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To study the lesions of anterior triangle of neck in correlation with histopathology and determine the diagnostic accuracy of FNAC

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Abstract: Introduction: Fine Needle Aspiration Cytology (FNAC) is a quick, simple, efficient, and inexpensive way to sample superficial masses in the head and neck due to the wide range of primary as well as metastatic neoplasms and the close proximity of several types of tissues. Due to its minimally invasive nature and easy access to target sites, FNAC has gained popularity and acceptance. Although FNAC cannot provide the same level of morphological detail as histology, it can reveal cells from the whole lesion since aspirating allows for many passes through the lesion. In addition to confirming the existence of metastatic disease, FNAC also offers information on the type and origin of the primary tumor. It provides the added advantage of being an outpatient procedure and lowers the frequency of exploratory procedures. The present study was carried out to study the lesions of the anterior triangle of the neck in correlation with histopathology and determine the diagnostic accuracy of FNAC.

Materials and Methods: This prospective observational study was carried out in the Department of Pathology, MGM Medical College and MYH Hospital, Indore, over a period of 2 years (2013-2015), among 1110 patients of both sexes and all age groups with palpable anterior triangle neck swellings reporting in the Department of Surgery, ENT, Pediatrics, TB, and Cancer hospital, who were referred to Pathology. A detailed clinical history was recorded, and a complete physical examination was carried out. FNAC was performed under all aseptic precautions. Cytological findings from the smears were recorded, and a diagnosis was made. Excisional biopsy specimens received were processed and mounted by DPX. Cytohistopathological correlation was done. Data were collected, compiled, and analyzed using SPSS 22.0 (trial version).

Results: Most participants belonged to the age group of 21-30 years. The male to female ratio was reported to be 1:1.35. A large proportion of lesions (71.08%) were found in lymph nodes, while 22.25% were in the thyroid, and the rest (6.67%) were distributed in various other regions. The majority of the lesions (77.12%) in the anterior triangle of the neck were non-neoplastic (inflammatory) lesions. Among the neoplastic lesions located in the thyroid gland, 13.76% were benign and 1.62% malignant. No benign neoplastic lesions were noted in the lymph node. Rather, 14.57% were malignant. Most lesions (38.66%) in the lymph nodes were classified as tuberculous lymphadenitis, followed by reactive hyperplasia of lymph nodes (15.59%). Thyroiditis was most common (84.62%) among the lesions found in the thyroid gland, followed by colloid goiter (8.10%). The sensitivity and specificity were calculated as 85.50% and 99.23%, respectively.

Conclusion: In addition to being safe and comparatively free of complications, FNAC offers a quick, efficient, and accurate approach to diagnosing lesions, especially of the neck. Consistent results were found between cytological and histological examinations, and hence it works as a useful adjunct to histopathology. It can help to significantly reduce morbidity and mortality by early as well as accurate diagnosis of benign and malignant lesions.

Keywords: FNAC; Cytology; Histopathology; Anterior triangle of neck; Neck swelling.

1. Introduction

In day-to-day clinical practice, palpable lesions of the neck region are frequently encountered among patients of all genders and ages. These lesions may range from inflammatory, non-neoplastic to cancerous lesions originating from various structures such as the thyroid gland, lymph nodes, salivary glands, and soft tissues. Fine Needle Aspiration Cytology (FNAC), a technique first introduced in 1930 by Martin, has gained popularity and acceptance as a quick, simple, efficient, and cost-effective way to sample superficial masses in the head and neck region. The proximity of various types of tissues in this region, as well as the wide range of primary and metastatic neoplasms, makes FNAC an ideal diagnostic tool [1,2].

Early detection of benign versus malignant conditions is important as it significantly impacts the intended course of therapy [3]. In the case of cystic swellings, FNAC can provide both diagnostic and therapeutic benefits [4]. Biopsy of a neck swelling should only be performed if all other diagnostic modalities have failed to provide a diagnosis, making FNAC particularly useful in the assessment of neck masses and nodules [5]. While FNAC cannot provide the same level of morphological detail as histology, it can reveal cells from the entire lesion, as aspirating allows for multiple passes through the mass [6]. In addition to confirming the presence of metastatic disease, FNAC can also provide information on the type and origin of the primary tumor. Furthermore, it offers the added benefit of being an outpatient procedure and can reduce the need for exploratory procedures [1].

The present study aims to investigate the lesions of the anterior triangle of the neck and their correlation with histopathology. Moreover, it seeks to determine the diagnostic accuracy of FNAC in identifying various types of neck masses.

2. Materials and Methods

This observational study was conducted in the Department of Pathology at MGM Medical College and MYH Hospital, Indore, over a 2-year period (2013-2015). A total of 1110 patients of all age groups and genders with palpable anterior triangle neck swellings who were referred to Pathology from the Departments of Surgery, ENT, Pediatrics, TB, and Cancer hospital were included in the study. Patients with suspected head and neck masses of vascular origin, pulsatile swelling, bleeding disorders, and swelling in other parts of the neck were excluded from the study.

A detailed clinical history was recorded, and a complete physical examination was conducted, with significant findings noted. The procedure of fine needle aspiration cytology (FNAC) was explained to the patients, and informed consent was obtained. The swelling was palpated and immobilized with one hand, and a 22/24 gauge needle with a 20cc plastic disposable syringe was inserted into the swelling under aseptic precautions. Aspiration or non-aspiration techniques were used as and when required. The sites included lymph nodes, thyroid, and other regions such as soft tissues and salivary glands. The sample was smeared on a clean, dry microscopy glass slide and prepared according to standard guidelines. Relevant staining was done using Papanicolaou/Haematoxylin-Eosin/special stains. Ziehl-Neelsen staining was used in cases of suspected tubercular lesions. Cytological findings from the smears were recorded, and a diagnosis was made. Medical treatment, biopsy, and surgical intervention were advised depending on the diagnosis. Excisional biopsy specimens received were fixed in 10% neutral buffered formalin, examined grossly, followed by processing with paraffin embedding, section cutting, and stained by Haematoxylin-Eosin, followed by mounting by DPX. Cytohistopathological correlation was done. Data was collected, compiled, and analyzed using SPSS 22.0 (trial version).

3. Results

Table 1 (Figure 1) summarizes the demographic distribution of the 1110 patients studied, out of which 471 (42.43%) were males and 639 (57.57%) were females, resulting in a male to female ratio of 1:1.35. The majority of both males (17.62%) and females (33.96%) belonged to the 21-30 years age group.

Figure 2 illustrates the distribution of lesions in different regions of the anterior triangle of the neck. The study found that the majority of lesions (71.08%) were located in the lymph nodes, 22.25% were in the thyroid gland, and the rest (6.67%) were distributed in various other regions.

Table 2 provides an overview of the histological classification of lesions in the anterior triangle of the neck. The majority of lesions (77.12%) were non-neoplastic (inflammatory) lesions. Among the neoplastic lesions located in the thyroid gland, 13.76% were benign and 1.62% were malignant. No benign neoplastic lesions were noted in the lymph nodes. However, 14.57% of lesions in lymph nodes were malignant, while in 8.75%, the results were inconclusive. Among lesions in other regions, 33.78% were benign, and none were malignant. However, 9.46% were inconclusive.

Table 3 (Figures 3–5) provides a detailed classification of lesions in lymph nodes and other regions. The majority of lesions (38.66%) in the lymph nodes were classified as tuberculous lymphadenitis, followed by reactive hyperplasia of lymph nodes (15.59%) and acute suppurative lymphadenitis (13.18%). Thyroiditis was the most common lesion (84.62%) found in the thyroid gland, followed by colloid goitre (8.10%), thyroglossal cyst and follicular neoplasm (2.02% each). Among lesions in other regions, most were identified as lipoma (35.14%), followed by epidermal inclusion cyst (27.03%) and cystic lesions (13.51%).

Cyto-histopathological correlation was performed in 778 cases, out of which 661 were benign and 117 were malignant. Among the 661 benign lesions, the cytological and histopathological diagnoses were consistent with each other in 642 cases, while it was inconsistent in 19 cases, which showed false negative results. Among the 117 malignant lesions, 112 had consistent cytological and histopathological diagnoses, while the rest 5 showed false positive results. The sensitivity and specificity were calculated as 85.50% and 99.23%, respectively, while the positive and negative predictive values were calculated as 95.73% and 97.13%, respectively. The overall diagnostic accuracy was found to be 96.92%.

Table 1. Distribution of study participants according to age and gender

Age Group	Males	Females
01 - 10	54 (11.46%)	31 (4.85%)
11 - 20	78 (16.56%)	141 (22.07%)
21 - 30	83 (17.62%)	217 (33.96%)
31 - 40	74 (15.71%)	112 (17.53%)
41 - 50	70 (14.86%)	69 (10.80%)
51 - 60	60 (12.74%)	36 (5.63%)
61 - 70	43 (9.13%)	25 (3.91%)
71 - 80	09 (1.91%)	08 (1.25%)
Total	**471 (100%)**	**639 (100%)**

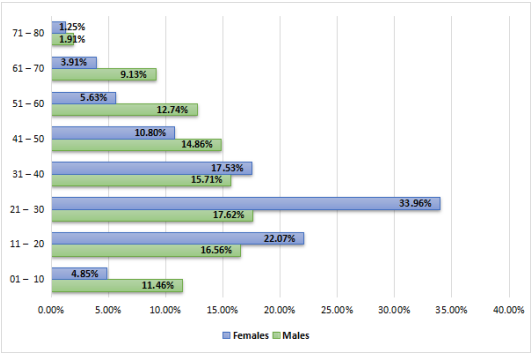

Figure 1. Distribution of study participants according to age and gender

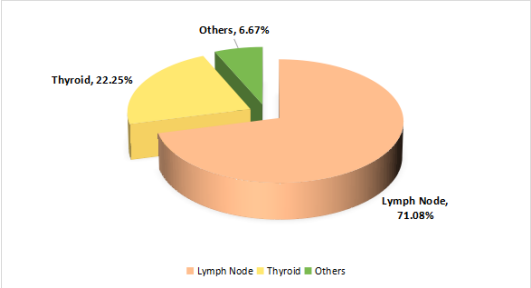

Figure 2. Organ wise distribution of lesions

Table 2. Distribution of study participants based on FNAC results of the lesions

FNAC results	Non Neoplastic	Neoplastic		Inconclusive	Total
Organ	**Inflammatory**	**Benign**	**Malignant**		
Thyroid	209 (84.62%)	34 (13.76%)	04 (1.62%)	00 (0.00%)	247 (100%)
Lymph Node	605 (76.68%)	00 (0.00%)	115 (14.57%)	69 (8.75%)	789 (100%)
Others	42 (56.76%)	25 (33.78%)	00 (0.00%)	07 (9.46%)	74 (100%)
Total	**856 (77.12%)**	**59 (5.31%)**	**119 (10.72%)**	**76 (6.85%)**	**1110 (100%)**

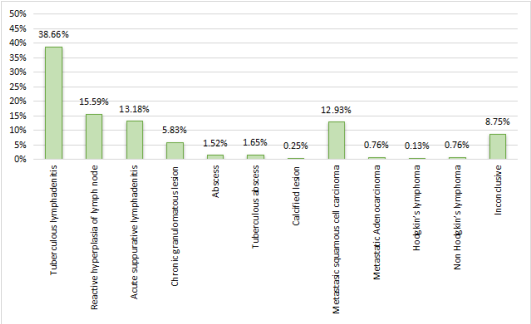

Figure 3. Classification of lymph node lesions

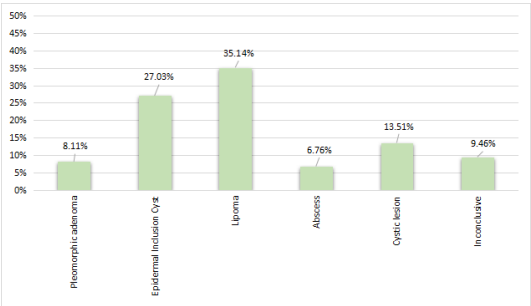

Figure 4. Classification of lesions in other regions

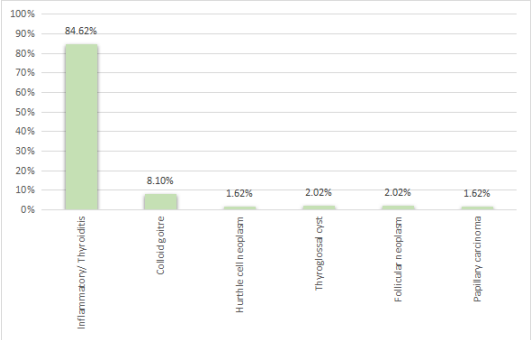

Figure 5. Classification of thyroid lesions

Table 3. Classification of lesions in lymph nodes and other regions

Lymph Node Lesions	**No. of Cases**	**Percentage**
Tuberculous lymphadenitis	305	38.66%
Reactive hyperplasia of lymph node	123	15.59%
Acute suppurative lymphadenitis	104	13.18%
Chronic granulomatous lesion	46	5.83%
Abscess	12	1.52%
Tuberculous abscess	13	1.65%
Calcified lesion	02	0.25%
Metastasic squamous cell carcinoma	102	12.93%
Metastatic Adenocarcinoma	06	0.76%
Hodgkin's lymphoma	01	0.13%
Non-Hodgkin's lymphoma	06	0.76%
Inconclusive	69	8.75%
Total	**789**	**100%**

Thyroid Lesions	**No. of Cases**	**Percentage**
Inflammatory/ Thyroiditis	209	84.62%
Colloid goitre	20	8.10%
Hurthle cell neoplasm	4	1.62%
Thyroglossal cyst	5	2.02%
Follicular neoplasm	5	2.02%
Papillary carcinoma	4	1.62%
Total	**247**	**100%**

Other regions	**No. of Cases**	**Percentage**
Pleomorphic adenoma	06	8.11%
Epidermal Inclusion Cyst	20	27.03%
Lipoma	26	35.14%
Abscess	05	6.76%
Cystic lesion	10	13.51%
Inconclusive	07	9.46%
Total	**74**	**100%**

4. Discussion

In the initial evaluation of patients with a mass in the head and neck region, FNAC serves as a useful diagnostic test.

In the present study, FNAC was carried out in a total of 1110 patients over a period of 2 years. Female preponderance was observed with a male: female ratio of 1: 1.35. Peak incidence was observed in the age group of 21-30 years, with males and females constituting 17.62% and 33.96% of the cases of palpable neck swelling. Similar findings were observed by Khetrapal S *et al.,* [1] in their study with majority patients (31.0%) in the age group of 21-30 years. They observed approximately one-fifth cases in the first decade of

life.Suryawanshi KH *et al.,* [2] reported similar findings with 32.63% patients in the 21-30 years age group, with majority females (58.33%).Fernandes H *et al*., [8] reported female predominance with male: female ratio =1:4.41 similar to our study. Adhikari RC *et al*., [12] also reported similar findings. Maniyar AU *et al*., [7], however, reported maximum cases in the age group of 51-60 years with a male predominance (male: female=1.8:1). Muddegowda PH *et al*., [9] reported higher number of females and majority population to be in the 4th and 5th decade of life.Mohamed MH *et al*., [13] reported the mean age to be 50-60 years.

In the present study, a large proportion of lesions (71.08%) were found in lymph nodes, while 22.25% were in thyroid and the rest (6.67%) were distributed in various other regions. The findings of Khetrapal S *et al*., [1] were similar to our study with most number of aspirates from lymph nodes (64.1%), followed by thyroid gland (16.9%). Similar findings were observed by Suryawanshi KH *et al*., [2], Maniyar AU *et al*., [7], Adhikari RC *et al*., [12], Mohamed MH *et al*., [13] and Jasani JH *et al.,* [14] with 39.58%,56.37%, 55.6%, 43%and 69% aspirates from lymph nodes respectively. However, findings of Fernandes H *et al*., [8] were contradictory to our findings with majority lesions of the thyroid gland (56.45%).

As observed in the present study, majority of the lesions (77.12%) in anterior triangle of the neck were non-neoplastic (inflammatory) lesions. Among the neoplastic lesions located in the thyroid gland, 13.76% were benign and 1.62% were found malignant. No benign neoplastic lesions were noted in the lymph node. Rather 14.57% were malignant, while in 8.75%, the results were inconclusive. Among other regions, 33.78% lesions were benign and none were malignant. However, 9.46% were inconclusive. Khetrapal S *et al*., [1] observed that most lesions in the thyroid were benign (44 out of 49) while rest were malignant. Similarly, in the lymph nodes, majority were benign (173 out of 185) and the rest malignant. These findings were different from our findings. Maniyar AU *et al.,* [7] found all the lymph node aspirates (100%) to be malignant, and none benign, similar to our study, while 73.81% thyroid lesions comprised follicular neoplasm and 26.19% were malignant.Non-neoplastic lesions were the most common in another study by Adhikari RC *et al*., [12] similar to our study.

As per the cytological classification of lesions in lymph nodes and other regions, as observed in the present study, most lesions (38.66%) in the lymph nodes were classified as tuberculous lymphadenitis followed by reactive hyperplasia of lymph nodes (15.59%) and acute suppurative lymphadenitis (13.18%). Thyroiditis was most common (84.62%) among the lesions found in thyroid gland, followed by colloid goitre (8.10%) and thyroglossal cyst and follicular neoplasm (2.02% each). Among lesions in other regions, majority were identified as lipoma (35.14%) followed by epidermal inclusion cyst (27.03%) and cystic lesions (13.51%). As observed by Khetrapal S *et al*., [1], most benign lesions of the lymph node were due to granulomatous lymphadenitis (31.4%) followed by reactive hyperplasia (23.8%). Colloid goitre (8.6%) was the most common thyroid lesion, followed by Thyroiditis (6.2%).In a study by Suryawanshi KH *et al*., [2], tubercular (47.36%) and reactive lymphadenitis (35.08%)were the predominant causes of benign lymph node lesions, while metastatic epithelial malignancy was the common cause among malignant lesions. Benign lesions (69.97%) were most common in the thyroid; while inflammatory lesions constituted 28.88%. Fernandes H *et al*., [8] reported that the commonest thyroid lesion was nodular goitre followed by Hashimoto's Thyroiditis. Reactive lymphadenopathy was the most common lesion followed by tuberculous lesions in the lymph node.As per Muddegowda PH *et al.,* [9], colloid goitre and reactive lymphadenitis were the commonest thyroid and lymph node lesions. Bhagat VM *et al.,* [10] and El Hag *et al*., [11] reported 67% and 54% cases of tuberculosis/ granulomatous; and reactive and tubercular lymphadenitis respectively. The most common of cause of lymphadenopathy was tuberculosis and that of thyroid swelling was colloid goitre in a study by Adhikari RC *et al*., [12]. Reactive lymphadenitis and metastatic carcinoma were the commonest among benign and malignant lesions respectively, in another study by Mohamed MH *et al*., [13].

In the present study, the cyto-histopathological correlation could be done in 778 cases of which 661 were benign and 117 were malignant. Among the 661 benign lesions, it was observed that the cytological and histopathological diagnoses were consistent with each other in 642 cases, while it was inconsistent in 19 cases i.e. they showed false negative results. Among 117 malignant lesions, in 112, the cytological and histopathological diagnoses were consistent with each other, while the rest 5 showed false positive result. The sensitivity and specificity were calculated as 85.50% and 99.23% respectively, while positive and negative predictive value were calculated as 95.73% and 97.13% respectively. The overall diagnostic accuracy was found to be 96.92%.Khetrapal S *et al*., [1] found the sensitivity and specificity to be 93.24% and 100% respectively, which was more than that of our study.Suryawanshi KH *et al*., [2] observed the overall diagnostic accuracy

rate to be 93.02%, and the sensitivity and specificity to be 81.81% and 96.87% respectively; while the positive predictive value (PPV) and negative predictive value (NPV) was 90.0 % and 93.93% respectively. Maniyar AU *et al.,* [7] reported the sensitivity and specificity as 98.46% and 100% respectively. In another study by Fernandes H *et al*., [8], the sensitivity, specificity, positive predictive value and negative predictive value was 87.5%, 100%,100% and 98.26%.

5. Conclusion

In addition to being safe and comparatively free of complications, FNAC offers a quick, efficient and accurate approach of diagnosing lesions, especially of the neck. Consistent results were found between cytological and histological examinations and hence, it works as a useful adjunct to histopathology. It can help to significantly reduce morbidity and mortality by early, as well as, accurate diagnosis of benign and malignant lesions.

Author Contributions: All authors contributed equally to the writing of this paper. All authors read and approved the final manuscript.

Conflicts of Interest: "Authors declare that they do not have any conflict of interests."

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