e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2026; 18(8); 1393-1400

Original Research Article

Diagnostic Accuracy of Multidetector Computed Tomography in the Evaluation of Neck Masses with Cytological Correlation: A Hospital-Based Cross-Sectional Study

Abhilas Choudhury[1], Naveen Kumar[2], Ratheshwara R.[3], Chhaya Bohare[4]

[1]Assistant Professor, Department of Radiodiagnosis, Shri Atal Bihari Vajpayee Medical College and Research Institute, Bengaluru, Karnataka, India

[2]Professor, Department of Radiodiagnosis, Basaveshwara Medical College and Hospital, Chitradurga, Karnataka, India

[3]Consultant Radiologist, Department of Radiodiagnosis, Chikkamagaluru Institute of Medical Sciences, Chikkamagaluru, Karnataka, India

[4]Assistant Professor, Department of Community Medicine LNMC & Research Centre, Bhopal, Madhya Pradesh, India

Received: 01-05-2026 / Revised: 15-06-2026 / Accepted: 21-07-2026

Corresponding author: Dr. Chhaya Bohare

Conflict of interest: Nil

Abstract

Background: Neck masses comprise a heterogeneous group of inflammatory, congenital, benign, and malignant lesions, often presenting diagnostic challenges because of complex cervical anatomy. Multidetector computed tomography (MDCT) enables rapid volumetric acquisition, high spatial resolution, multiplanar reconstruction, and accurate assessment of lesion extent. This study evaluated MDCT characteristics of neck masses with cytological correlation.

Aims & Objectives: To assess the role of MDCT in detecting, characterizing, and diagnosing neck masses; correlate imaging findings with cytology; determine diagnostic accuracy; and differentiate benign from malignant lesions.

Material & Methods: This hospital-based cross-sectional study was conducted in the Department of Radiodiagnosis, Basaveshwara Medical College and Hospital, Chitradurga, from August 2022 to March 2024. Eligible patients presenting with neck masses were recruited through universal sampling and evaluated using MDCT, with cytological correlation wherever applicable. Statistical analysis was performed using Microsoft Excel and SPSS, with data presented in percentages.

Results: Visceral space was the commonest site (40%), followed by parapharyngeal space (18%). Heterogeneous density predominated (66%). Abscess was the commonest benign lesion (14%), followed by lymph-node mass (12%) and lymphangioma (10%). Among malignant lesions, carcinoma was most frequent (14%), followed by malignant lymph-node mass (8%) and laryngeal carcinoma (6%). MDCT demonstrated 95.2% sensitivity, 100% specificity, and 100% positive predictive value for predicting neck masses.

Conclusion: MDCT provides valuable characterization of neck masses and facilitates differentiation of benign and malignant lesions through assessment of enhancement, necrosis, invasion, calcification, and fat content. Its high diagnostic performance, combined with cytological correlation, supports accurate diagnosis, evaluation of disease extent, biopsy guidance, and appropriate therapeutic planning.

Keywords: Multidetector Computed Tomography; Neck Mass; Fine-Needle Aspiration Cytology; Cervical Lymph Node; Benign Lesion; Malignant Lesion.

DOI: 10.25258/ijcpr.18.8.208

Introduction

Neck masses represent a diverse spectrum of pathological conditions arising from the complex anatomical structures extending from the skull base to the thoracic inlet. Their etiologies range from congenital and inflammatory disorders to benign and malignant neoplasms, making precise characterization essential for appropriate clinical management. [1] Because many lesions involve deep cervical spaces or demonstrate overlapping clinical manifestations, physical examination alone may not reliably establish their origin, extent, or relationship with adjacent structures. Computed tomography (CT) has consequently assumed an important role in the systematic evaluation of neck masses by providing detailed visualization of both soft-tissue and osseous structures. [2] The development of multidetector computed tomography (MDCT) has further strengthened cross-sectional imaging through rapid volume acquisition, improved spatial and temporal resolution, reduced motion-related degradation, and high-quality multiplanar reconstruction. [3] These capabilities permit accurate localization of lesions and assessment of their internal characteristics, enhancement patterns, vascular relationships, and extension across anatomical compartments. [4,5]

The diagnostic importance of imaging becomes particularly evident in adult patients, in whom a persistent neck mass may represent an underlying neoplastic process. [6] MDCT can demonstrate features useful for differentiating inflammatory and benign lesions from malignant masses while simultaneously defining involvement of surrounding vascular and visceral structures. [7] Cytological assessment, particularly fine-needle aspiration, provides complementary pathological characterization and strengthens diagnostic confidence when correlated with imaging findings.

Previous investigations have demonstrated the value of CT in cervical disease. Stevens et al. reported greater diagnostic accuracy for CT than clinical examination in assessing the neck. [8] Atula et al. demonstrated the ability of CT to identify radiologically suspicious cervical nodes that were clinically occult, [9] while Shetty et al. reported high specificity for CT in detecting metastatic cervical lymph nodes. [10] Therefore, systematic MDCT evaluation combined with cytological correlation offers a comprehensive approach for characterizing neck masses, distinguishing benign from malignant disease, and facilitating informed therapeutic planning.

Literature Review: Multidetector computed tomography (MDCT) has emerged as an important imaging modality for comprehensive assessment of neck masses because it provides rapid acquisition, precise anatomical localization, and detailed characterization of lesion morphology. Gupta et al. demonstrated high diagnostic accuracy of multislice CT for distinguishing benign and malignant neck lesions, supporting its value in clinical decision-making. [11] The compartment-based understanding of cervical anatomy, particularly the parapharyngeal space and its relationships, further improves localization and identification of lesion origin. [12] The thesis similarly emphasizes the improved resolution and shorter acquisition time achieved with MDCT.

Jindal et al. highlighted the broad cytological spectrum of neck swellings, emphasizing the complementary role of fine-needle aspiration in establishing pathological diagnosis. [13] In the Indian setting, tuberculous cervical lymphadenopathy remains an important differential diagnosis, as documented by Prasad et al. [14] Gupta et al. further reinforced the effectiveness of multislice spiral CT in evaluating diverse cervical masses. [15]

Malignant lesions remain particularly important because head and neck cancers arise from multiple anatomical subsites and require accurate assessment of local and nodal disease. [16] Cross-sectional imaging also contributes substantially to treatment planning by delineating tumour extent and relationships with critical structures. [17]

A thorough understanding of normal CT anatomy and key cervical landmarks is therefore fundamental for reliable interpretation. Branstetter emphasized the hyoid bone, laryngeal cartilages, and major cervical muscles as important CT landmarks. [18] Collectively, these observations support MDCT with cytological correlation as a valuable approach for accurate characterization and management planning of neck masses.

Aims & Objectives:

The aim of this study is to-

1. To assess the role of MDCT in detecting, characterizing, and diagnosing neck masses; correlate imaging findings with cytology; determine diagnostic accuracy.
2. To differentiate benign from malignant lesions.

Methodology

Study Design: The present study was designed as a hospital-based cross-sectional study and was conducted in the Department of Radiodiagnosis, Basaveshwara Medical College and Hospital, Chitradurga, from August 2022 to March 2024.

Study Type: This was an observational diagnostic study evaluating the role and diagnostic performance of multidetector computed tomography (MDCT) in the detection and characterization of neck masses, with cytological correlation wherever applicable.

Study Population: The study included 50 male and female patients with neck masses referred to the Department of Radiodiagnosis. Universal sampling was employed, whereby all eligible patients were consecutively considered until the required sample size was achieved.

Inclusion Criteria: Patients presenting with clinically suspected or palpable neck masses who fulfilled the predefined eligibility criteria, provided written informed consent, and were suitable for MDCT examination were included.

Exclusion Criteria: Patients unwilling to participate, those unsuitable for contrast-enhanced CT examination, and individuals not fulfilling the study eligibility criteria were excluded.

Data Collection Methods: After Institutional Ethics Committee approval and written informed consent, demographic details, relevant clinical history, medication history, clinical examination findings, and routine investigations were systematically documented.

Procedure: All enrolled patients underwent neck imaging using a Siemens SOMATOM Scope 16-slice CT scanner. Patients were positioned supine with mild neck hyperextension. Axial images were acquired from the skull base to the clavicles. Non-contrast and contrast-enhanced examinations were performed using non-ionic iodinated contrast (Iohexol, 80–100 mL). Images were assessed for lesion location, extent, margins, density, enhancement pattern, necrosis, calcification, vascular involvement, and adjacent structural invasion. Coronal and sagittal multiplanar reconstructions were obtained whenever required. MDCT findings were subsequently correlated with cytological, clinical, or surgical diagnoses.

Data Analysis: All collected data were systematically entered and analyzed using Microsoft Excel and SPSS. Descriptive statistics were expressed as frequencies and percentages. Diagnostic performance of MDCT was assessed using sensitivity, specificity, positive predictive value, and negative predictive value, with cytological/clinical findings used for correlation.

Observations & Results:

Demographic and Clinical Characteristics

Table 1: Demographic Characteristics of the Study Participants (n = 50)

Characteristic	Category	Frequency (n)	Percentage (%)
Age (years)	<20	6	12
	21–40	12	24
	41–60	18	36
	>60	14	28
Gender	Female	23	46
	Male	27	54

Statistically Significant at $p < 0.05$

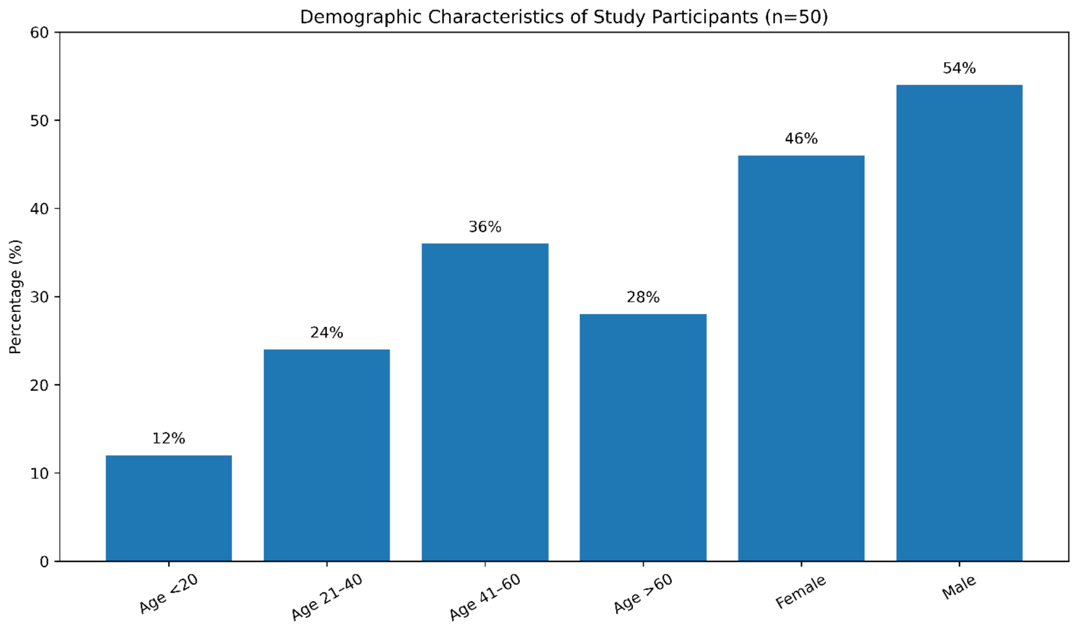

Figure 1: Demographic characteristics of study participants (n=50)

Interpretation: The demographic profile demonstrated representation across a broad age range, with the largest proportion of patients belonging to the 41–60-year group (36%), followed by those older than 60 years (28%). The mean age was 47.2 ± 20.8 years. Males constituted a modest majority (54%) compared with females (46%). This distribution indicates that clinically significant neck masses were encountered predominantly among middle-aged and older adults while remaining relevant across all age categories.

Table 2: Distribution of Neck Masses According to Anatomical Space (n = 50)

Anatomical Space	Frequency (n)	Percentage (%)
Masticator space	4	8
Parapharyngeal space	9	18
Parotid space	3	6
Pharyngeal mucosal space	4	8
Posterior cervical space	2	4
Post-styloid space	1	2
Retropharyngeal space	1	2
Submandibular space	6	12
Visceral space	**20**	**40**
Total	**50**	**100**

Statistically Significant at $p < 0.05$

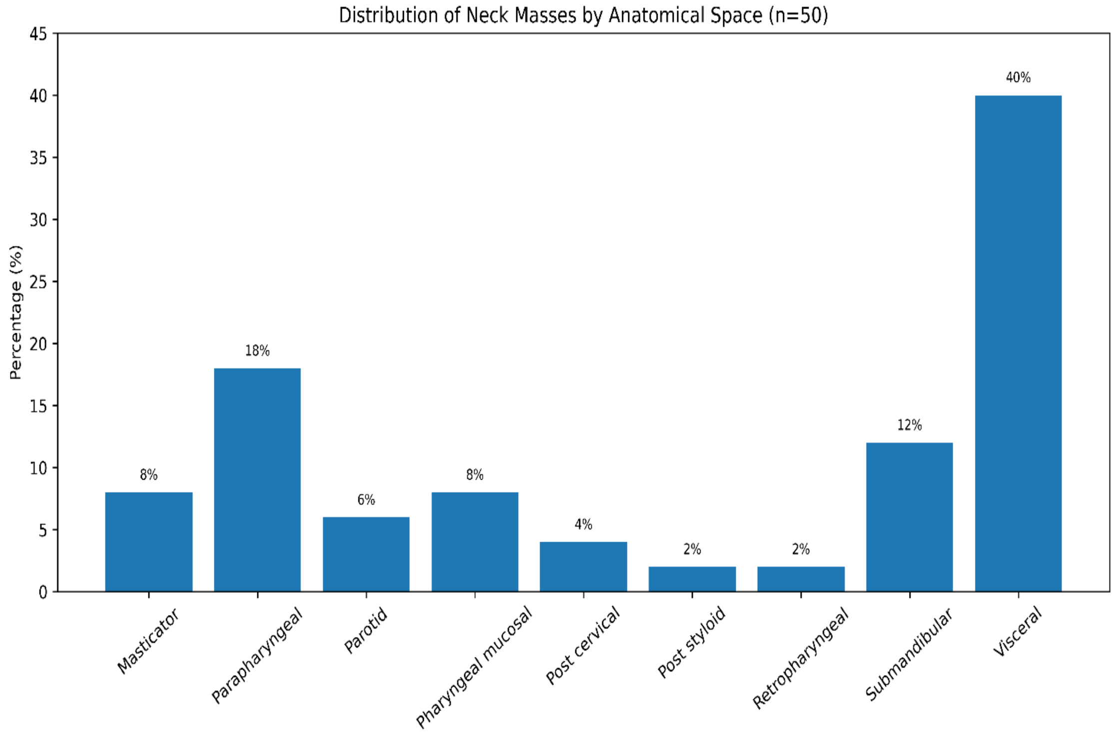

Figure 2: Destribution of neck masses by anatomical space (n=50)

Interpretation: MDCT successfully localized neck masses across multiple cervical compartments. The visceral space was the predominant site, accounting for 40% of lesions, followed by the parapharyngeal space at 18% and submandibular space at 12%. Other compartments contributed smaller proportions. This anatomical distribution highlights the value of a space-based MDCT approach, which enables precise localization of the lesion origin and its relationship with surrounding cervical structures, thereby facilitating diagnostic characterization and treatment planning.

Table 3: Distribution of Neck Masses According to Lesion Type (n = 50)

Lesion Category	Frequency (n)	Percentage (%)
Benign lesions	29	58
Malignant lesions	21	42
Total	50	100

Statistically Significant at $p < 0.05$

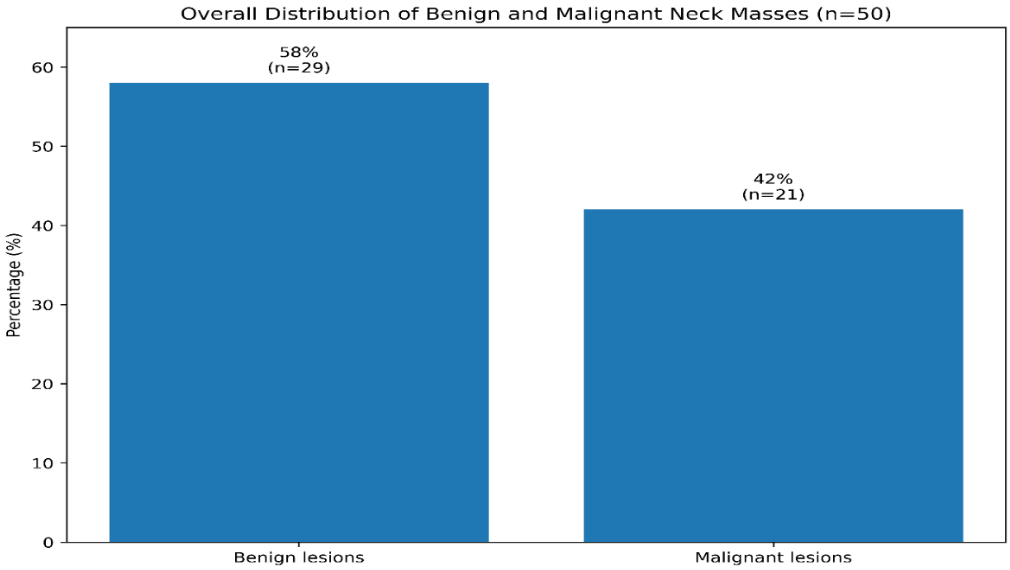

Figure 3: Overall distribution of bengn and malignant neck masses (n=50)

Interpretation: Benign lesions constituted the larger diagnostic group, representing 58% of all neck masses, whereas malignant lesions accounted for a substantial 42%. Abscess, lymph-node mass, and lymphangioma were prominent benign entities, while carcinoma and malignant nodal disease formed important malignant diagnoses. The presence of a considerable malignant proportion emphasizes the clinical importance of detailed MDCT characterization and cytological correlation, enabling timely differentiation between non-neoplastic or benign conditions and lesions requiring definitive oncological evaluation.

Table 4: Key MDCT Characteristics According to Benign and Malignant Lesions (n = 50)

MDCT Feature	Benign (n = 29)	Malignant (n = 21)	p-value
Ill-defined margin	9 (31.0%)	18 (85.7%)	**<0.05**
Heterogeneous enhancement	19 (65.5%)	17 (81.0%)	**<0.05***
Necrosis	6 (20.7%)	7 (33.3%)	**<0.05**
Adjacent-space invasion	12 (41.4%)	14 (66.7%)	>0.05
Vascular invasion	5 (17.2%)	6 (28.6%)	>0.05
Bone erosion	1 (3.4%)	7 (33.3%)	**<0.05**

Statistically Significant at $p < 0.05$

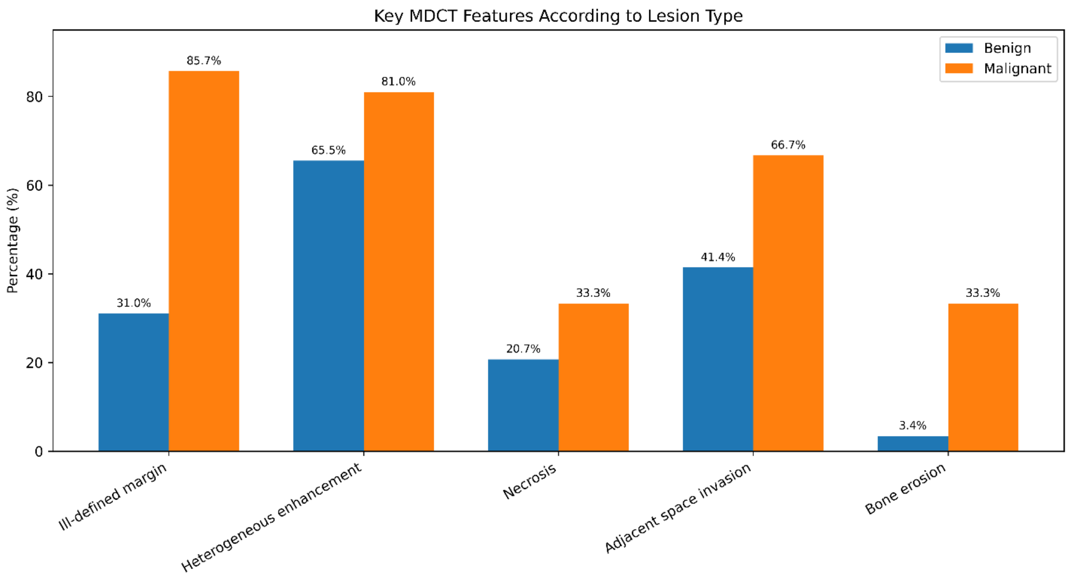

Figure 4: Key MDCT features according to lesion type

Interpretation: Several MDCT characteristics showed clear discriminatory value between benign and malignant lesions. Ill-defined margins were markedly more common among malignant masses (85.7%), while heterogeneous enhancement was also prominent in malignancy (81%). Necrosis, adjacent-space invasion, vascular involvement, and particularly bone erosion occurred more frequently among malignant lesions. Significant associations observed for margins, enhancement pattern, necrosis, and bone erosion demonstrate the usefulness of MDCT morphological criteria in strengthening radiological differentiation of malignant from benign cervical masses.

Table 5: Diagnostic Performance of MDCT in Prediction of Neck Masses - (n = 50)

Diagnostic Parameter	Performance (%)
Sensitivity	95.2
Specificity	100
Positive Predictive Value (PPV)	100
Negative Predictive Value (NPV)	96.6

Statistically Significant at $p < 0.05$

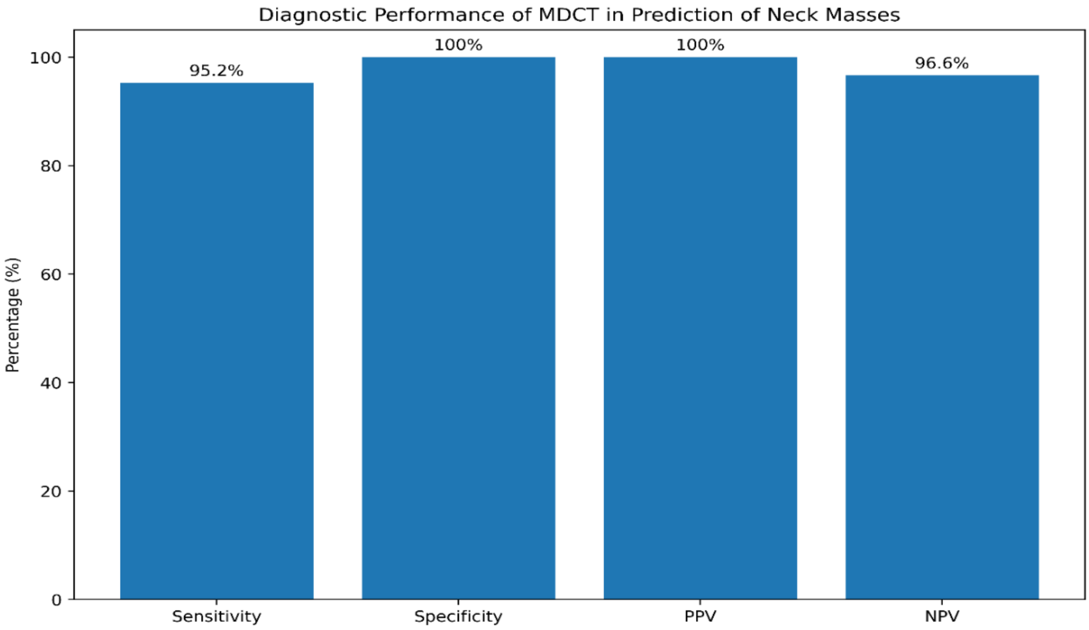

Figure 5: Statistically of MDCT in prediction of neck massess

Interpretation: MDCT demonstrated excellent diagnostic performance in the evaluation of neck masses, achieving a sensitivity of 95.2%, specificity of 100%, positive predictive value of 100%, and negative predictive value of 96.6%.

The complete specificity and PPV indicate particularly strong performance in correctly identifying the relevant diagnostic category without false-positive classification in the study dataset. These findings strongly support MDCT as a reliable imaging technique for characterization of neck masses when appropriately correlated with cytological and clinical findings.

Discussion

The present study demonstrates the substantial diagnostic utility of multidetector computed tomography (MDCT) in evaluating neck masses and differentiating benign from malignant lesions. Among the 50 patients evaluated, the visceral space was the most frequently involved compartment (40%), followed by the parapharyngeal space (18%). Accurate knowledge of normal cervical anatomy is fundamental for such compartment-based localization, because assessment of fascial planes, muscular landmarks, aerodigestive structures, and cervical spaces substantially improves interpretation of cross-sectional images. [21] The postcricoid region and cervical oesophagus also require careful anatomical assessment because subtle distortion or extension into these structures may influence lesion characterization and staging. [22] In this series, benign lesions constituted 58% and malignant lesions 42% of cases. Abscess was the most common benign lesion, whereas carcinoma predominated among malignant lesions. The infrahyoid neck contains several closely related visceral and vascular structures, and appropriate anatomical localization facilitates identification of the likely tissue of origin. [23] Thyroid-related lesions formed an important component of the diagnostic spectrum, emphasizing the usefulness of cross-sectional evaluation of thyroid morphology, enhancement, regional extension, and its relationship with surrounding tissues. [24]

Radioisotopic techniques remain valuable for functional thyroid and parathyroid assessment, although anatomical imaging provides complementary structural information. [25] Similarly, ultrasound and other imaging approaches contribute to thyroid and parathyroid characterization, while MDCT is particularly useful where assessment of deep extension or adjacent structures is required. [26]

Morphological characteristics showed clinically meaningful differences between lesion categories. Malignant masses more commonly exhibited ill-defined margins, heterogeneous enhancement, necrosis, adjacent-space invasion, vascular involvement, and bone erosion. Significant associations were observed for margins, enhancement pattern, necrosis, and bone erosion, reinforcing the value of combined morphological criteria rather than reliance on a single imaging sign. Salivary gland lesions also require systematic evaluation of internal architecture, enhancement, calcification, and surrounding tissue involvement. [27] CT has long been recognized as valuable for depicting major salivary glands and defining the extent of associated lesions. [28] Most importantly, MDCT achieved 95.2% sensitivity, 100% specificity, 100% positive predictive value, and 96.6% negative predictive value in this study.

These findings support MDCT as a highly effective modality for precise localization, characterization, assessment of local extension, and differentiation of neck masses, particularly when imaging findings are integrated with cytological evaluation for confident diagnosis and appropriate therapeutic planning.

Implications for Clinical Practice: The findings support incorporating MDCT as a valuable cross-sectional imaging modality in the systematic evaluation of patients presenting with neck masses. Its ability to accurately localize lesions, characterize internal morphology, identify necrosis and enhancement patterns, and demonstrate vascular, osseous, or adjacent-space involvement can strengthen diagnostic confidence and guide subsequent management.

When integrated with cytological assessment, MDCT may facilitate differentiation of benign and malignant lesions, selection of appropriate biopsy sites, assessment of tumour extent, and informed surgical or oncological planning. The high diagnostic performance observed further supports its practical clinical application.

Limitations: The present study has certain limitations that should be considered while interpreting its findings. The relatively small sample size of 50 patients and single-centre design may limit broader generalization of the observations. Cytological correlation was performed wherever applicable; therefore, uniform pathological confirmation was not available for every lesion. Additionally, the cross-sectional design did not permit assessment of long-term clinical or treatment outcomes. Nevertheless, the study provides clinically meaningful evidence supporting MDCT for systematic characterization and diagnostic evaluation of diverse neck masses.

Conclusion

The present study establishes MDCT as a valuable and reliable imaging modality for the comprehensive evaluation of neck masses. Its ability to precisely localize lesions and characterize margins, density, enhancement, necrosis, calcification, bone erosion, and adjacent structural involvement facilitates effective differentiation between benign and malignant pathologies. The observed 95.2% sensitivity and 100% specificity further demonstrate its strong diagnostic performance. Integration of MDCT findings with cytological assessment enhances diagnostic confidence and supports appropriate biopsy selection, assessment of disease extent, therapeutic planning, and timely clinical management of patients presenting with neck masses.

Acknowledgment: The authors sincerely acknowledge the valuable support and cooperation extended by the Department of Radiodiagnosis, Basaveshwara Medical College and Hospital, Chitra Durga, throughout the conduct of this study. We express our gratitude to the institutional authorities, faculty members, radiology technicians, laboratory personnel, and supporting staff whose contributions facilitated systematic imaging evaluation and cytological correlation. Special appreciation is extended to all study participants for their consent, cooperation, and valuable contribution to the research. The authors also acknowledge the guidance provided during data collection, interpretation, statistical analysis, and preparation of the manuscript, which contributed significantly to the successful completion of this scientific work.

References

1. Mancuso AA, Dillon WP. The neck. Radiol Clin North Am. 1989;27(2):407-33.
2. Rydberg J, Buckwalter KA, Caldemeyer KS, et al. Multisection CT: scanning techniques and clinical applications. Radiographics. 2000;20 (6):1787-806.

3. Imhof H, Czerny C, Dirisamer A. Head and neck imaging with MDCT. Eur J Radiol. 2003;45 Suppl 1:S23-31.
4. Vogl TJ. Cervical adenopathy and neck masses.
5. Haaga JR, et al., editors. CT and MRI of the whole body. Vol. 1. 5th ed. Philadelphia: Mosby Elsevier; 1993. p. 639-67.
6. Reibel JF. The patient with a neck mass. Compr Ther. 1997;23:737-41.
7. Charan I, Kapoor A, Kumar N, Jagawat N, Singhal MK, Kumar HS. Evaluation of neck mass with computed tomography: an observational study. Int J Sci Stud. 2014;2:118-22.
8. Stevens MH, Harnsberger HR, Mancuso AA, Davis RK, Johnson LP, Parkin JL. Computed tomography of cervical lymph nodes: staging and management of head and neck cancer. 1985;11:735-39.
9. Atula TS, Varpula MJ, Kurki TJ, Klemi PJ, Grenman R. Assessment of cervical lymph node status in head and neck cancer patients: palpation, computed tomography and low-field magnetic resonance imaging compared with ultrasound-guided fine-needle aspiration cytology. Eur J Radiol. 1997;25:152-61.
10. Shetty D, Jayade BV, Joshi SK, Gopalkrishnan K. Accuracy of palpation, ultrasonography, and computed tomography in the evaluation of metastatic cervical lymph nodes in head and neck cancer. Indian J Dent. 2015;6:121-24.
11. Gupta P, Satish K, Gopesh M, Vineeta R. Role of multislice spiral CT in the evaluation of nec k masses. J Int Med Sci Acad. 2013;26:51-54.
12. Harnsberger HR. Parapharyngeal space overview. In: Harnsberger HR, editor. Diagnostic imaging: head and neck. Altona, Canada: Amirsys; 2011.
13. Jindal U, Singh K, Baghla A, Kochhar A. Spectrum of neck swellings in the rural population of India based on fine needle aspiration findings. IJHNS. 2012;5(2):1-6.
14. Prasad KC, Sreedharan S, Chakravarthy Y, Prasad SC. Tuberculosis in the head and neck: experience in India. J Laryngol Otol. 2007;121(10):979-85.
15. Gupta P, Bhargava SK, Mehrotra G, Rathi V. Role of multi-slice spiral CT in the evaluation of neck masses. J Int Med Sci Acad. 2013;26(1):51-4.
16. Sankaranarayanan R, Masuyer E, Swaminathan R, et al. Head and neck cancer: a global perspective on epidemiology and prognosis. Anticancer Res. 1998;18:4779-86.
17. Kovács G, Martinez-Monge R, Budrukkar A, et al. GEC-ESTRO ACROP recommendations for head and neck brachytherapy in squamous cell carcinomas: first update—improvement by cross-sectional imaging-based treatment planning and stepping source technology. Radiother Oncol. 2017;122:248-54.
18. Branstetter BF. Pertinent CT anatomy of the neck for interpreting PET/CT. PET Clin. 2007;2(4):423-32.
19. Branstetter BF, Weissman JL. Normal anatomy of the neck with CT and MR imaging correlation. Radiol Clin North Am. 2000;38(5):925-40.
20. Woodson GE. Anatomy of the neck and larynx. In: Meyerhoff W, Rice D, editors. Otolaryngology-head and neck surgery. Philadelphia: WB Saunders; 1992. p. 667.
21. Williams DW. An imager's guide to normal neck anatomy. Semin Ultrasound CT MR. 1997;18(3):157-81.
22. Schmalfuss IM, Mancuso AA, Tart RP. Postcricoid region and cervical esophagus: normal appearance at CT and MR imaging. Radiology. 2000;214(1):237-46.
23. Weissman JL. The infrahyoid neck. In: Valvassori G, Mafee M, Carter B, editors. Imaging of the head and neck. 2nd ed. New York: Thieme Medical Publishers; 1995. p. 424.
24. Weber AL, Randolph G, Aksoy FG. The thyroid and parathyroid glands. Radiol Clin North Am. 2000;38(5):1105-29.
25. Price DC. Radioisotopic evaluation of the thyroid and the parathyroids. Radiol Clin North Am. 1993;31(5):991-1015.
26. Hopkins C, Reading CC. Thyroid and parathyroid imaging. Semin Ultrasound CT MR. 1995;16(4):279-95.
27. Rastogi R, Bhargava S, Mallarajapatna GJ, Singh SK. Pictorial essay: salivary gland imaging. Indian J Radiol Imaging. 2012;22(4):325-33.
28. Bryan R, Miller R, Ferreyro R, Sessions R. Computed tomography of the major salivary glands. AJR Am J Roentgenol. 1982;139(3):547-54.