Original Article

Ultrasound-Guided Fine-Needle Aspiration Cytology of Head and Neck Masses: Experience in Ado-Ekiti, Southwestern Nigeria

Abidemi Emmanuel Omonisi, Olufunso Simisola Aduayi[1], John Adetunji Omotayo, Ganiyu Olusola Akanbi[1], Olusola Olusoga Akute[2]

Departments of Anatomic Pathology, [1]Radiology and [2]Surgery, College of Medicine, Ekiti State University, Ado-Ekiti, Ekiti State, Nigeria

Abstract

Background: A multidisciplinary approach to the evaluation of head and neck masses is crucial to achieving optimum patient care and enhancing diagnostic accuracy for definitive treatment. This is exemplified by the clinical and radiopathologic correlation of head and neck masses subjected to diagnostic evaluation using ultrasound-guided fine-needle aspiration cytology (FNAC) in a tertiary health institution. **Subjects and Methods:** A prospective study was carried out on 51 patients with head and neck lesions referred to the FNAC Clinic of the Department of Anatomic Pathology of Ekiti State University Teaching Hospital, Ado-Ekiti, Nigeria. The study was conducted over a period of 2 years between February 2014 and January 2016. The FNAC was done under imaging guidance with a 7.5 MHz ultrasound probe. Clinical, radiological, and pathological findings were correlated. The data were analyzed using SPSS version 15. **Results:** The study population consisted of 12 (23.5%) males and 39 (76.5%) females. The age range was 2–80 years with a mean age of 44.7 ± 18.4 years. A significant proportion (80.4%) of the masses was located in the anterior neck. Multinodular goiter (n = 22, 43.1%) was the predominant clinical diagnosis. On ultrasonography, the predominant echotexture of the masses was heterogeneous (n = 29, 56.9%), only 4 (7.84%) of the masses had internal calcifications while the predominant composition of the masses was a mixture of solid and cystic portions (n = 30, 58.8%). There was a strong radiopathologic correlation (Spearman correlation value of 0.910). **Conclusion:** Ultrasound-guided FNAC of head and neck masses provides a synergistic approach to patient care and should be encouraged in our setting for optimum diagnostic yields.

Keywords: *Fine-needle aspiration cytology, neck masses, ultrasonography*

Introduction

Fine-needle aspiration cytology (FNAC) of head and neck masses are routinely done blindly (without imaging guidance) in most centers in our part of the world. The anatomic pathologists in our setting usually examine these head and neck masses clinically and relate to surface anatomical landmarks before performing the procedure blindly. This traditional method makes the complete assessment of the anatomical extent of involvement of the masses very difficult with the higher risk of penetrating neck vessels with its consequent risks of massive bleeding and death. This is contrary to what is practiced in the developed countries where the most head and neck masses are now referred for ultrasound-guided FNAC at the head and neck ultrasound-guided fine-needle aspiration clinic.[1-4] The assessment of the head and neck masses involves a detailed history and meticulous general and physical examinations. However, imaging particularly ultrasound is vital in assessing the detailed anatomical location and the extent of involvement for planning definitive treatment.[5]

Ultrasound-guided FNAC can be of great value in the evaluation of head and neck masses. Ultrasound reliably differentiates between solid and cystic lesions. Small lesions that may not be overtly palpable are better localized while large masses are better delineated. The location of masses and the relationship to adjacent anatomical structures can be assessed, and this helps to avert complications such as inadvertent entry into blood vessels around the neck. The incidence of wrong or inadequate tissue sampling by the pathologist is also minimized. Ultrasound-guided FNAC thus provides an avenue for the characterization of masses by both the radiologist and the

How to cite this article: Omonisi AE, Aduayi OS, Omotayo JA, Akanbi GO, Akute OO. Ultrasound-guided fine-needle aspiration cytology of head and neck masses: Experience in Ado-Ekiti, Southwestern Nigeria. Clin Cancer Investig J 2018;7:171-5.

Address for correspondence:
Dr. Olufunso Simisola Aduayi, Department of Radiology, College of Medicine, Ekiti State University, Ado-Ekiti, Ekiti State, Nigeria.
E-mail: faduayi@gmail.com

Access this article online

Website: www.ccij-online.org

DOI: 10.4103/ccij.ccij_87_17

Quick Response Code:

pathologist, and this translates to better patient care in the diagnostic arena.

The primary objective of this study is to use the triple approach of clinical examination, ultrasound, and FNAC under the ultrasound guidance to characterize lesions in patients presenting with head and neck masses. This is the first study to look at the role of ultrasonography in the management of head and neck lesions and its correlation with FNAC in our center.

Subjects and Methods

This is a prospective study carried out on 51 patients with head and neck lesions referred to the FNAC Clinic of the Department of Anatomic Pathology of Ekiti State University Teaching Hospital, Ado-Ekiti, Nigeria. The study was conducted over a 2-year period between February 2014 and January 2016. Ethical approval was obtained from the Institution's Ethical Clearance Committee.

The clinical history of symptoms related to head and neck masses such as dysphagia, movement of mass with swallowing or tongue protrusion, change in voice, painful swellings, and hyperdynamic manifestations were some of the common complaints documented in the request forms.

The image-guided minimally invasive FNAC of the head and neck masses were performed by an anatomic pathologist and a radiologist and the procedure was done on an outpatient basis. The patients were properly positioned on an examination couch with a pillow to support their necks to ensure adequate exposure and access to the area of interest. The neck was cleaned with methylated spirit. An ultrasound transducer with a small amount of sterile soluble gel was placed on the neck over the mass by the radiologist. Ultrasonography examinations of the masses were done using a 7.5 MHz linear ultrasound probe (GE Healthcare LOGIQ C5 Premium, USA). The ultrasonography examination of the head and neck masses were carried out with special interest on the site, outline, echogenicity, anatomical architecture, relationship to adjacent vessels (the common carotid artery and internal jugular vein), and surrounding strap muscles. The vessels were observed for pulsations, and Color Doppler interrogation was used for confirmation.

The pathologist then inserts the needle through the skin under the direct imaging guidance. Ultrasound-guided FNAC was done by freehand technique and without local anesthesia. The needle was inserted into the mass until the tip was sonographically visualized within the mass and aspiration was done. The aspirated material was expressed at least on two previously numbered glass slides, and thin smears were prepared. After the sampling, the needle was removed and new needles were re-inserted if additional samples were required. Several specimens may be needed occasionally for a complete analysis. Once the procedure was completed, the pressure was applied to the area to decrease the risk of bleeding. No suture was used. The procedure was usually completed in <35 min per patient evaluated.

The smears prepared as wet and air dry before staining with hematoxylin and eosin stains. The evaluation of the cytology was done with special reference to the adequacy of sampling and nature of cellular yield. The cytological diagnosis was done independently. The final diagnosis of the head and neck lesion was offered comprehensively and on critical evaluation of clinical, ultrasonography, and cytological findings. The correlation of ultrasound diagnosis and cytological diagnosis was done, and data were analyzed using Statistical Package for Social Sciences for windows, version 15. (Chicago, SPSS Inc).

Results

A total of 51 patients were recruited into the study over a period of 2 years, out of which males were 12 (23.5%) and females were 39 (76.5%). The age range was 2–80 years with a mean age of 44.7 ± 18.4 years. The age group of 51–60 years (n = 14, 27.4%) constituted the majority [Table 1]. A significant proportion (80.4%) of the masses were located in the anterior neck, 17.6% were submandibular in location while 2.0% were located in the posterior lower neck region. Multinodular goiter (n = 22, 43.1%) was the predominant clinical diagnosis [Table 2].

On ultrasonography, the predominant echotexture was heterogeneous (n = 29, 56.9%), only 4 (7.84%) of the masses had internal calcifications while the predominant composition of the masses was a mixture of solid and cystic portions (n = 30, 58.8%). The final ultrasound diagnosis showed that most of the masses were multinodular goiters (n = 25, 49.0%) [Table 3].

The FNAC diagnosis showed that out of 51 cases, 43 (84.3%) were benign, 4 (7.84%) were malignant and FNAC could not be done in 4 (7.84%) of the cases. The FNAC could not be done successfully in four cases with anterior neck masses, in three of such instances the procedure was discontinued due to the proximity of the mass to the common carotid artery while it was also discontinued in a fourth anxious patient who complained of difficulty with breathing after the first attempt at FNAC. Hence, out of the 51 patients, recruited into the study, only 47 patients had FNAC successfully completed with results.

There was a strong radiopathologic correlation of the ultrasonography [Figures 1 and 2] and cytology [Figures 3 and 4] features of the masses (Spearman correlation value of 0.910) [Table 4].

Discussion

The neck region is divided into anterior and posterior triangles by the sternocleidomastoid muscle.[6] The anterior triangle extends from the inferior border of the mandible to the sternum below and is bounded by the midline and the

Table 1: Sociodemographic characteristics

Variables	Mean±SD
Age (years)	44.7±18.4
Variables	**Frequency distribution (%)**
Age group (years)	
<20	6 (11.8)
21-30	2 (3.9)
31-40	11 (21.6)
41-50	10 (19.6)
51-60	14 (27.4)
61-70	3 (5.9)
71-80	5 (9.8)
Sex	
Male	12 (23.5)
Female	39 (76.5)

SD: Standard deviation

Table 2: Clinical diagnosis

	Frequency (%)
Multinodular goiter	22 (43.1)
Thyrotoxicosis	1 (2.0)
Suspected thyroid malignancy	6 (11.8)
Neck swelling	2 (3.9)
Thyroglossal cyst	1 (2.0)
Graves diseases	1 (2.0)
Submandibular lymphadenopathy	2 (3.9)
Toxic goiter	2 (3.9)
Cervical lymphadenopathy	3 (5.9)
Lymphoma	3 (5.9)
Euthyroid goiter	1 (2.0)
Thyroid mass ? infected	4 (7.8)
Diffuse goiter	1 (2.0)
Lymphadenitis	1 (2.0)
Lipoma	1 (2.0)
Total	51 (100.0)

sternocleidomastoid muscle. The posterior triangle extends backward to the anterior border of trapezius muscle and inferiorly to the clavicle. The upper part of anterior triangle is commonly subdivided into the submandibular triangle above the digastric muscle and the submental triangle below.[1] Various benign and malignant lesions are found in the neck region involving the thyroid, salivary glands, lymph nodes, upper aero-digestive tract (throat), skin, various cysts, and soft tissues.[7-9]

In tertiary health facilities such as ours with specialists in surgery, anatomic pathology, and radiology, the setting provides an enabling environment for proper clinical and radio-pathologic appraisal of head and neck masses.

In this present study, most of the patients (27.4%) were within the 51–60 years of age group and the mean age was 44.7 years. Majority of our patients were females (76.5%). In a similar study by Surapaneni *et al*.,[10] the neck lesions were predominant in the females (67.2%), consistent with

Table 3: Ultrasound findings and diagnosis

Variable	Frequency distribution (%)
USS findings	
Echotexture	
Hypoechoic	5 (9.8)
Isoechoic	1 (2.0)
Hyperechoic	13 (25.4)
Heterogeneous	29 (56.9)
Anechoic	3 (5.9)
Calcification	
No	47 (92.2)
Yes	4 (7.8)
Composition of lesion	
Cystic	4 (7.8)
Solid	17 (33.3)
Mixed	30 (58.8)
USS diagnosis	
Multinodular goiter	25 (49.0)
Diffuse goiter	5 (9.8)
Mitotic thyroid mass	2 (3.9)
Lymphadenopathy	10 (19.6)
Infected thyroid cyst	2 (3.9)
Thyroglossal cyst	1 (2.0)
Solitary thyroid nodule	2 (3.9)
Lymphoma	1 (2.0)
Suspicious thyroid mass	3 (5.9)

USS: Ultrasonography scan

Table 4: Radiopathologic correlation of the masses

	FNAC diagnosis			Total
	Benign	Malignant	Not done	
USS diagnosis				
Benign	43	0	1	44
Malignant	0	2	0	2
Indeterminate	0	2	3	5
Total	43	4	4	51

Spearman correlation: 0.910. FNAC: Fine-needle aspiration cytology, USS: Ultrasonography scan

the finding in our study. However, the median age group in the Surapaneni *et al*.[10] study involved the 21–30 years of age group, representing the younger population unlike the findings in our study which involved the older population.

In this study, majority of the neck lesions were located in the anterior neck region, and the most common site of pathologies in the neck was the thyroid gland. These findings are in agreement with the findings by Popat *et al*.[11] which reported that the anterior neck is a home to a large number of pathological lesions which includes congenital, inflammatory/infective and neoplastic lesions. Popat *et al*.[11] also reported that the most common site of pathologies in the neck in their study was the thyroid gland. However, majority of their cases were slightly predominant in the males (52.4%) when compared with our study where 23.5% of our cases were males.

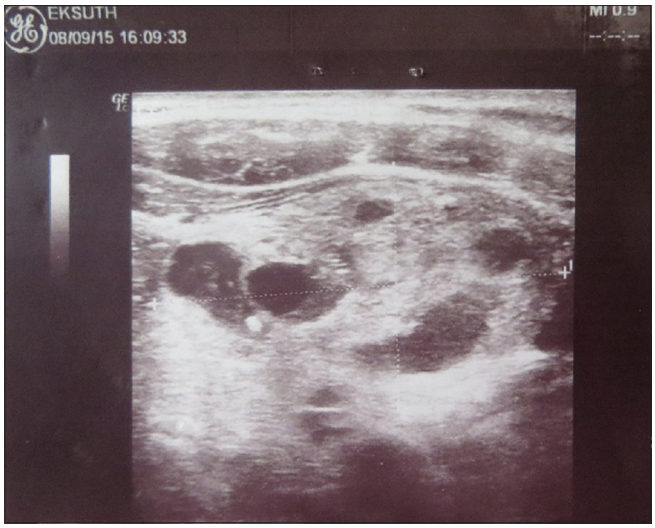

Figure 1: Ultrasonography scan showing an enlarged left lobe of the thyroid gland with heterogeneous parenchymal echotexture, nodules, and cystic portions consistent with multinodular goiter

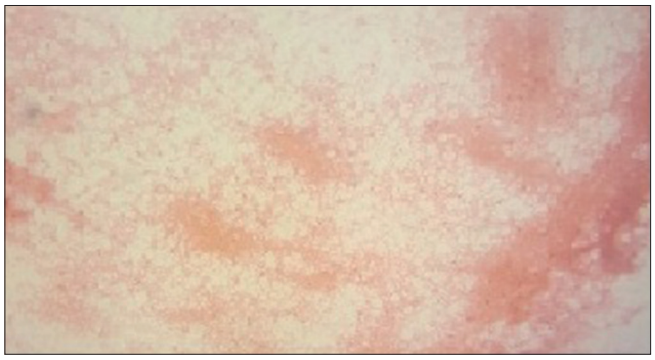

Figure 3: The corresponding photomicrograph of the thyroid gland in Figure 1 shows widespread area of hemorrhage with inconspicuous epithelial cells (H and E, ×10)

Nodular enlargement of the thyroid was the most common clinical indication for referring patients to our FNAC Clinic. Panchal *et al*.[12] also reported that nodular enlargement of the thyroid gland constituted the most common indication in their series. However, in contrast to our findings, Ahmad *et al*.[13] in their series, reported tuberculous lymphadenitis as the most common problem in patients who presented with neck swellings at the surgical outpatient in their setting.

Majority of the lesions in our study were heterogeneous in echotexture, and the composition was mixed, having both solid and cystic components. Calcifications were only seen in 7.8% of the lesions. Thapa[14] in his series, however, reported hypoechoic echotexture as the most common ultrasound finding. Majority of his cases also have no calcification and mixed solid, and cystic lesions were the most common lesions in his findings and these are consistent with the findings in our study.

Nodular goiter was the most common ultrasound diagnosis in this study. This finding is consistent with findings in

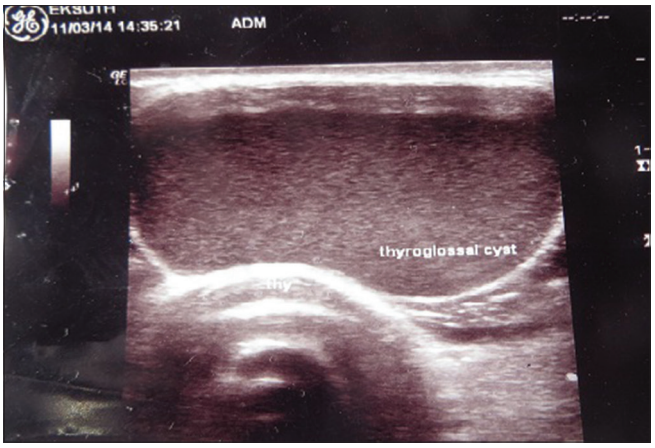

Figure 2: Ultrasonography scan showing a thick walled cystic centrally located anterior neck mass containing medium level internal echoes consistent with a thyroglossal cyst

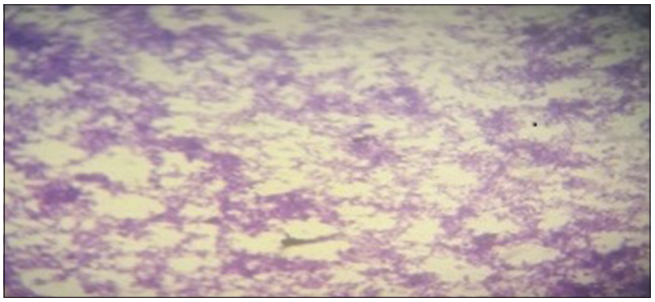

Figure 4: The corresponding photomicrograph of the neck mass in Figure 2 shows essentially fibrillary network with very scanty epithelial cells consistent with a benign lesion (Papanicolaou stain ×100)

studies by Hoang *et al*.[15] and Bonavita *et al*.[16] which also reported nodular goiter as the most commonly sonographically diagnosed lesion in their series.

The ultrasonography features associated with the malignancy of the head and neck masses include nodule hypoechogenicity, presence of microcalcifications, increased vascular flow, irregular borders, and the absence of a halo.[17-19] Out of the three cases in this study with an ultrasound diagnosis of suspicious thyroid mass, two were finally diagnosed by the pathologist as malignant thyroid lesions. This demonstrates the diagnostic synergy that can be obtained through radiopathologic evaluation of masses. The third case with an ultrasound diagnosis of suspicious thyroid could not be successfully subjected to pathological appraisal through FNAC because the edge of the nodule of interest was abutting the common carotid artery and a high risk of bleeding was envisaged.

Interestingly, there was a strong radiopathologic correlation observed in this study. This finding is similar to the findings of Heller *et al*.,[20] who also reported a strong correlation between the ultrasound findings and the findings on the cytology.

FNAC has shown over the decades to be a valuable procedure in the diagnostic evaluation and patients of

patients with head and neck lesions. However, combining this procedure with ultrasound examination will greatly reduce the rates of inadequate sampling as shown in this study. There was no single case of inadequate sampling reported in our series. Furthermore, the concordant findings by both the radiologist and the pathologist will guide appropriate management and avoid other unnecessary tests.

Conclusion

Imaging for neck masses is frequently performed in a routine radiology practice, but on the contrary, there are very few centers in Nigeria, where ultrasound-guided FNAC of neck masses are done routinely. We found this technique to be a very useful, safe, cost-effective, and reasonably accurate diagnostic tool in the assessment of neck masses. This procedure provides a synergistic approach to patient care and should be encouraged in our setting for optimum diagnostic yields. We recommend the routine use of ultrasound-guided FNAC for the assessment of neck masses in Nigeria.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. McIvor NP, Freeman JL, Salem S, Elden L, Noyek AM, Bedard YC. Ultrasonography and ultrasound-guided fine-needle aspiration biopsy of head and neck lesions: A surgical perspective. Laryngoscope 1994;104:669-74.
2. Baatenburg de Jong RJ, Rongen RJ, Verwoerd CD, van Overhagen H, Laméris JS, Knegt P, *et al.* Ultrasound-guided fine-needle aspiration biopsy of neck nodes. Arch Otolaryngol Head Neck Surg 1991;117:402-4.
3. Siegert R, Küppers P, Barreton G. Ultrasonographic fine-needle aspiration of pathological masses in the head and neck region. J Clin Ultrasound 1992;20:315-20.
4. Ganguly A, Giles TE, Smith PA, White FE, Nixon PP. The benefits of on-site cytology with ultrasound-guided fine needle aspiration in a one-stop neck lump clinic. Ann R Coll Surg Engl 2010;92:660-4.
5. Ahuja A, Ying M. Sonography of neck lymph nodes. Part II: Abnormal lymph nodes. Clin Radiol 2003;58:359-66.
6. Howard DJ, Lund-Pharynx VJ. Larynx and neck. In: Russell RC, Williams NS, Bulstrode CJ, editors. Bailey and Love's Short Practice of Surgery. 24th ed. London: Arnold; 2004. p. 742-3.
7. Beckers C. Endemic and sporadic nontoxic goiter. Prog Clin Biol Res 1981;74:153-9.
8. LiVolsi VA. The pathology of autoimmune thyroid disease: A review. Thyroid 1994;4:333-9.
9. Reid JD, Wolinsky E. Histopathology of lymphadenitis caused by atypical mycobacteria. Am Rev Respir Dis 1969;99:8-12.
10. Surapaneni SL, Gangadharan V, Kuppili VM. A histopathological spectrum of neck lesions in a rural hospital. J Evid Based Med Healthc 2016;3:32333-7.
11. Popat V, Vora D, Shah H. Clinico-pathological of neck lesions – A study of 103 cases. Internet J Head Neck Surg 2009;4(2).
12. Panchal MG, Deshpande SA, Noone RB, Suvernakar SV. Diagnostic accuracy fine needle aspiration cytology of thyroid gland lesions. Int J Pharm Sci Invention 2014;3:5-10.
13. Ahmad T, Naeem M, Ahmad S, Samad A, Nasir A. Fine needle aspiration cytology (FNAC) and neck swellings in the surgical outpatient. J Ayub Med Coll Abbottabad 2008;20:30-2.
14. Thapa NB. Ultrasound in the diagnosis of neck masses. J Nepal Health Res Counc 2016;4:17-25.
15. Hoang JK, Lee WK, Lee M, Johnson D, Farrell S. US features of thyroid malignancy: Pearls and pitfalls. Radiographics 2007;27:847-60.
16. Bonavita JA, Mayo J, Babb J, Bennett G, Oweity T, Macari M, *et al.* Pattern recognition of benign nodules at ultrasound of the thyroid: Which nodules can be left alone? AJR Am J Roentgenol 2009;193:207-13.
17. Batawil N, Alkordy T. Ultrasonographic features associated with malignancy in cytologically indeterminate thyroid nodules. Eur J Surg Oncol 2014;40:182-6.
18. Cappelli C, Castellano M, Pirola I, Gandossi E, De Martino E, Cumetti D, *et al.* Thyroid nodule shape suggests malignancy. Eur J Endocrinol 2006;155:27-31.
19. Jung HN, Jaetton C, Yong-Ki M, Moon-Kyu L, Jung HY, Kwang-Won K. Prevalence, clinical and ultrasonographic characteristics of thyroid incidentaliomas. Thyroid 2004;14:29-33.
20. Heller MT, Gilbert C, Ohori NP, Tublin ME. Correlation of ultrasound findings with the Bethesda cytopathology classification for thyroid nodule fine-needle aspiration: A primer for radiologists. AJR Am J Roentgenol 2013;201:W487-94.