

Efficacy of FNAC in diagnosis of neck swelling by comparing with histopathology- A tertiary care based cross-sectional study

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Abstract

Background: A large number of masses may develop in the cervical region. Most common swelling may arise within the thyroid, salivary glands and lymph nodes. These masses are also called swellings, tumours, growths or lumps.¹These cervical lumps could be malignant or benign. Few common cervical masses are thyroid nodules, (e.g-colloid nodule, multinodular goiter, Hashimoto’s thyroiditis, follicular adenomas or carcinomas like papillary and medullary thyroid carcinoma, etc) enlarged lymph nodes, (due to tuberculosis, reactive changes, lymphomas and many lymphoproliferative disorders) and submandibular abscesses (e.g cold abscess). Few tumours also arise from the salivary glands (pleomorphic adenoma, ameloblastoma, Warthin’s tumour, etc).²Thyroglossal cysts, carotid body tumour, cystic hygromas, skin appendage lumps, Castleman’s disease, kimuras disease,

Rosai Dorfman disease etc. are uncommon swellings of the cervical region.

Materials and methods: It is a cross-sectional descriptive study conducted from November 2020 to December 2022 at Department of Pathology in coordination with department of ENT and surgery, MGM Medical College and Hospital, Aurangabad which is a tertiary care centre.

Observations: Maximum cases i.e. 26 (31 %) were from age group 31 to 40 years followed by 22 (26 %) cases from 18 to 30 years, 13 (15 %) cases from 51 to 60 years, 11 (13 %) case each from 41 to 50 &>60 years and only 2 (2 %) patients were of ≤ 18 years age. Female to male ratio was 1:0.35. Thyroid specimens were taken from 58 (68 %) cases, lymph node specimen from 23 (27 %) and submandibular specimens from 4 (5 %) cases. 10 (12 %) malignant cases were diagnosed correctly by FNAC & Histopathology both whereas 63 (74 %) benign

cases were diagnosed correctly by FNAC & Histopathology both. 12 (14 %) cases were diagnosed as benign by FNAC which later found to be malignant on histopathology. Sensitivity, Specificity, Positive predictive value (PPV) and negative predictive value (NPV) was found as 45.45 %, 100 %, 100 % and 84 % respectively.

Conclusion: 10 (12 %) malignant cases were diagnosed correctly by FNAC & Histopathology both whereas 63 (74 %) benign cases were diagnosed correctly by FNAC & Histopathology both.

In our study comparison between FNAC and histopathology in the diagnosis of neck swellings showed Sensitivity, Specificity, Positive predictive value (PPV) and negative predictive value (NPV) of FNAC as 45.45 %, 100 %, 100 % and 84 % respectively. However, the combined use of FNAC and histopathology gives more accuracy for proper diagnosis of neck swelling than FNAC alone.

Keywords: FNAC, Histopathology, Thyroid , Lymph Node, Submandibular Lesions

Introduction

A large number of masses may develop in the cervical region. Most common swelling may arise within the thyroid, salivary glands and lymph nodes. These masses are also called swellings, tumours, growths or lumps.¹These cervical lumps could be malignant or benign. Few common cervical masses are thyroid nodules, (e.g-colloid nodule, multinodular goiter, Hashimoto's thyroiditis, follicular adenomas or carcinomas like papillary and medullary thyroid carcinoma, etc) enlarged lymph nodes, (due to tuberculosis, reactive changes, lymphomas and many lymphoproliferative disorders) and submandibular abscesses (e.g cold abscess). Few tumours also arise

from the salivary glands (pleomorphic adenoma, ameloblastoma, Warthin's tumour, etc).²Thyroglossal cysts, carotid body tumour, cystic hygromas, skin appendage lumps, Castleman's disease, kimuras disease, Rosai Dorfman disease etc. are uncommon swellings of the cervical region.²Fine needle aspiration cytology (FNAC) is an easy, feasible, cost effective and useful diagnostic tool for early diagnosis of malignancies in the cervical region. FNAC can be done in adults as well as in children. It is minimally invasive, safe and quick method for obtaining material and providing diagnosis. It usually does not have any complications. It has no absolute contraindications.³Cervical lymphadenopathy is the most commonly encountered cervical swelling where the lymph nodes measure more than 1cm and can easily be diagnosed by FNAC⁴Fine-needle aspiration cytology (FNAC) also plays an important role in the evaluation of thyroid swellings. majority of thyroid swellings are benign lesions and < 5% are malignant.⁵Although FNAC has high accuracy, there are limitations related- sampling techniques, specimen adequacy, size of swelling, skill of performing the aspiration, accessibility of site and interpretation of aspirate due overlapping cytological features between malignant and benign follicular neoplasm and also in the detection of some papillary carcinomas because of associated thyroid pathology including multinodular goiter, thyrotoxicosis and cystic changes⁶So histopathological examination is needed as it is considered the gold standard diagnostic test. Histopathology examination always plays a vital role and has diagnostic as well as therapeutic importance.^{7,8} Histopathology examination is done on a biopsy specimen which is performed in operation theatre (OT)⁹

Materials and methods

It is a cross-sectional descriptive study conducted from November 2020 to December 2022 at Department of PATHOLOGY in coordination with department of ENT and SURGERY, MGM Medical College and Hospital, Aurangabad which is a tertiary care centre.

FNAC	Histopathology		TOT
	Positive	Negative	
Positive	A	b	a+b
Negative	c	d	c+d
TOT	a+c	b+d	a+b+c+d

$$(a + c) = \frac{Z^2 S(1 - S)}{d^2}$$

$$(a + b + c + d) = P(a + c)$$

Sample Size: Study done by k. rout et al in April 2007 to march 2008, sensitivity was found to be (52.6%) and specificity was (86.6%). This was used for calculation of sample size

Source of Formula : Patrikar S: In Text book of Public Health & Community Medicine, 1st Ed, 2009 Ed. Bhalwar R. Dept of Community Medicine, AFMC, Pune

Statistical Analysis

The collected Data is entered in Microsoft Excel and analysed using SPSS version 24.0th. Mean and SD is calculated for quantitative variables and proportions are calculated for categorical variables. Also, data is represented in form of visual impression like bar-diagram, pie- diagram etc

Methodology: FNAC samples of patients presenting with swelling in the neck region were included in this study and previously diagnosed cases were excluded.

FNAC samples of neck swellings were collected. The slides were fixed in 95% alcohol for Papanicolaou stain. All the surgically resected biopsies were preserved in 10% formalin. All the sections were studied by routine paraffin sectioning and haematoxylin and eosin staining and special staining like ZN stain, PAS and MT will be done if required. Histopathological typing of tumours was done according to tumours will be done. The FNAC results were compared with histopathology results. The sensitivity, specificity, positive predictive value, negative predictive value and accuracy was calculated.

Observation and Results

Table 1: Distribution of Cases according to Age

Sn.	Age group (Years)	Number of cases N	Percentage %
1	≤ 18	2	2%
2	18 to 30	22	26%
3	31 to 40	26	31%
4	41 to 50	11	13%
5	51 to 60	13	15%
6	> 60	11	13%
Total		85	100 %

Table 1 Shown distribution of Cases according to Age. Maximum cases i.e. 26 (31 %) were from age group 31 to 40 years followed by 22 (26 %) cases from 18 to 30 years, 13 (15 %) cases from 51 to 60 years, 11 (13 %) case each from 41 to 50 &>60 years and only 2 (2 %) patients were of ≤ 18 years age

Table 2: Distribution of Cases according to Gender

Sn.	Gender	Number of cases N	Percentage %
1	Male	22	26%
2	Female	63	74%
Total		85	100 %

Table 2 shows distribution of Cases according to Gender. Males were 22 (26 %) and females were 63 (74 %). Female to male ratio was 1:0.35

Table 3: Distribution of Cases according to type of specimen

Sr. No.	Type of specimen	Number of cases N	Percentage %
1	Thyroid	58	68%
2	Lymph Node	23	27%
3	Submandibular	4	5%
Total		85	100 %

Table 3 shows distribution of Cases according to type of specimen. Thyroid specimens were taken from 58 (68 %) cases, lymph node specimen from 23 (27 %) and submandibular specimens from 4 (5 %) cases

Table 4: Distribution of thyroid cases according to FNAC & Histopathology results

Sn.	FNAC results	Histopathology results		Total N (%)
		Malignant N (%)	Benign N (%)	
1	Malignant N (%)	6 (10 %)	0 (0 %)	6 (10 %)
2	Benign N (%)	9 (16 %)	43 (74 %)	52 (90 %)
Total		15 (26 %)	43 (74 %)	58 (100 %)
Sensitivity: 40 %, Specificity: 100 %, PPV: 100 %, NPV: 82.69 %				

Table 4 shows distribution of thyroid Cases according to FNAC & Histopathology results. 6 (10 %) malignant cases were diagnosed correctly by FNAC & Histopathology both whereas 43 (74 %) benign cases were diagnosed correctly by FNAC & Histopathology both. 9 (16 %) cases were diagnosed as benign by FNAC which later found to be malignant on histopathology. Sensitivity, Specificity, Positive predictive value (PPV)

and negative predictive value (NPV) was found as 40 %, 100 %, 100 % and 82.69 % respectively (Graph 1)

Graph 1: Distribution of thyroid Cases according to FNAC & Histopathology results

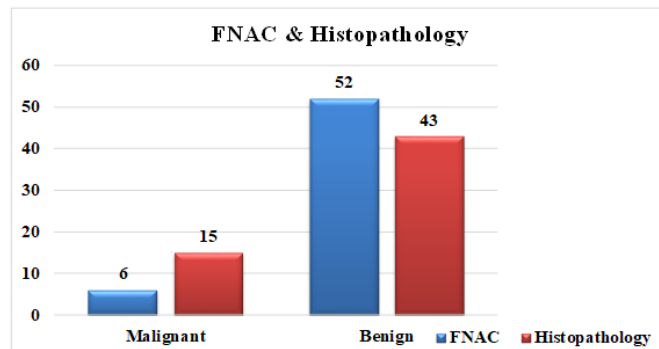


Table 5: Distribution of LN Cases according to FNAC & Histopathology results

Sn.	FNAC results	Histopathology results		Total N (%)
		Malignant N (%)	Benign N (%)	
1	Malignant N (%)	2 (9 %)	0 (0 %)	2 (9 %)
2	Benign N (%)	3 (13 %)	18 (78 %)	21 (91 %)
Total		5 (22 %)	18 (78 %)	23 (100 %)
Sensitivity: 40 %, Specificity: 100 %, PPV: 100 %, NPV: 85.71 %				

Table 5 shows distribution of LN Cases according to FNAC & Histopathology results. 2 (9 %) malignant cases were diagnosed correctly by FNAC & Histopathology both whereas 18 (78 %) benign cases were diagnosed correctly by FNAC & Histopathology both. 3 (13 %) cases were diagnosed as benign by FNAC which later found to be malignant on histopathology. Sensitivity, Specificity, Positive predictive value (PPV) and negative predictive value (NPV) was found as 40 %, 100 %, 100 % and 85.71 % respectively (Graph 2)

Graph 2: Distribution of LN Cases according to FNAC & Histopathology results

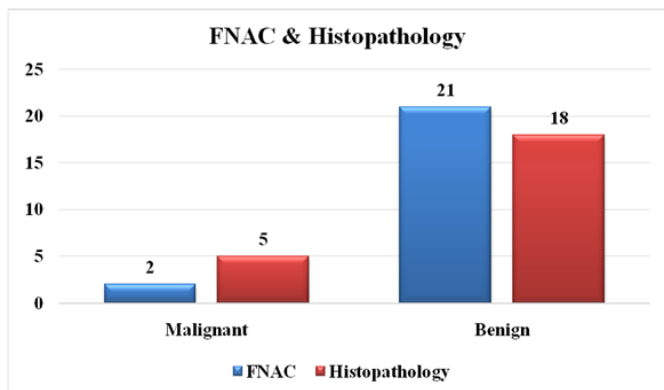


Table 6: Distribution of submandibular Cases according to FNAC & Histopathology results

Sn.	FNAC results	Histopathology results		Total N (%)
		Malignant N (%)	Benign N (%)	
1	Malignant N (%)	2 (50 %)	0 (0 %)	2 (50 %)
4	Benign N (%)	0 (0 %)	2 (50 %)	2 (50 %)
Total		2 (50 %)	2 (50 %)	4 (100 %)

Sensitivity: 100 %, Specificity: 100 %, PPV: 100 %, NPV: 100 %

Table 6 shows distribution of submandibular Cases according to FNAC & Histopathology results. 2 (50 %) malignant cases were diagnosed correctly by FNAC & Histopathology both whereas 2 (50 %) benign cases were diagnosed correctly by FNAC & Histopathology both. 0 (0 %) cases were diagnosed as benign by FNAC which later found to be malignant on histopathology. Sensitivity, Specificity, Positive predictive value (PPV) and negative predictive value (NPV) was found as 100 %, 100 %, 100 % and 100 % respectively (Graph 3).

Graph 3: Distribution of Cases according to FNAC & Histopathology results

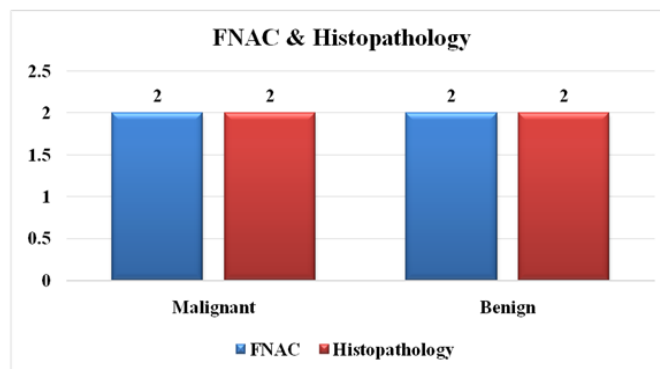


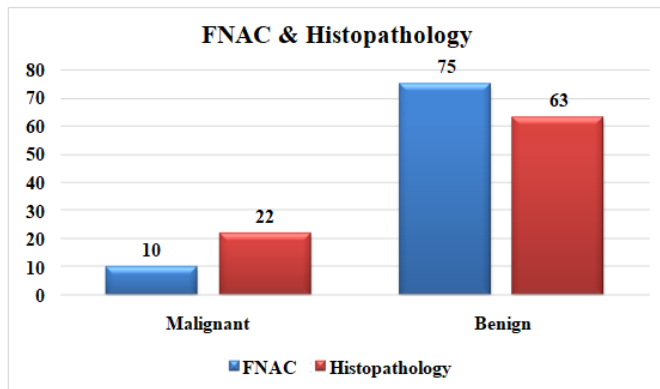
Table 7: Distribution of total Cases according to FNAC & Histopathology results

Sn.	FNAC results	Histopathology results		Total N (%)
		Malignant N (%)	Benign N (%)	
1	Malignant N (%)	10 (12 %)	0 (0 %)	10 (12 %)
2	Benign N (%)	12 (14 %)	63 (74 %)	75 (88 %)
Total		22 (26 %)	63 (74 %)	85 (100 %)

Sensitivity: 45.45 %, Specificity: 100 %, PPV: 100 %, NPV: 84 %

Table 7 shows distribution of Cases according to FNAC & Histopathology results. 10 (12 %) malignant cases were diagnosed correctly by FNAC & Histopathology both whereas 63 (74 %) benign cases were diagnosed correctly by FNAC & Histopathology both. 12 (14 %) cases were diagnosed as benign by FNAC which later found to be malignant on histopathology. Sensitivity, Specificity, Positive predictive value (PPV) and negative predictive value (NPV) was found as 45.45 %, 100 %, 100 % and 84 % respectively (Graph 4)

Graph 4: Distribution of Cases according to FNAC & Histopathology results



Discussion

Different types of neck swellings are widespread in our clinical practice, and clinician frequently faces the clinical issue of evaluating a neck mass. Lymph nodes, the thyroid, and salivary glands are where neck tumours frequently occur. Thyroglossal cysts, branchial cleft cysts, carotid body tumours, cystic hygromas, pharyngeal pouch abnormalities, and lumps of cutaneous appendages are less frequent causes of presenting neck masses. Preoperative evaluation of the nature of these lesions is crucial in order to perform an accurate and successful surgical intervention. Martin and Ellis were the first to use FNAC as a diagnostic technique to assess head and neck swelling in 1930¹⁰. It costs little, is safe, has quick reporting, and needs little equipment. It roughly doubles the surgical yield of carcinoma, reduces the total cost by 25%¹¹, and reduces the number of thyroidectomies performed by around 50 %¹². The location of the oedema and its link to nearby anatomical structures are both disclosed by US-FNAC. It has a number of advantages, including fewer doctor visits, evaluation by a surgeon who is knowledgeable with the architecture of the neck, and maybe shorter wait times for surgery¹². Present study was conducted in 85 neck swelling cases. In all the enrolled cases demographic

details, type of swelling, TI-RADS & Bethesda scoring was evaluated & noted in case report form (CRF). FNAC & histopathology results were compiled & analyzed in all the neck swelling cases

Age distribution

In present study maximum cases i.e. 26 (31 %) were from age group 31 to 40 years followed by 22(26 %) cases from 18to 30years,13 (15%) cases from 51to 60 years,11(13 %) case each from 41 to 50 &>60 years and only 2 (2 %) patients were of ≤ 18 years age.

Yadwinder Kaur Virk et al (2019)¹³ in their study found maximum number of the patients were in age group of 41 to 50 years (24.29%). However, 5.71% of the patients were aged < 18 years and 4.28 % of the patients were aged > 60 years. The mean age was 40.23 ± 15.13 years

Gender distribution

In present study males were 22 (26 %) and females were 63 (74 %). Male to female ratio was 1:0.35. In similar study by **Sangavi A K B et al (2018)¹⁴** out of 100 patients, 36 were males and 64 were females.

Type of specimen

In present study thyroid specimens were 58 (68 %) cases, lymph node specimen were 23 (27%) and submandibular gland specimens were 4 (5 %) cases.

Jain S et al (2021)¹⁵ in their study found most common diagnosis was thyroid swelling (45; 56.25 %), followed by parotid gland swellings (18; 22.50 %), 2 (2.50 %) submandibular glands swelling, and 15(18.75 %) were other neck swellings. In 15, other neck swelling cases most common clinical diagnosis was cervical lymphadenopathy (7;8.75%) followed by cervical swellings (6; 7.50 %) and 1 (1.25 %) was submental swelling, and 1 (1.25 %) was submandibular swelling.

FNAC & Histopathology results

In present study 10 (12 %) malignant cases were diagnosed correctly by FNAC & Histopathology both whereas 63 (74 %) benign cases were diagnosed correctly by FNAC & Histopathology both. 12 (14 %) cases were diagnosed as benign by FNAC which later found to be malignant on histopathology. Sensitivity, Specificity, Positive predictive value (PPV) and negative predictive value (NPV) was found as 45.45 %, 100 %, 100 % and 84 % respectively. **Yadwinder Kaur Virket al (2019)¹³** in their study found based on FNAC, majority of the patients that is 65(92.86 %), had benign lesions while malignant lesions were diagnosed in 5 (7.14 %) patients. In this study histopathological examination revealed benign lesions in 64 (91.43%) of the patients and malignant lesions in 6 (8.57 %) of the patients. FNAC was highly specific (100 %) and had 100 % PPV. With Sensitivity of 83.33%, NPV was 98.46 % and 98.57 % diagnostic accuracy. The preliminary array of modalities for evaluating neck swellings includes FNAC and US-FNAC as they are readily available, straightforward to use, and less invasive. They are crucial in assessing the neck swellings. Given that the frequency of procedures conducted has significantly decreased as a result of FNAC use in recent years, it is the gold standard treatment for evaluating neck swellings. Since it can usually tell the difference between benign and malignant lesions rather clearly before surgery, it is also regarded as the best preoperative screening tool. In our study, the FNAC's sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were determined to be correspondingly 45.45 %, 100 %, 100 %, and 84 %. The differences in the technique used to aspirate the neck swelling and some pitfalls in FNAC of the thyroid,

such as inadequate specimens (quantitative and qualitative), inaccurate specimens (non-homogeneous needle placement), inaccurate cytopathologic interpretation, cysts (difficulties with degenerative nodules), and benign versus malignant follicular lesions, may account for the difference in sensitivity, specificity, and accuracy between our study and others (lymphocytic thyroiditis vs. Lymphoma). Histology provides more architectural information than FNAC, but FNAC can reveal cells from the whole lesion since aspirating allows for many passes through the lesion¹⁵. A quick, easy, and inexpensive technique called fine needle aspiration cytology (FNAC) is typically employed in outpatient clinics to sample superficial neck masses.

Summary & Conclusion

Fine Needle Aspiration Cytology (FNAC) is of great importance in neck swellings because the target sites are easily accessible, patient compliant due to its minimally invasive nature. Present study was conducted in 85 neck swelling cases. FNAC & histopathology results obtained are summarized as-

1. Maximum cases i.e. 26 (31 %) were from age group 31 to 40 years followed by 22 (26%) cases from 18 to 30 years, 13 (15%) cases from 51 to 60 years, 11 (13%) case each from 41 to 50 & >60 years and only 2 (2 %) patients were of ≤ 18 years age
2. Males were 22 (26 %) and females were 63 (74 %). Female to male ratio was 1:0.35
3. Thyroid specimens were 58 (68 %) cases, lymph node were 23 (27 %) and sub-mandibular gland were 4 (5 %) cases
4. 12 (14 %) cases were diagnosed as benign by FNAC which later found to be malignant on histopathology.
5. 9 (16 %) of thyroid cases were diagnosed as benign by FNAC which later found to be malignant on

histopathology. Sensitivity, Specificity, Positive predictive value (PPV) and negative predictive value (NPV) was found as 40 %, 100 %, 100 % and 82.69 % respectively

6. 3 (13 %) of lymph node cases were diagnosed as benign by FNAC which later found to be malignant on histopathology. Sensitivity, Specificity, Positive predictive value (PPV) and negative predictive value (NPV) was found as 40 %, 100 %, 100 % and 85.71 % respectively.

7. 10 (12 %) malignant cases were diagnosed correctly by FNAC & Histopathology both whereas 63 (74 %) benign cases were diagnosed correctly by FNAC & Histopathology both.

In our study comparison between FNAC and histopathology in the diagnosis of neck swellings showed Sensitivity, Specificity, Positive predictive value (PPV) and negative predictive value (NPV) of FNAC as 45.45 %, 100 %, 100 % and 84 % respectively. However, the combined use of FNAC and histopathology gives more accuracy for proper diagnosis of neck swelling than FNAC alone.

Abbreviations: FNAC- fine needle aspiration cytology, PPV- positive predictive value, NPV negative predictive value, LN -lymph node

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