery	100

In this research, a total of 150 FNAC procedures were conducted on patients with thyroid swellings. Out of these, 120 procedures produced satisfactory smears, constituting an 80% success rate. Moreover, 100 out of 150 patients underwent surgical interventions post-procedure, indicating a substantial pool for evaluating the correlation between FNAC results and biopsy outcomes.

Table 2: Age Distribution of Patients

Age (yrs)	Number of patients	Percentage (%)
17 - 23	08	6.7
24 - 31	35	29.1
32 - 39	15	12.5
40 - 47	30	25
48 - 55	18	15
56 - 63	08	6.7
64 - 70	06	5
Total	120	100

The majority of the patients were in the age bracket of 24-31 years, representing 29.1% of the cases. This was closely followed by the 40-47 years age group which constituted 25% of the total cases. The least represented age groups were 64-70 years and 17-23 years, each accounting for a small percentage of the total population, indicating a lower incidence of thyroid swellings in these age groups.

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Table 3: Sex Distribution

Sex	Number of patients	Percentage (%)
Male	13	10.84
Female	107	89.16
Total	120	100.00

A significant portion of the patients were females, comprising 89.16% of the total cases. This stark contrast indicates that females are considerably more affected by thyroid swellings compared to males, who constituted only 10.84% of the cases.

Table 4: Distribution Based on Duration of Swelling

Duration of Swelling	Number of Cases	Percentage (%)
< 1 year	28	23.3
1-2 years	51	42.5
2-4 years	32	26.7
> 4 years	9	7.5
Total	120	100

The data reveals that a majority of the patients had a swelling duration between 1-2 years, representing 42.5% of cases. Those with a swelling duration of less than a year constituted 23.3% of the total, indicating that most patients sought medical intervention within the first two years of noticing the swelling.

Table 5: Clinical Diagnosis Based on Swelling Location

Clinical Diagnosis	Number of Cases	Percentage (%)
SNT (L)	53	44.17
SNT (R)	67	55.83
Total	120	100

Swelling predominantly occurred on the right side (SNT (R)) with 55.83% cases, as opposed to the left side (SNT (L)) which accounted for 44.17% cases. This suggests a slightly higher propensity for swellings to occur on the right side.

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Table 6: Diagnosis of Patients Based on FNAC

FNAC Finding	Number of Cases	Percentage (%)
CG	67	55.84
CN	08	6.66
FN	06	5
HT	18	15
PC	21	17.5
Total	120	100

The FNAC findings revealed that the most common diagnosis was CG, accounting for 55.84% of cases. This was followed by PC and HT, with 17.5% and 15% of cases respectively. The findings indicate that CG is the most prevalent condition among patients presenting with thyroid swellings.

Table 7: Types of Surgeries Performed

Type of Surgery	Number of Cases	Percentage (%)
RHT	39	32.5
LHT	34	28.34
STT	30	25
TT	17	14.16
Total	120	100

Among the surgeries performed, RHT was the most common, making up 32.5% of the cases. LHT and STT were also common surgical interventions, constituting 28.34% and 25% of cases respectively. This suggests a varied approach to surgical intervention, with a slight preference towards RHT.

Table 8: Diagnosis of Patients Based on Biopsy (HPE)

Biopsy/HPE Finding	Number of Cases	Percentage (%)
CG	43	35.84
FA	21	17.5
PC	24	20

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Biopsy/HPE Finding	Number of Cases	Percentage (%)
HT	23	19.16
HCA	2	1.66
FC	7	5.83
Total	120	100

Biopsy results illustrated that CG was again the most frequent finding, occurring in 35.84% of cases. However, it was closely followed by HT and PC, representing 19.16% and 20% of cases respectively, pointing to a diverse range of conditions presenting in patients with thyroid swellings.

Table 9: Incidence of Malignancy

Parameters	Number of Cases	Percentage (%)
Malignancy	31	25.84
Benign	89	74.16
Total	120	100

The malignancy incidence was noted to be 25.84%, with benign cases constituting the majority at 74.16%. This indicates a relatively high rate of benign cases in the sample population.

Table 10: Age Wise Distribution of Disease Patterns

Age (Years)	CG	HT	FA	HCA	FC	PC	Total
17-23	5	1	0	0	0	2	8
24-31	16	5	6	0	1	7	35
32-39	4	5	4	0	0	2	15
40-47	12	5	4	1	3	5	30
48-55	4	3	5	1	2	3	18
56-63	4	1	0	0	1	2	8
64-70	1	0	2	0	0	3	6
Total	46	20	21	2	7	24	120
p-value							<0.0001

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A comprehensive analysis of age-wise distribution of disease patterns reveals a diverse representation of diseases across different age groups. The p-value of less than 0.0001 suggests a significant association between age and disease patterns.

Table 11: Comparison of FNAC and Biopsy Results

FNAC	Biopsy/ HPE	CG	HT	FA	HCA	FC	PC	Total
CG		48	2	12	2	0	3	67
HT		0	18	0	0	0	0	18
CN		6	0	1	0	1	0	8
FN		0	0	0	0	6	0	6
PC		0	0	0	0	0	21	21
Total		54	20	13	2	7	24	120

Comparative analysis of FNAC and biopsy results suggests a fairly consistent correlation in diagnosing various conditions, with a few discrepancies noted in the findings.

Table 12: Evaluation of FNAC with Biopsy Results

FNAC	Biopsy	Positive	Negative	Total
Positive		88	4	92
Negative		32	26	58
Total		120	30	150

Sensitivity:truepositive/truepositive+falsepositive=88/120*100=73.33%Specificity:truenegative/falsepositive+truenegative=26/30*100=86.66%

Positivepredictivevalue:truepositive/truepositive+falsepositive=88/92*100=95.6%

Negativepredictive value:true negative/falsenegative +true negative= 26/58*100=44.82%

Percentageoffalsenegatives:falsenegatives/truepositive+falsenegative=32/120*100=26.66%

Percentageoffalsepositives:falsepositive/falsepositive+truenegative=4/30*100=13.33%

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The analysis demonstrated a sensitivity of 73.33% and a specificity of 86.66%, indicating a moderately high accuracy of FNAC in diagnosing thyroid swellings. The positive predictive value was quite high at 95.6%, but the negative predictive value was relatively low at 44.82%.

Discussion

The critical role of diagnostic tools like Fine-Needle Aspiration Cytology (FNAC) in evaluating thyroid swellings has been spotlighted in our current study, offering new perspectives and complementing existing research in this field. Our findings demonstrate the potential of FNAC as a primary diagnostic tool, showcasing a sensitivity of 73.33% and a specificity of 86.66%, a significant advancement in the clinical setting which stands parallel to the study conducted by Rossi et al. (2016) which reported values of 74.6% and 97.2%, respectively[^2^]. This correlation with previous research underscores FNAC's reliability and consistent performance in thyroid swelling diagnosis, aligning with other studies that advocate for FNAC's cost-effectiveness and lesser invasiveness compared to surgical biopsy (Layfield et al., 2011)[^3^].

Moreover, our research indicated a pronounced gender disparity in the prevalence of thyroid swellings, emphasizing a higher vulnerability among females, a fact backed by established studies highlighting the hormonal and autoimmune factors that might contribute to this discrepancy (Hollowell et al., 2002)[^4^]. This aspect necessitates the implementation of gender-focused preventative and management strategies to better tackle the gender-specific prevalence trends noted in thyroid disorders.

The age distribution in our data shed light on the significant representation of certain age groups, accentuating the influence of age on the prevalence of thyroid diseases, a sentiment

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echoed by previous research (Vanderpump et al., 1995)[^5^]. This representation alludes to the necessity for an expansive study to delve deeper into the connection between age and thyroid swellings, aiming to facilitate more targeted interventions in the future.

One interesting aspect our study highlighted was the higher incidence of swellings occurring on the right side, a trend which demands further investigation in subsequent research to provide a comprehensive understanding, given the limited existing literature on the laterality preference in thyroid swellings.

Our pathological results denoted Colloidal Goitre (CG) as the prevailing diagnosis, corroborating with existing literature which indicates a frequent occurrence of this condition in thyroid swellings (Cibas& Ali, 2009)[^6^]. Further, the incidence of malignancy in our study was relatively higher, a phenomenon possibly echoing the geographical and demographic influences highlighted in broader population studies, suggesting the influence of specific regional factors on malignancy rates (Pellegriti et al., 2013)[^7^].

The substantial positive predictive value of 95.6% in our study reinstates FNAC's potential as a reliable diagnostic tool, with several studies backing this efficacy (Polyzos &Anastasilakis, 2010)[^8^]. However, the lower negative predictive value points towards an existing margin for enhancing the accuracy of FNAC, highlighting the need for continual refinement in the procedure to decrease the false-negative rate, thereby fostering more accurate and early diagnoses.

In conclusion, our study reinforces the critical role FNAC plays in the initial evaluation of thyroid swellings, establishing itself as a valuable asset in the clinical sphere despite certain limitations. Future studies should aim to fine-tune this diagnostic technique, assimilating insights from patterns and associations noted in existing studies, promoting an evidence-based approach for continual improvements in patient care.

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CONCLUSION

In conclusion, our study largely encompassed individuals between their third and fourth decades of life, with a significant representation of female participants. A substantial portion of the investigated cases were determined to be benign, with colloid goitre standing out as the most prevalent pathological finding, constituting 55.84% of the cases. When examining malignancies within the study cohort, it was observed that a dominant 77.77% were identified as papillary carcinomas.

The diagnostic efficacy of FNAC was illustrated through notable sensitivity and specificity metrics, observed at 73% and 86% respectively, alongside a high positive predictive value of 95.6%. This signifies the instrumental role FNAC plays in the preoperative diagnostic landscape of thyroid swellings. In particular, FNAC demonstrated a substantial utility in the clear identification of colloid goitres. However, it exhibited certain limitations, notably creating diagnostic dilemmas in cases involving follicular adenomas and in distinguishing Hashimoto's thyroiditis from hyperplastic nodular goitre.

Our study further revealed that a significant number of patients are unable to undergo regular and prolonged follow-up, which amplifies the importance of considering clinical malignancy suspicions as a viable indication for surgery, even in instances where FNAC reports turn out negative. Moreover, our analysis reinforces the notion that FNAC serves as a more straightforward, safer, faster, and information-rich diagnostic tool in comparison to several other sophisticated investigative methods currently utilized for thyroid lesion diagnoses. Consequently, it is incumbent upon healthcare providers to maximize the utilization of FNAC in the evaluation of all thyroid swellings, fostering a more precise and efficient diagnostic approach.

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