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Original Research

Study of neck tumour in relation to their clinicopathological and radiological presentations

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Abstract

Background: Neck tumors encompass a wide spectrum of benign and malignant lesions arising from diverse anatomical structures. Accurate diagnosis requires a comprehensive approach integrating clinical examination, radiological imaging, and histopathological evaluation. **Objectives:** To study neck tumors in relation to their clinical, radiological, and pathological presentations and to assess the correlation between radiological findings and histopathological diagnosis. **Materials and Methods:** This hospital-based observational study included 60 patients presenting with neck swellings. Detailed clinical evaluation was performed, followed by radiological assessment using ultrasonography, computed tomography, or magnetic resonance imaging as indicated. Histopathological examination served as the reference standard. Statistical analysis was performed to evaluate associations between clinical, radiological, and pathological parameters. **Results:** The mean age of patients was 47.4 ± 11.9 years, with malignant lesions occurring significantly more frequently in older individuals. Dysphagia, weight loss, and hoarseness of voice were significantly associated with malignant pathology. Radiological impression showed strong correlation with histopathological diagnosis, demonstrating a sensitivity of 80.8%, specificity of 91.2%, and overall diagnostic accuracy of 86.7%. Radiology proved highly effective in identifying malignant lesions and guiding further management. **Conclusion:** The study confirms that a combined clinicoradiological and histopathological approach is essential for accurate diagnosis and management of neck tumors. Radiological imaging plays a crucial complementary role in early detection, staging, and treatment planning. Early diagnosis through a multidisciplinary approach can significantly improve patient outcomes.

Keywords: Neck tumors; Clinicopathological correlation; Radiological evaluation; Histopathology; Head and neck neoplasms.

Introduction

Neck tumors represent a heterogeneous group of pathological entities arising from diverse anatomical structures including lymph nodes, thyroid gland, salivary glands, soft tissues, vascular elements, and neurogenic tissues. The neck acts as a vital anatomical conduit between the head and thorax, housing critical neurovascular structures, aerodigestive pathways, and endocrine organs. Owing to this anatomical complexity, tumors of the neck exhibit a wide spectrum of clinical presentations, biological behavior, and prognostic implications.[1]

Neck swellings constitute one of the most common presenting complaints in otorhinolaryngology practice. While many neck masses are benign and inflammatory in nature, a significant proportion may represent malignant disease, especially in adults. The probability of malignancy increases with age, particularly in individuals above 40 years, making early evaluation and accurate diagnosis imperative. Delayed diagnosis may lead to advanced disease, increased morbidity, and reduced survival.[2]

Clinically, neck tumors may present as painless or painful swellings, sometimes associated with dysphagia, hoarseness, weight loss, or referred otalgia. The anatomical location often provides clues to etiology—midline neck swellings frequently arise from thyroid or thyroglossal duct remnants, whereas lateral neck swellings are commonly lymph nodal or salivary in origin. However, overlapping clinical features often make differentiation challenging without further investigations.[3]

Radiological evaluation plays a pivotal role in the assessment of neck tumors. Imaging modalities such as ultrasonography (USG), computed tomography (CT), and magnetic resonance imaging (MRI) aid in determining the site of origin, size, internal architecture, vascularity, and relationship with adjacent structures. Ultrasonography serves as an initial screening tool due to its accessibility, cost-effectiveness, and ability to guide fine-needle aspiration cytology (FNAC). CT and MRI provide superior anatomical delineation and staging, particularly in malignant lesions.[4]

Histopathological examination remains the gold standard for definitive diagnosis. Fine-needle aspiration cytology offers a minimally invasive, rapid, and reliable diagnostic tool, especially for lymph nodes and thyroid lesions. Correlation between clinical findings, radiological characteristics, and histopathological diagnosis is essential for accurate classification and appropriate management planning.[5]

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Aim

To study neck tumors in relation to their clinical, radiological, and pathological presentations.

Objectives

1. To evaluate the clinical profile of patients presenting with neck tumors, including age, sex, site, and presenting symptoms.
2. To correlate radiological findings with histopathological diagnosis in patients with neck tumors.

Materials and Methods**Source of Data**

The study was conducted on patients presenting with neck swellings attending the Department of Otorhinolaryngology at a tertiary care teaching hospital.

Study Design

A hospital-based descriptive observational study.

Study Location

Department of Otorhinolaryngology, tertiary care teaching hospital.

Study Duration

The study was conducted over a period of 12 Months.

Sample Size

A total of **60 patients** diagnosed with neck tumors were included in the study.

Inclusion Criteria

- Patients of all age groups presenting with neck swelling.
- Patients with clinically and/or radiologically suspected neck tumors.
- Patients willing to provide informed consent.

Exclusion Criteria

- Patients with acute inflammatory neck swellings or abscesses.
- Patients with traumatic neck swellings.
- Patients unwilling to participate in the study.
- Previously treated or recurrent neck malignancies.

Procedure and Methodology

All patients underwent a detailed clinical evaluation including history taking and thorough physical examination focusing on site, size, consistency, mobility, and tenderness of the neck mass. Routine hematological investigations were performed. Radiological evaluation included ultrasonography of the neck for all patients, and contrast-enhanced CT or MRI wherever indicated to assess lesion extent, nodal involvement, and relation to adjacent structures. Fine-needle aspiration cytology (FNAC) was performed in all feasible cases. Surgical excision or biopsy specimens were subjected to histopathological examination for definitive diagnosis.

Sample Processing

Specimens obtained through FNAC or surgery were fixed in 10% formalin, processed routinely, embedded in paraffin, sectioned, and stained with hematoxylin and eosin. Special stains and immunohistochemistry were used wherever indicated.

Data Collection

Data were recorded in a pre-designed proforma including demographic details, clinical findings, radiological features, cytological and histopathological diagnosis.

Statistical Methods

Data were entered into Microsoft Excel and analyzed using appropriate statistical software. Descriptive statistics were used to summarize data. Categorical variables were expressed as frequencies and percentages. Correlation between clinical, radiological, and pathological findings was analyzed using appropriate statistical tests, with $p < 0.05$ considered statistically significant.

OBSERVATION AND RESULTS

Table 1: Overall clinicopathological and radiological profile with benign-malignant comparison (N=60)

Variable	Total (N=60)	Benign (n=34)	Malignant (n=26)	Test of significance	Effect size (95% CI)	p-value
Age (years), Mean $\pm$ SD	47.4 $\pm$ 11.9	43.6 $\pm$ 10.8	52.4 $\pm$ 11.7	Welch t = -2.98	Mean diff = -8.8 (-14.7 to -2.9)	0.004
Male sex	28 (46.7)	14 (41.2)	14 (53.8)	$\chi^2 = 0.51$	OR = 1.67 (0.59 to 4.67)	0.475
Unilateral swelling (vs others)	35 (58.3)	22 (64.7)	13 (50.0)	$\chi^2 = 0.78$	OR = 0.55 (0.19 to 1.55)	0.378
Fixed / non-mobile swelling	8 (13.3)	2 (5.9)	6 (23.1)	$\chi^2 = 2.43$	OR = 4.80 (0.88 to 26.15)	0.119
Dysphagia	26 (43.3)	10 (29.4)	16 (61.5)	$\chi^2 = 4.95$	OR = 3.84 (1.30 to 11.32)	0.026
Weight loss	7 (11.7)	1 (2.9)	6 (23.1)	Fisher exact	OR = 9.90 (1.11 to 88.34)	0.036
Radiology impression "suggestive of malignancy"	24 (40.0)	3 (8.8)	21 (80.8)	$\chi^2 = 28.85$	OR = 43.40 (9.35 to 201.40)	<0.001

Table 1 presents the comparison of clinicopathological and radiological characteristics between benign and malignant neck tumors among 60 patients. The mean age of the study population was 47.4 $\pm$ 11.9 years. Patients with malignant lesions were significantly older than those with benign lesions (52.4 $\pm$ 11.7 vs. 43.6 $\pm$ 10.8 years), with a statistically significant mean difference of -8.8 years (95% CI: -14.7 to -2.9; $p = 0.004$), indicating increasing malignancy risk with advancing age.

Male predominance was observed overall (46.7%), though no statistically significant difference was noted between benign and malignant groups ($p = 0.475$). Unilateral neck swelling was the most common presentation (58.3%), occurring more frequently in benign lesions (64.7%) than malignant ones (50.0%), though this difference was not statistically significant ($p = 0.378$).

Fixed or non-mobile swellings were more frequently observed in malignant tumors (23.1%) compared to benign lesions (5.9%), suggesting invasive behavior; however, this association did not reach statistical significance ($p = 0.119$). Dysphagia was significantly more common in malignant cases (61.5%) compared to benign lesions (29.4%), with an odds ratio of 3.84 (95% CI: 1.30-11.32; $p = 0.026$), highlighting its importance as a red-flag symptom.

Weight loss was significantly associated with malignancy, being present in 23.1% of malignant cases compared to only 2.9% of benign cases (OR = 9.90; 95% CI: 1.11-88.34; $p = 0.036$). Radiological impression suggestive of malignancy showed a strong and statistically significant association with histologically confirmed malignancy (80.8% vs. 8.8%; $p < 0.001$), with a high odds ratio of 43.40, emphasizing the diagnostic value of imaging.

Table 2: Clinical profile of patients with neck tumors (age/sex/site/symptoms) with benign-malignant comparison (N=60)

Variable	Total (N=60)	Benign (n=34)	Malignant (n=26)	Test of significance	Effect size (95% CI)	p-value
Age ≥ 50 years	29 (48.3)	12 (35.3)	17 (65.4)	$\chi^2 = 4.20$	OR = 3.46 (1.19 to 10.11)	0.040
Female sex	32 (53.3)	20 (58.8)	12 (46.2)	$\chi^2 = 0.51$	OR = 0.60 (0.21 to 1.68)	0.475
Midline swelling	7 (11.7)	6 (17.6)	1 (3.8)	Fisher exact	OR = 0.19 (0.02 to 1.68)	0.135
Neck pain	11 (18.3)	8 (23.5)	3 (11.5)	Fisher exact	OR = 0.42 (0.10 to 1.79)	0.320
Fever	8 (13.3)	6 (17.6)	2 (7.7)	Fisher exact	OR = 0.39 (0.07 to 2.11)	0.446
Dyspnea	7 (11.7)	2 (5.9)	5 (19.2)	Fisher exact	OR = 3.81 (0.68 to 21.48)	0.222
Ear pain	5 (8.3)	4 (11.8)	1 (3.8)	Fisher exact	OR = 0.30 (0.03 to 2.86)	0.377
Hoarseness of voice	4 (6.7)	0 (0.0)	4 (15.4)	Fisher exact	OR = 13.80 (0.71 to 268.90)	0.031

Table 2 depicts the clinical characteristics of patients presenting with neck tumors and their association with histopathological outcomes. Patients aged ≥ 50 years constituted 48.3% of the cohort and were significantly more likely to have malignant tumors (65.4%) compared to benign lesions (35.3%), showing a statistically significant association (OR = 3.46; $p = 0.040$).

Female patients accounted for 53.3% of the total sample; however, gender distribution did not differ significantly between benign and malignant groups ($p = 0.475$). Midline swellings were more commonly observed in benign lesions (17.6%) than malignant ones (3.8%), though this association did not reach statistical significance ($p = 0.135$).

Symptoms such as neck pain, fever, and dyspnea were more frequently observed in malignant cases; however, these associations were not statistically significant. Hoarseness of voice, a classical warning sign for laryngeal involvement, was exclusively observed in malignant cases (15.4%) and demonstrated statistical significance ($p = 0.031$), highlighting its clinical relevance in suspecting malignancy.

Table 3: Correlation of radiological impression with histopathological diagnosis (N=60)
3A. 2x2 agreement table (Radiology: benign vs malignant) vs Histopathology (reference standard)

Radiology impression	Histopathology Malignant	Histopathology Benign	Total
Malignant / suspicious	21	3	24
Benign / non-suspicious	5	31	36
Total	26	34	60

McNemar (exact) test: discordant pairs = FP 3 vs FN 5 $\rightarrow p = 0.727$

3B. Diagnostic validity of radiology (Histopathology as gold standard)

Measure	Estimate	95% CI
Sensitivity (21/26)	80.8%	62.1% to 91.5%
Specificity (31/34)	91.2%	77.0% to 97.0%
PPV (21/24)	87.5%	69.0% to 95.7%
NPV (31/36)	86.1%	71.3% to 93.9%
Overall accuracy (52/60)	86.7%	75.8% to 93.1%

Table 3 demonstrates the correlation between radiological impressions and histopathological diagnosis, with histopathology considered the gold standard. Among 60 patients, radiology suggested malignancy in 24 cases, of which 21 were confirmed malignant on histopathology, while 3 were false positives. Conversely, among 36 radiologically benign cases, 5 were found to be malignant on histopathology, representing false negatives.

The McNemar test showed no statistically significant discordance between radiological and histopathological diagnosis ($p = 0.727$), indicating good agreement between the two modalities.

Diagnostic performance analysis revealed that radiological evaluation demonstrated a sensitivity of 80.8% and specificity of 91.2%. The positive predictive value was 87.5%, while the negative predictive value was 86.1%. The overall diagnostic accuracy of radiological assessment was high at 86.7%. These findings highlight the strong concordance between radiological and histopathological diagnoses and reinforce the role of imaging as a reliable, non-invasive tool in the diagnostic workup of neck tumors.

Discussion

Clinicopathological Profile and Age-Sex Distribution (Table 1): In the present study, the mean age of patients was 47.4 ± 11.9 years, with malignant lesions occurring at a significantly higher mean age compared to benign lesions (52.4 ± 11.7 vs. 43.6 ± 10.8 years; $p = 0.004$). This finding aligns with multiple studies reporting that malignant neck tumors tend to present in older individuals, reflecting cumulative exposure to carcinogens and age-related genetic instability. Nagar SR et al. (2022)[1] similarly reported higher malignant tumor prevalence beyond the fifth decade. Comparable observations were also made by Collins LH et al. (2023)[2], who noted increased malignancy rates after 50 years of age.

Male predominance was noted in malignant cases (53.8%), although this did not reach statistical significance ($p = 0.475$). This pattern is consistent with earlier studies by Xu B et al. (2022)[3], where male predominance was attributed to higher exposure to tobacco, alcohol, and occupational carcinogens.

Unilateral neck swelling was more frequently observed overall (58.3%), particularly in benign lesions (64.7%), though this association lacked statistical significance. Similar findings were reported by Tariq MU et al. (2023)[4], who observed that benign salivary and thyroid swellings commonly present as unilateral, slow-growing masses.

Fixed or non-mobile swellings were more frequently associated with malignant lesions (23.1%) compared to benign ones (5.9%), reflecting infiltrative behavior, although this trend did not reach statistical significance. This observation parallels findings by Hodgson A et al. (2021)[5], who reported reduced mobility as an important clinical predictor of malignancy.

Dysphagia emerged as a significant symptom associated with malignancy (61.5% vs. 29.4%; $p = 0.026$), highlighting deeper tissue invasion and involvement of pharyngeal or laryngeal structures. Similar associations were documented by de Pauli Paglioni M et al. (2020)[6], emphasizing dysphagia as a red-flag symptom in head and neck cancers. Weight loss also showed a strong association with malignancy ($p = 0.036$), reflecting systemic effects and cancer-related cachexia.

Radiological suspicion of malignancy demonstrated a very strong association with histopathological confirmation (80.8% vs. 8.8%; $p < 0.001$), with a high odds ratio (OR = 43.40), reinforcing the diagnostic value of imaging modalities in evaluating neck masses.

Clinical Profile and Symptomatology (Table 2): Patients aged ≥ 50 years were significantly more likely to harbor malignant tumors (65.4%), reaffirming age as a key predictive factor for malignancy ($p = 0.040$). This observation is consistent with global epidemiological patterns reported by Gupta A et al. (2021)[7], where increasing age correlated with higher cancer incidence.

Female predominance was observed overall, though no significant difference was noted between benign and malignant groups. This finding contrasts with some Indian studies reporting male predominance in malignant neck tumors, likely reflecting regional lifestyle and tobacco exposure patterns.

Midline neck swellings were predominantly benign, correlating with congenital and thyroid lesions, similar to observations by Tariq MU et al. (2023)[4]. Pain, fever, and dyspnea were more common in malignant lesions but did not reach statistical significance, possibly due to limited sample size. Hoarseness of voice, however, was exclusively associated with malignancy (15.4%) and showed statistical significance ($p = 0.031$), underscoring its importance as a warning sign for laryngeal or recurrent laryngeal nerve involvement, consistent with findings by Hodgson A et al. (2021)[5].

Radiological-Histopathological Correlation (Table 3): Radiological evaluation demonstrated strong concordance with histopathological diagnosis. Sensitivity (80.8%) and specificity (91.2%) were high, indicating reliable differentiation between benign and malignant lesions. These findings are comparable to studies by Banasser AM et al. (2020)[8], who reported sensitivity and specificity values of 78-92% and 85-95% respectively for combined ultrasound and CT imaging.

The overall diagnostic accuracy of 86.7% highlights the effectiveness of radiological assessment in clinical decision-making. The McNemar test revealed no significant discordance ($p = 0.727$), suggesting good agreement between imaging and histopathology. Similar diagnostic performance has been reported by Whaley RD et al. (2021)[9], emphasizing the value of radiology in preoperative planning and staging.

Conclusion

The present study highlights the significant role of integrated clinical, radiological, and histopathological evaluation in the diagnosis and characterization of neck tumors. A wide spectrum of neck masses was encountered, ranging from benign inflammatory and developmental lesions to malignant neoplasms, with malignancies being more prevalent in the older age group. Clinical features such as dysphagia, weight loss, and hoarseness of voice were significantly associated with malignant pathology, underscoring their importance as warning signs requiring prompt evaluation.

Radiological assessment demonstrated high diagnostic accuracy, with strong correlation to histopathological findings. Imaging modalities effectively differentiated benign from malignant lesions and provided valuable information regarding tumor extent, nodal involvement, and local invasion, thereby facilitating appropriate treatment planning. Histopathological examination remained the definitive diagnostic modality, reinforcing its indispensable role in confirming tumor type and guiding management strategies.

Overall, the study emphasizes that a multidisciplinary approach combining clinical examination, radiological imaging, and histopathological confirmation is essential for accurate diagnosis and optimal management of neck tumors. Early identification and timely intervention can significantly improve patient outcomes, reduce morbidity, and enhance prognostic accuracy.

LIMITATIONS OF THE STUDY

1. The study was conducted at a single tertiary care center, which may limit the generalizability of the findings to the broader population.
2. The relatively small sample size of 60 patients may limit the statistical power and affect the detection of weaker associations.
3. Being a cross-sectional observational study, long-term outcomes such as survival and recurrence rates could not be assessed.
4. Advanced imaging modalities such as PET-CT were not performed in all cases due to financial and logistical constraints.
5. Inter-observer variability in radiological interpretation and histopathological assessment could not be entirely eliminated.
6. Certain subgroups of neck tumors were underrepresented, limiting detailed subgroup analysis.

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