

A Cross-Sectional Study to Assess the Role of Ultrasound for Evaluating Adult Neck MassesNirvan Sharma¹, Bijendar Kumar², Dr Praveen Singhal³, R.C.Yadav⁴¹Post Graduate Student, Department of Radiodiagnosis, NIMS & R, Jaipur²Associate Professor, Department of Radiodiagnosis, NIMS & R, Jaipur³Assistant Professor, Department of Radiodiagnosis, NIMS & R, Jaipur⁴Professor, Department of Radiodiagnosis, NIMS & R, Jaipur

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Conflict of interest: Nil

Abstract**Introduction:** In clinical practice, neck masses in adults are a common occurrence. High-resolution ultrasonography plays a crucial role in the diagnostic process for these masses. This study was conducted to assess the effectiveness of high-resolution ultrasonography in the evaluation of neck masses.**Material and Methods:** This study was conducted in the Department of Radio diagnosis in coordination with the Departments of E.N.T, Surgery, Department of Oncology and Pathology at the National Institute of medical sciences and research and its teaching hospital. A total of 50 patients with palpable neck masses were included in our study.**Results:** A total of 64 patients with a visible or palpable neck mass and had ultrasound as part of their work up met inclusion criteria; 40 were female, and 24 were male with an average age of 46 ± 16 years. The study population consisted of 76.6% from rural area and the rest 23.44% from urban settlements as the study setting, NIMS Hospital is established in rural background. Malignancy was diagnosed in 22 patients through FNA, core or open biopsies. The remaining 42 patients were classified as having benign etiologies either through tissue sampling ($n = 18$) or clinical impression and follow up ($n = 24$).**Conclusion:** In our research, patients who came in with a noticeable or tactile neck lump could circumvent the need for cross-sectional imaging or tissue biopsy, provided the ultrasound showed characteristics indicative of non-malignant pathology. These findings imply that ultrasound can serve as a valuable tool in the preliminary assessment and treatment plan for adults who present with a neck lump.**Keywords:** Ultrasound, Tissue Sampling, Malignant, Cervical Adenopathy, Biopsy.This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

Neck masses frequently lead patients to seek medical attention at otolaryngology clinics. In the adult population, a persistent neck mass is often indicative of cancer, making it crucial to approach such cases with a presumption of malignancy until proven otherwise. This is particularly important as delayed diagnosis and treatment can negatively impact patient outcomes [1]. It has been reported that the average time from the initial presentation of a neck mass to the diagnosis of head and neck squamous cell carcinoma (HNSCC) is between 3 to 6 months [2].

In 2017, the American Academy of Otolaryngology (AAO) issued evidence-based guidelines to prevent diagnostic and treatment delays in adults presenting with neck masses. These guidelines provide detailed, actionable steps for patient evaluation, aiming to facilitate efficient and accurate diagnosis

of potentially malignant neck masses [3]. For patients with certain risk factors or neck mass characteristics, the guidelines recommend cross-sectional imaging or fine needle aspiration (FNA). While the benefits of early diagnosis of head and neck malignancies outweigh the risks of these procedures, there may be opportunities for incorporating additional low-risk diagnostic steps early in the evaluation process.

This study aims to evaluate the role of ultrasound in managing adults with palpable neck masses persisting for 2 weeks or more, who are seen in the Otolaryngology clinic. This patient characteristic is identified in the AAO guidelines as a feature associated with an increased risk of malignancy, warranting a CT scan or FNA. Ultrasound, in contrast to CT, avoids radiation exposure and carries minimal risk. It may also provide diagnostic

details suggesting benign pathology, potentially eliminating the need for further invasive procedures. We hypothesize that ultrasound can play a significant role in this context. Moreover, concerning findings on ultrasound may expedite referral or tissue sampling.

This study was conducted to assess the effectiveness of high-resolution ultrasonography in the evaluation of neck masses.

Method:

A retrospective analysis was conducted on patients aged 18 and above who visited the Otolaryngology clinic at a single academic institution between November 2021 and November 2023, presenting with a neck mass visible or palpable for more than two weeks. The chosen time frame was to ensure a lengthy follow-up period. Initial identification of potential patients was through the ICD-10 diagnosis code R22.1 (localized swelling, mass and lump, neck) or R59 (enlarged lymph nodes).

The patient's chart was then reviewed to confirm that they were evaluated within the specified time frame with a visible or palpable neck mass on examination and had undergone an ultrasound exam as part of their diagnostic process. Patients who had imaging before the Otolaryngology evaluation were included, but those who had already received a definitive pathologic diagnosis were excluded. Patients with a history of prior head and neck malignancy, primary salivary gland or thyroid lesion were also excluded.

Data on patient demographics, tobacco use, and mass size were recorded. The sonographic features of the neck masses documented in the chart were collected, along with other imaging results including neck CT and MRI, if performed. In cases where tissue samples were obtained from FNA, core needle or open biopsy techniques, the pathologic diagnosis was collected.

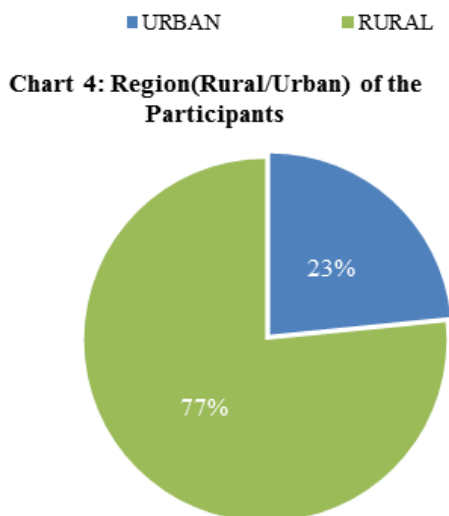
For ultrasound and ultrasound-guided FNA performed in our clinic, a VOLUSON 730 pro and VOLUSON S6 models machine with a 12.5 MHz linear array probe was used, and was performed by postgraduate residents of NIMS Hospital. If FNA was performed, the overlying skin was marked with a surgical pen and the skin was thoroughly cleaned with alcohol. Two percent of lidocaine with epinephrine was injected along the expected biopsy tract. The FNA was performed using a 25-gauge needle under ultrasound guidance.

Patients were stratified into two groups based on pathologic or clinical diagnosis of their neck mass: malignant and benign. Paired t-test was used to determine the significance of age and mass size, while chi-squared was used to determine the significance of gender and tobacco use between patients with benign and malignant pathologies. The study site Institutional Review Board approved this study.

Result:

Table 1 Region wise Distribution of the Participants

S.No	Age Distribution	No.of cases	Percentage (%)
1	Rural	49	76.56
2	Urban	15	23.44
	Total	64	100.00



A total of 64 patients with a visible or palpable neck mass and had ultrasound as part of their work up met inclusion criteria; 40 were female, and 24 were male with an average age of 46 ± 16 years. The study population consisted of 76.6% from rural area and the rest 23.44% from urban settlements as the study setting, NIMS Hospital is established in rural background. Malignancy was diagnosed in 22 patients through FNA, core or open biopsies. The remaining 42 patients were classified as having benign etiologies either through tissue sampling ($n = 18$) or clinical impression and follow up ($n = 24$)

Malignant Neck Masses

Of the 22 patients diagnosed with malignancy, 12 of 22 (54.5%) were male, 12 (83.3%) had a history of tobacco use, and the average age was 60 ± 18 years. The average size of the masses was 3.25 ± 1.1 cm (Table 2). Prior to the Otolaryngology consult visit, Nine of the 22 patients had already completed an ultrasound, five had a CT neck, and two had both CT neck and ultrasound. 68.7% of malignant neck mass patients were noted to be tobacco users.

Table 2 Demographic Distribution with frequency of Benign and Malignant Disease

		Benign disease	Malignant disease	Total	p
		n = 42	n = 22	n = 64	
Age	Age, years	42 ± 14	58 ± 16	46 ± 16	<0.001
Sex	Male	55.6%	42.1%	53.6%	0.35
	Female	44.4%	57.9%	46.4%	
Tobacco use	Tobacco use rate (%)	52.4%	68.7%	58.9%	0.42
Average size of mass	Centimeters	2.2 ± 1.4	3.25 ± 1.1	2.56 ± 1.3	0.18

Table 3 High Resolution Ultrasound findings in cases with benign and malignant masses

	Benign disease		Malignant disease	
	n = 42	Percentage(%)	n = 22	Percentage(%)
Hypochoic	15	35.71	10	45.45
Oval	14	33.33	2	9.09
Round	3	7.14	3	13.64
Echogenic Hilum	18	42.86	2	9.09
No Echogenic Hilum	3	7.14	6	27.27
“Reactive or benign appearing”/ “Morphologically normal”	9	21.43	0	0.00
Abnormal ultrasound findings a	7	16.67	12	54.55

a* - Abnormal ultrasound results refer to ultrasound scans that exhibit any of the following characteristics: a circular form, absence of an echogenic hilum, necrosis, presence of calcifications, cystic features, unusual blood vessel patterns, thickened cortex, "matted nodes," appearances indicative of pathology, pathologically enlarged structures, indications suggestive of cancer or metastasis, "suspicious" findings, "abnormal morphology," and a "loss of normal architecture."

Benign neck masses

Forty two patients were diagnosed with benign disease; 12 (28.6%) were male, 22(52.4%) had a history of tobacco use. The average age for these patients was 42 ± 14 years and average size of the masses was 2.2 ± 1.4 cm (Table 2). Ultrasonographic features found in this group were varied given the multiple diagnoses, with 7 (16.7%) patients having abnormal ultrasound findings

Discussion

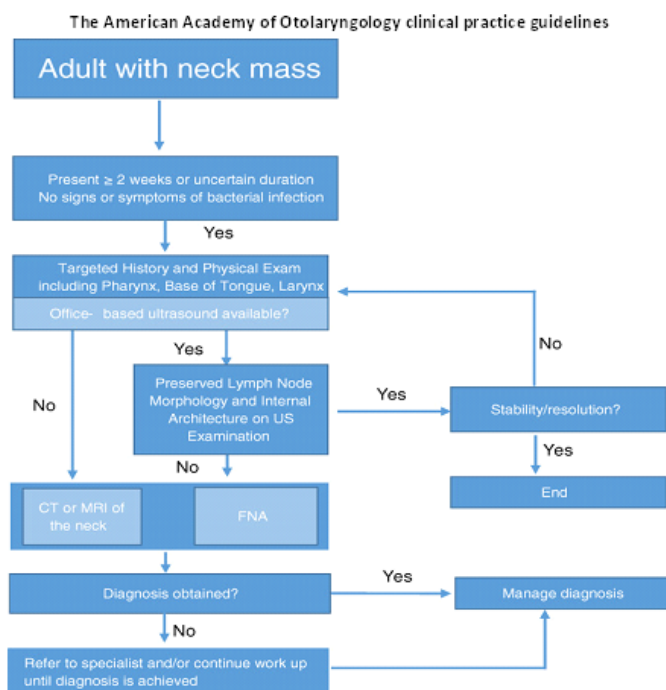
The study you're referring to suggests that ultrasound can be a valuable tool in the initial evaluation and management of adults presenting with a neck mass. In this study, approximately one third of patients were able to avoid cross-sectional imaging and/or tissue sampling when ultrasound demonstrated features consistent with benign pathology [2].

Ultrasound is a cost-effective, safe, and non-invasive imaging modality that can provide valuable information about the nature of a neck mass. It can help differentiate between solid and cystic masses, and can also provide information about the vascularity of the mass [4]. Ultrasound can also guide fine-needle aspiration (FNA) or biopsy procedures, which can provide a definitive diagnosis. [4]

The American Academy of Otolaryngology clinical practice guidelines recommend cross-sectional imaging or fine needle aspiration for any neck mass

in an adult that persists beyond 2 weeks that is not convincingly related to a bacterial infection⁵. However, this study suggests that if ultrasound

findings are consistent with benign pathology, some patients may safely avoid further invasive procedures or imaging. [2]



It's important to note that while ultrasound can provide valuable information, it may not be sufficient in all cases. For example, cross-sectional imaging with CT or MRI can provide more precise localization of the mass and can accurately assess tumors and inflammation [5]. Furthermore, the sensitivity and specificity of ultrasound in diagnosing cervical lymph node metastases are approximately 89-95% and 80-95% respectively, indicating that there can be difficulties in differentiating between enlarged nodes of lymphoid hyperplasia and enlarged metastatic nodes [4].

A limitation of ultrasound technology is its reliance on the operator's proficiency and subjective interpretation of the ultrasonographic findings. Moreover, the lack of a standardized reporting protocol for ultrasound findings can lead to ambiguous results, often suggesting a mass is pathological without specifying its particular characteristics, as we found in our record review. Other patient-related factors such as age, gender, mass size, and tobacco use history may also impact the overall interpretation of the ultrasound examination. However, in our research, we found no significant disparity in these aspects between the benign and malignant groups, except for the patient's age.

Despite the encouraging findings of our study, it is constrained by a small sample size and its retrospective design. The outcomes may not be

applicable to settings where Otolaryngologists lack experience in cervical ultrasonography and ultrasound-guided Fine Needle Aspiration (FNA), or for studies conducted by radiologists with diverse levels of expertise.

Conclusion

The study findings imply that ultrasound can serve as a valuable tool in the preliminary assessment and treatment plan for adults who present with a neck lump.

In conclusion, while ultrasound can play a useful role in the initial evaluation and management of adults presenting with a neck mass, the decision to use ultrasound alone or in combination with other diagnostic tools should be made on a case-by-case basis, considering the patient's history, clinical presentation, and ultrasound findings.

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