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Original Article

Clinical, Radiological, Pathological Study of Neck Masses

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ABSTRACT

Background: *Neck masses are a common clinical presentation with diverse etiologies, ranging from benign inflammatory conditions to malignant neoplasms. Accurate diagnosis requires a multidisciplinary approach integrating clinical assessment, radiological imaging, and pathological evaluation.* ***Aim of the study:*** *The aim of this study was to evaluate the clinical, radiological, and pathological correlation of neck masses to enhance diagnostic accuracy and management.* ***Methods & Materials:*** *This prospective observational study was conducted at 250 Bed General Hospital, Khulna, Bangladesh. A total of 95 patients with neck swellings were enrolled. Data collection included detailed clinical history, physical examination, radiological imaging (ultrasonography, computed tomography, and magnetic resonance imaging), and fine-needle aspiration cytology (FNAC). Histopathological examination (HPE) of surgically excised specimens was performed to confirm diagnoses. Statistical analysis was conducted using SPSS version 26.0.* ***Result:*** *The majority of patients were aged 21–30 years (25.26%), with a female predominance (69.47%). The most common site of neck masses was the anterior part of the neck/midline (45.26%). Thyroid swellings were the most frequently diagnosed category (48.42%), with colloid goiter (18.95%) and thyroiditis (11.58%) being the predominant conditions. Tuberculous lymphadenitis accounted for 13.68% of cases. FNAC demonstrated high diagnostic accuracy, but false-negative results necessitated histopathological confirmation in some cases. Pleomorphic adenoma (21.05%) was the most frequent histopathological diagnosis. Radiological imaging played a critical role in guiding FNAC and further evaluation.* ***Conclusion:*** *Thyroid disorders and tuberculosis-related lymphadenopathy were the most common causes of neck masses, with FNAC and histopathology providing essential diagnostic clarity in distinguishing benign from malignant lesions.*

Keywords: *Neck masses, Fine-needle aspiration cytology, Histopathology, Radiological imaging, Thyroid swelling, Tuberculous lymphadenitis, Clinical diagnosis*

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INTRODUCTION

Neck masses are clinically palpable swellings or enlargements occurring between the inferior border of the mandible and the clavicle[1]. They are a common clinical finding that can be encountered in patients of all age groups[2]. The global prevalence of neck masses varies widely due to the diverse etiologies and demographic factors influencing their occurrence. An analysis of 1,208 consecutive cases of neck masses revealed that 58.7% occurred in adults aged 40 years and above[3]. Neck masses can arise from a multitude of causes, ranging from benign inflammatory processes to malignant neoplasms. The differential diagnosis is broad and includes congenital anomalies, infectious or inflammatory conditions, benign neoplasms, and malignant tumors[4]. The clinical presentation of these masses can vary significantly, making accurate diagnosis challenging. A meticulous approach that integrates clinical evaluation, radiological imaging, and pathological assessment is essential for precise diagnosis and effective management[5]. Clinically, a thorough assessment of the patient's age, comprehensive medical history, and the duration of the mass is essential for diagnosis. Additionally, evaluating associated symptoms, including pain, dysphagia, hoarseness, or unexplained weight loss, can offer valuable insights into the underlying condition. Furthermore, identifying potential risk factors, such as a history of tobacco use, alcohol consumption, occupational exposures, or genetic predispositions, plays a crucial role in establishing a differential diagnosis and guiding further investigations[6]. Radiological imaging plays a pivotal role in the assessment of neck masses. Contrast-enhanced computed tomography (CT) is often the initial imaging modality of choice, offering detailed information about the size, location, extent, and characteristics of the mass, as well as its relationship to adjacent structures[7]. Ultrasonography is another valuable tool, particularly for evaluating thyroid masses and distinguishing cystic from solid lesions[8]. Magnetic resonance imaging (MRI) may be employed for further characterization, especially in cases where soft tissue delineation is crucial[9].

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Pathological evaluation, particularly fine-needle aspiration cytology (FNAC), is a cornerstone in the diagnostic workup of neck masses. FNAC is a simple, safe, and minimally invasive procedure that provides valuable cytological information, aiding in the differentiation between benign and malignant lesions[10]. However, it is important to note that FNAC may yield false-negative results, necessitating correlation with clinical and radiological findings[11]. The integration of clinical, radiological, and pathological data is imperative for accurate diagnosis and appropriate management of neck masses[1]. In cases where FNAC results are inconclusive or discordant with imaging findings, a core needle biopsy or excisional biopsy may be warranted to obtain a definitive diagnosis[12]. Moreover, understanding the anatomical location and lymphatic drainage patterns of the neck is crucial, as certain malignancies have predilection for specific nodal basins, guiding both diagnosis and therapeutic planning[13]. A systematic approach that combines thorough clinical evaluation, advanced imaging techniques, and precise pathological assessment is essential for accurate diagnosis and effective management. This study aims to evaluate the clinical, radiological, and pathological correlation of neck masses to enhance diagnostic accuracy and management.

METHODS & MATERIALS

This was a prospective observational study conducted over a period of six months, from 10th July 2024 to 15th December 2024. The research was carried out in the at 250 Bed General Hospital, Khulna, Bangladesh. A total of 95 patients presenting with neck swellings were enrolled during this period.

Inclusion Criteria:

- Age 1 to 70 years at enrollment.
- Presented with neck swelling.

Exclusion Criteria:

- Patients with a previously confirmed diagnosis of the neck mass.
- Patients undergoing treatment for neck tumors.
- Patients with clinically suspected vascular neck masses.

Ethical Considerations

All participants provided informed consent before participation. The study protocol was reviewed and approved by the institutional ethics committee, and all procedures adhered to the ethical standards.

Data Collection

Detailed clinical histories were obtained from all participants, including information regarding the age, gender, duration of the neck mass, and location of each neck mass. Endoscopic evaluations of the nasal cavity, nasopharynx, pharynx, and larynx were performed. Routine laboratory investigations were conducted for all patients. Neck ultrasonography was universally applied for initial imaging. Further imaging techniques such as computed tomography (CT) and magnetic resonance imaging (MRI) were employed as necessary for differential diagnosis. Fine-needle aspiration biopsy (FNAB) was also performed in select cases where additional diagnostic clarity was needed. FNAC was conducted using a 21–23 gauge needle attached to a 10 ml disposable syringe under aseptic conditions. Negative pressure was created by retracting the syringe piston, and the needle was moved back and forth within the swelling to obtain a sufficient sample. The aspirated material was expelled onto glass slides. Air-dried smears were stained using Haematoxylin and Eosin (H&E) and May-Grünwald Giemsa (MGG) stains, while alcohol-fixed smears were stained using Papanicolaou stain. Subsequently, all patients underwent surgical intervention (incisional or excisional biopsy), and the tissue samples were sent for histopathological examination (HPE) at the pathology department. Cytological findings were then compared with the corresponding histopathological results.

Data Analysis

Descriptive statistics were used for summarizing continuous variables, while categorical variables were presented as frequencies and percentages. All statistical analyses were conducted using SPSS software version 26.0.

RESULT

A total of 95 participants were included in the study. The age distribution was as follows: 11.58% were between 1-10 years old, 15.79% between 11-20 years old, 25.26% between 21-30 years old, 23.16% between 31-40 years old, 11.58% between 41-50 years old, 9.47% between 51-60 years old, and 3.16% between 61 and 70 years old. Regarding gender, 30.53% of participants were male, and 69.47% were female (Table I). Table II showed that regarding the formation duration, 14.74% of participants had symptoms for 0-3 months, 29.47% had symptoms for 3-6 months, and 55.79% experienced symptoms for more than 6 months. 4.21% had lesions in the submental triangle, 7.37% in the submandibular triangle, 29.47% in the upper cervical region, 3.16% in the middle cervical region, 2.11% in the lower cervical region, 6.32% in the posterior triangle, 45.26% in the anterior part of the neck/midline swelling, and 2.11% had lateral neck involvement. Among thyroid swelling diagnoses, 2.11% had multinodular goiter, 18.95% colloid goiter, 11.58% thyroiditis, 10.53% solitary thyroid nodule, and 5.26% malignant thyroid neoplasm. Salivary gland disorders were found in 1.05% with chronic sialadenitis and 7.37% with salivary neoplasm. Lymph node conditions included 6.32% acute suppurative lymphadenitis, 1.05% chronic lymphadenitis, 13.68% TB lymphadenitis, 4.21% malignant neck node, and 4.21% lymphoproliferative disorder. Other diagnoses included cystic hygroma (5.26%), thyroglossal cyst (2.11%), branchial cyst (2.11%), carotid body tumor (1.05%), and vascular swelling (1.05%) (Table III). Figure 1 presented the radiological examination findings. The results indicate that the majority of participants underwent ultrasound (USG), with 49.47% of the population using this imaging technique. A smaller proportion of the population, 35.79%, underwent CT scans, while 14.74% of participants were examined using MRI. The pathological

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diagnoses showed that pleomorphic adenoma was the most common (21.05%), followed by chronic granulomatous disease (8.42%) and Warthin's tumor (7.37%). Other diagnoses included lipoma, thyroglossal duct cyst, chronic sialadenitis with sialolithiasis, and squamous cell carcinoma metastasis, each at 5.26%. Less common diagnoses included dermoid cyst, basal cell adenoma, acinic cell carcinoma, papillary thyroid carcinoma metastasis, and benign lymphoepithelial cysts, each accounting for 2.11%. (Table IV).

Table – I: Demographic characteristics of the study population (*n*=95)

Variable	Frequency (n)	Percentage (%)
Age (Years)		
1–10	11	11.58
11–20	15	15.79
21–30	24	25.26
31–40	22	23.16
41–50	11	11.58
51–60	9	9.47
61–70	3	3.16
Gender		
Male	29	30.53
Female	66	69.47

Table – II: Disease characteristics of the study population (*n*=95)

Variable	Frequency (n)	Percentage (%)
Formation duration		
0-3 months	14	14.74
3-6 months	28	29.47
> 6 months	53	55.79
Anatomic site		
Submental triangle	4	4.21
Submandibular triangle	7	7.37
Upper cervical	28	29.47
Middle cervical	3	3.16
Lower cervical	2	2.11
Posterior triangle	6	6.32
Anterior part of neck/midline swelling	43	45.26
Lateral part of the neck	2	2.11

Table – III: Clinical diagnosis of the study patients (*n*=95)

Clinical diagnosis	Frequency (n)	Percentage (%)
Thyroid swelling		
Multinodular goiter	2	2.11
Colloid goiter	18	18.95
Thyroiditis	11	11.58
Solitary thyroid nodule	10	10.53
Malignant thyroid neoplasm	5	5.26
Salivary gland		
Chronic saloadenitis	1	1.05
Salivary neoplasm	7	7.37
Lymph nodes		
Acute suppurative lymphadenitis	6	6.32
Chronic lymphadenitis	1	1.05
TB lymphadenitis	13	13.68
Malignant neck node	4	4.21
Lymphoproliferative disorder	4	4.21
Lymph node abscess	1	1.05
TB abscess	1	1.05
Others		
Cystic hygroma	5	5.26
Thyroglossal cyst	2	2.11
Branchial cyst	2	2.11
Carotid body tumor	1	1.05
Vascular swelling	1	1.05

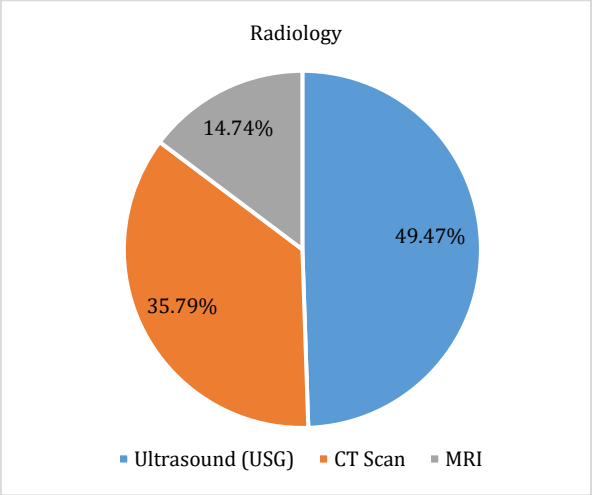

Figure – 1: Radiological examination of the study population (*n*=95)

Table – IV: Pathological diagnosis of the neck masses (*n*=95)

The Pathological Diagnosis	Frequency (n)	Percentage (%)
Pleomorphic adenoma	20	21.05
Chronic granulomatous disease	8	8.42
Warthin's tumor	7	7.37
Lipoma	5	5.26
Thyroglossal duct cyst	5	5.26
Chronic sialadenitis and sialolithiasis	5	5.26
Squamous cell carcinoma metastasis	5	5.26
Reactive lymphadenopathy	3	3.16
Branchial cleft cyst	3	3.16
Hodgkin lymphoma	3	3.16
Non-Hodgkin lymphoma	3	3.16
Lymphangioma	3	3.16
Dermoid cyst	2	2.11
Basal cell adenoma	2	2.11
Acinic cell carcinoma	2	2.11
Papillary thyroid carcinoma metastasis	2	2.11
Benign lymphoepithelial cysts	2	2.11
Other	15	15.79

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DISCUSSION

Neck masses encompass a diverse range of conditions that vary in etiology, including congenital, inflammatory, and neoplastic causes. These masses can be broadly categorized into benign and malignant types[14]. This study provided a comprehensive analysis of neck masses, focusing on clinical presentation, radiological imaging, and pathological findings. The demographic analysis of our study population revealed that the majority of patients were aged between 21 and 30 years (25.26%). This finding is consistent with a study conducted in India, which also observed the highest prevalence of neck masses in the 21–30 years age group (30%). In terms of gender distribution, our study found a higher prevalence of neck masses in females (69.47%) compared to males (30.53%), resulting in a male-to-female ratio of approximately 0.44:1. Similarly, the Indian study reported a female predominance, with 68% females and 32% males, yielding a male-to-female ratio of 0.6:1[15]. Regarding the duration of neck mass formation, over half of our patients (55.79%) presented with masses persisting for more than six months. This is in line with the study by Pynnonen et al., which emphasized the significance of mass duration in the clinical evaluation of neck swellings[1]. Anatomically, the most common site of neck masses in our study was the anterior part of the neck/midline swelling (45.26%), followed by the upper cervical region (29.47%). This distribution highlights the importance of thorough clinical evaluation, as emphasized by Haynes et al., who stressed the role of clinical assessment in managing neck swellings[8]. Clinically, thyroid swellings were the most frequently diagnosed (48.42%), with colloid goiter (18.95%) and thyroiditis (11.58%) being the predominant conditions. This is consistent with the Indian study, which reported thyroid-related etiologies in 35% of cases, with colloid goiter constituting 26%. Salivary gland neoplasms accounted for 7.37% of our cases, closely mirroring the 8% reported in the same Indian study[15]. Lymph node pathologies, particularly tuberculous (TB) lymphadenitis, were observed in 13.68% of our patients. This finding aligns with the study by Lemus et al., which reported TB lymphadenitis as a common cause of cervical lymphadenopathy in developing countries[16]. Radiological investigations played a crucial role in our diagnostic process, with ultrasonography (USG) utilized in 49.47% of cases, computed tomography (CT) scans in 35.79%, and magnetic resonance imaging (MRI) in 14.74%. Alabousi et al. highlighted the complementary roles of USG and CT in evaluating neck masses, emphasizing their combined utility in diagnosis[17]. Histopathologically, pleomorphic adenoma was the most common diagnosis (21.05%), followed by chronic granulomatous disease (8.42%) and Warthin's tumor (7.37%). These findings differ slightly from a study by Rothka et al., which reported pleomorphic adenoma in 5% of cases[18]. The higher prevalence in our study may be attributed to regional variations or differences in sample size. Warthin's tumor also accounted for 7.37% of cases, consistent with the study by Hellquist et al.[19]. Thyroglossal duct cyst accounted for 5.26% of the cases, a finding similar to that in a study by Kurt et al.[20]. Hodgkin lymphoma was observed in 3.16% of the cases in our study. A separate study analyzing 221 patients with head and neck lymphoma found that Hodgkin lymphoma comprised 12.7% of cases[21]. Our study underscored the critical importance of integrating clinical evaluation with radiological and cytopathological assessments to achieve accurate diagnoses of neck masses. This comprehensive approach ensures timely and appropriate management, ultimately improving patient outcomes.

Limitations of the study:

- FNAC has inherent limitations, including the possibility of false-negative results, which could influence diagnostic accuracy
- Interobserver variability in radiological and pathological assessments may introduce bias.

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CONCLUSION

This study underscores the importance of a comprehensive diagnostic approach integrating clinical, radiological, and pathological assessments for evaluating neck masses. Thyroid swellings were the most prevalent, with colloid goiter and thyroiditis being the predominant conditions. FNAC and histopathology remain indispensable for accurate differentiation between benign and malignant lesions. Given the significant proportion of tuberculosis-related lymphadenopathy, targeted screening in endemic regions is recommended. Enhanced radiological assessment, particularly with ultrasonography and computed tomography, should be prioritized for early and precise diagnosis. Future studies with larger cohorts and molecular diagnostics may further refine diagnostic accuracy and treatment strategies. Multidisciplinary collaboration is crucial for optimizing patient management and outcomes.

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