Original Article

FNAC of Thyroid Nodules

Significance of Sonographic Characterization and FNAC of Small Size Thyroid Nodules

1. Tanweer Ahmad 2. Nadeem Mehmood Butt 3. S.M.Nasir Qadri

1. Asstt. Prof. of Radiology, PGMI/Ameer ud Din Medical College Lahore 2,3. Consultant Radiologists, Deptt. of Diagnostic Radiology SIMS/Services Hospital Lahore

ABSTRACT

Objective: The purpose of this study is to determine the accuracy of various ultrasound characteristics of small size thyroid nodules in the predication of malagnancy and the usefullness of ultrasound guided FNAC of these nodules.
Study Design: Experimental study. .
Materials and Methods: This study was conducted on 70 patients, in whom 76 thyroid nodules 4mm to 10mm in size were biopsied. Diagnostic ultrasound was performed with high frequency linear probe for the evaluation of following ultrasound characteristics, internal structure, echogenicity, margins, posterior acoustic shadowing, height to width ratio, halo around the nodules, calcifications and vascular flow on Doppler scan. Each character was corelated with the results of FNAC to determine the accuracy of the feature in the prediction of malagnancy.
Results: Out of 76 FNACs of 4mm to 10mm size thyroid nodules 8(10.5%) biopsies did not yeild significant cytological specimen. Another 8(10.5%) specimen were classified as indeterminate so no further analysis was done. The rate of malignancy among nodules on final diagnosis was 20%. The most accurate sonographic features associated with malignancy were posterior acoustic shadowing (88.3%), taller than wider (83%), Halo around the nodule (80%) and calcification (70%).
Conclusion: Small size thyroid nodules are associated with significant risk of malagnancy. Certain sonographic characteristics can be used to measure the risk of malagnancy. FNAC of these nodules can be safely and accurately performed with high diagnostic rate.

Key Words: Thyroid Nodules, Sonographic features, Fine needle aspiration biopsy

Citation of article: Ahmad T, Butt NM, Qadri SMN. Significance of Sonographic Characterization and FNAC of Small Size Thyroid Nodules. Med Forum 2015;26(7):

INTRODUCTION

The thyroid gland nodules are a common medical problem seen in 4-7% of patients on clinical examination, 10-67% on thyroid ulrasound and 50% at autopsy.[1,2]
Rate of malignancy of these nodules on FNAC is 9.2-14.8%[2]. The overall prevalance of thyroid cancer is 3.6%.[3] The management of large size thyroid nodules is clearly defined[4]. But there is controversy for the smaller size nodules, how best to approach the small size nodules. It is suggested by the experts that suspecious features on ultrasound seems to merit for ultrasound guided fine needle aspiration biopsy.
The aim of this study is to determine the usefullness of the evaluation of thyroid nodules up to 10 mm in size. It will compare ultrasound features with pathlogical results to determine the rate of malignancy in small size nodules**.**

Correspondence: Dr. Tanweer Ahmad,
Assistant Professor of Radiology PGMI/ Ameer ud Din Medical College Lahore.
Department of Diagnostic Radiology, Lahore General Hospital Lahore.
Cell No.: 0300-4249182
E-mail: drtanweer22@gmail.com

MATERIALS AND METHODS

In this study 70 patients including male and female of the age 25 to 80 years were evaluated consecutively referred to the radiology department Services Hospital Lahore from October 2011 to September 2012. In these entire patients at least one nodule up to 10 mm in greatest diameter was biopsied. Patients with total and partial thyroidectomy and diagnosed cases of thyroid cancer were excluded from the study.
High frequency (7.5-10 MHz) linear ultrasound probe was used for the thyroid scanning and aspiration of nodules was done with 25 gauge needles. Ultrasound guided fine needle aspiration was performed by qualified and experinced radiologists. The size of the nodules biopsied ranges from 4mm to 10mm.If repeat aspiration failed to yield an adequate specimen, then 22 guage needles were used to obtain adequate aspirate. It was spread on slides and air dried. The average no. of passes was 2 +_0.8. The final cytological results were classified according to the Bethesda thyroid system (5), Unsatisfactory, benign, indetrminate and malignant (inclding suspecion for malignancy). No serious complications except minor bleed and or pain was noted.

All patients with malignant cytological results were referred for surgical resection.

The ultrasound images of small size thyroid nodules were evaluated for the following characteristics, internal structure (soid / cystic/ mixed), echogenicity (iso/hypo/hyperechogenic), margins (Defined/ illdefined), hight to width ratio, presence of calcification (micro/macrocalcification/few /many/ none), vascular flow on Doppler scan, Posterior acoustic shadowing and periphral halo around the nodules. Images were analysed independentally, in case of discrepency consensus was reached by mutual discussion between radiologists.

RESULTS

This study was conducted on 70 patients having thyroid nodules Up to 10 mm in greatest diameter. These patients were scanned with high frequency linear ultrasound probe and sonographic characteriscics of each nodule were recorded. FNAC of 76 thyroid nodules was performed. In 6 out of 70 patients 2 nodules up to 10 mm in size were biopsied.

Out of 76 biopsies 8 (10.5%) did not yeild significant cytological specimen and were excluded from the study. Another 8 (10.5%) nodules were classified as indeterminate, so no further analysis was done and excluded from the study.

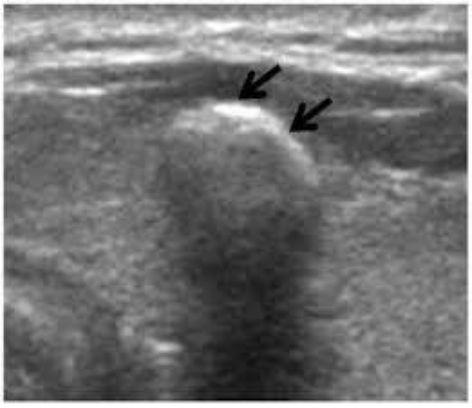

Figure No.1: Thyroid nodule with rim of calcification

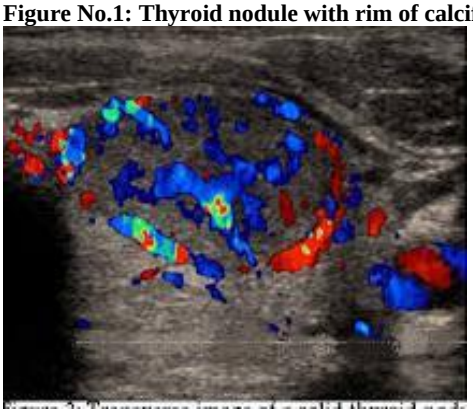

Figure No.2: Thyroid nodule with increased vascularity

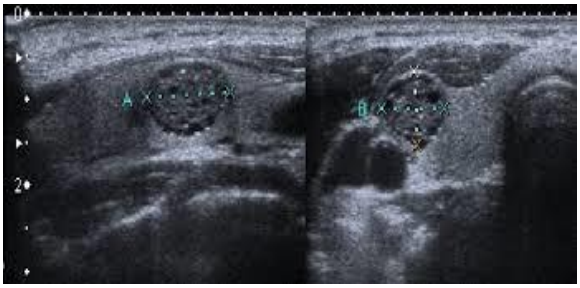

Figure No.3: Malignant Thyroid nodule

Table No.1: Sono Graphic Features of up to 10 mm size malignant and Benign Thyroid Nodules.

Sono Graphic Features	Malignant Nodules (n=12)	Benign Nodules (n=48)
(1)		
(a) Solid	12(100%)	30 (62.5 %)
(b) Partially Solid/	0	18(37.5%)
(2) Echogenicity		
(a) Hypo echoic	11 (92%)	39 (81 %)
(b) Iso/	1 (8%)	9 (19%)
(3) Margins		
(a) III defined	9 (75%)	14 (30 %)
(b) Well defined	3 (25%)	34 (70 %)
(4) Posterior Acoustic Shadowing		
(a) Present	9 (75%)	4 (8%)
(b) Abscent	3 (25%)	44 (92 %)
(5) Dimensions		
(a) Taller than	6 (50%)	5 (11%)
(b) wider than tall	6 (50%)	43 (89 %)
(6) Halo		
(a) Present	5 (40%)	5 (11 %)
(b) Abscent	7 (60%)	43 (89%)
(7) Calcification		
(a) Present	10 (84%)	16(33%)
(i) Micro	7	3
(ii) Macro	1	6
(iii) Rim	1	4
(iv)Diffuse	1	3
(b) Abscent	2 (16%)	32 (67%)
(8) Vascular Flow		
(a) Present	10 (83%)	24 (50 %)
(b) Abscent	2 (17%)	24 (50%)

In total 60 nodules included in this study were satisfactorily biopsed with 25/22 gauge needles. 92 % of the patients were having solitary nodule while only 8 % presented with more than one small size nodules. The frequency of sonographic features between malignant and benign nodules is shown in Table 1.

The accuracy data on the bases of ultrasound features for the detection of malignant nodules is shown in Table 2.

No single feature except purly solid structure was most common in malignant than in benign nodules (100% vs?? %) The frequency of hypo echoic nodules was more common in malignant than benign (92% vs 81%) as were the taller than wide (50% vs 11%).

Presence of posterior acousting shadowing (75% vs 8%), halo around the nodule (40% vs 11%), and illdefined margins (75% vs 30%). Presence of any calcification (84% vs 33%) was also significant. Doppler study revealed the vascular flow in (83% vs 50%).

Malignant nodules were significantelly linked to the presence of any type of calcification. The presence of diffuse microcalcifications was more accurate feature. By contrast features with high specificty included taller than wider shape (90%) or a halo around the nodule (90%)

Those features that did not show statistical significance but were more common in malignant than in benigh nodules included hypo echogenicity (91%) sensitivity and (18%) specificity, and presence of vasular flow 84% sensitivity vs 50% specificity.

Table No. 2: Diagnostic Index of ultrasound Features of Malignant Thyroid Nodules.

Sr. No	Sonographic Features	Sensitivity %	Specificity %	Positive Predictive Value %	Negative Predictive Value %	Diagnostic Accuracy %	Odds Ratio
1	Solid structure	100%	37.5	28.5	100	50%	7.2
2	Hypoecho-genicity	91.6	1837	22	90	34%	2.5
3	Margins (III defined)	75	70.8	39.1	92	72%	7.2
4	Post, acoustic Shadowing	75	92	70	94	88.3%	33
5	Taller than wider	50	90	55	88	83%	8.6
6	Halo	42	90	50	86	80%	6.2
7	Calcification	84	67	38.4	94	70%	10
8	Vascular flow	84	50	30	92.3	57%	5

DISCUSSION

Guide lines for the biopsy of larger thyroid nodules (>10mm) are recommended in the literature [4,7,8]. With marked improvement in technology and advent of high resolution / high frequency probes the subcentimeter thyroid nodules are well visualized. But its management is somewhat over looked. One possible reason is technically difficult biopsy of small size nodules. Some authors have found that biopsy of smaller nodules results in poor rate of diagnostically significant biopsy material[9,10]. Others have shown similar rate of success in FNACs in larger and smaller nodules.[10,11] In this study we have achieved about 90% rate of diagnostic biopsy. This rate is higher than generally mentioned in literature which range from (67-81%)[1,9,12-15]. In another study adequate biopsy rate of nodule smaller than 5mm was achieved[16].

Another reason to neglect subcentimetre size nodules is the belief that smaller nodules have lesser rick of malignancy. But it is shown in the literature that cutoff of 10mm have no clinical justification[1,2,12-14]. Rate of malignancy varies in different studies from as low as 3% to as high as 15%. Several studies have shown significantely higher rate of malignancy in small size nodules than in large size nodules[11,12,14]. Fuerter more it is seen that aggresiveness of malignant thyroid tumor is independent of its size including smaller than 10mm [2,13,17-20].

In our study rate of malignancy was 21%. This is attributed to higher rate of malignancy due to accurate selection of nodules for biopsy. Certain ultrasound features helped the radiologist in the selection of nodules for biopsy and yeilded a high malignancy rate.

The suspecious characteristics which require biopsy in subcentimetre nodules are hypoechoic olid structure[13], indistinct margins, taller than wider[2], presence of micro or macro calcification and intra nodular vascular pattern[14]. On the baises of odds ratio the most suspecious ultrasound character were posterior acoustic shadowing (odds ratio 33), purly solid structure (odds ratio 7.2) many diffuse calcifications (odds ratio10) and taller than wider (odda ratio 8.6).

It was noted that calcification of benign nodules are few in number as compared to malignant nodules in which calcifications are many and diffuse. All these features in conjunction with those suggested by other studies can guide the radiologist to choose the small size nodules more accurately for further work up.

CONCLUSION

It is conculded that small size thyroid nodules (=/<10mm) in size are associated with high risk (20%) of malignancy. Ultrasound characteristics including solid structure, microcalcification, taller than wide and posterior acoustic shadowing can be used to merit the smaller nodules for biopsy with high suspecion of malignancy.

Considering all above features radiologist should rely on his own impression for the selection of patients for biopsy.

Conflict of Interest: The study has no conflict of interest to declare by any author.

REFERENCES

1. Nam-Goong IS, Kim HY, Gong G, et al. Ultrasonography-guided fine-needle aspiration of thyroid incidentaloma: correlation with pathological findings. Clin Endocrinol (Oxf) 2004; 60:21–28
2. Moon WJ, Jung SL, Lee JH, et al. Benign and malignant thyroid nodules: US differentiation—multicenter retrospective study. Radiol 2008; 247: 762–770.
3. Lin JD, Chao TC, Huang BY, et al. Thyroid cancer in the thyroid nodules evaluated by ultrasonography and fine-needle aspiration cytology. Thyroid 2005; 15:708–717.
4. Frates MC, Benson CB, Charboneua JW, et al. Management of thyroid nodules detected at US: Society of Radiologists in Ultrasound consensus conference statement. Radiol 2005;237:794–800.
5. Baloch ZW. LiVosi VA, Asa SL, et al. Diagnostic terminology and morphologic criteria for cytologic diagnosis of thyroid lesions: a synopsis of The National Cancer Institute Thyroid Fine-Needle Aspiration State of the Science Conference. Diagn Cytopathol 2008;36:425–437.
6. Nayar R, Ivanovic M. The indeterminate thyroid fine-needle aspiration: experience from an academic Center using terminology similar to that proposed in the 2007 National Cancer Institute Thyroid Fine Needle Aspiration State of the Science Conference. Cancer Cytopathol 2009;117: 195–202.
7. Cooper DS, Doherty GM, Haugen BR, et al. American Thyroid Association (ATA) Guidelines Taskforce on Thyroid Nodules and Differentiated Thyroid Cancer. Revised American Thyroid Association management guidelines for patients with thyroid nodules and differentiated thyroid cancer. Thyroid 2009;19:1167–1214.
8. Ghraib H, Papini E, Valcavi R, American Association of Clinical Endocrinologists and Associazione Medici Endocrinologi medical guidelines for clinical practice for the diagnosis and management of thyroid nodules. Endocr Pract 2006;12:63–102
9. Leenhardt L, Hejblum G, Franc B, et al. Indications and limits of ultrasound-guided cytology in the management of nonpalpable thyroid nodules. Clin Endocrinol Metab 1999; 84:24–28.
10. Kim DW, Lee EJ, Kim SH, et al. Ultrasoundguided fine-needle aspiration biopsy of thyroid nodules: comparison in efficacy according to nodule size. Thyroid 2009;19:27–31.
11. Kim JY, Lee CH, Kim SY, et al. Radiologic and pathologic findings of nonpalpable thyroid carcinomas detected by ultrasonography in a medical screening center. J Ultrasound Med 2008; 27:215–223.
12. Berker D, Aydin Y, Ustun I, et al. The value of fine-needle aspiration biopsy in subcentimeter thyroid nodules. Thyroid 2008; 18:603–608.
13. Cappelli C, Castellano M, Pirola I, et al. The predictive value of ultrasound findings in the management of thyroid nodules. QJM 2007; 100:29–35.
14. Papini E, Guglielmi R, Bianchini A, et al. Risk of malignancy in nonpalpable thyroid nodules: predictive value of ultrasound and color-Doppler features. J Clin Endocrinol Metab 2002; 87:1941–1946.
15. Hagag P, Strauss S, Weiss M, et al. Role of ultrasound-guided fine-needle aspiration biopsy in evaluation of nonpalpable thyroid nodules. Thyroid 1998; 8:989–995.
16. Kim DW, Park AW, Lee EJ, et al. Ultrasound guided fine-needle aspiration biopsy of thyroid nodules smaller than 5 mm in the maximum diameter: assessment of efficacy and pathological findings. Korean J Radiol 2009;10:435–440.
17. Baudin E, Travagli JP, Ropers J, et al. Micro carcinoma of the thyroid gland: the Gustave-Roussy Institute experience. Cancer 1998;83: 553–559.
18. Kim EK, Park CS, Chung WY, et al. New sonographic criteria for recommending fine-needle aspiration biopsy of nonpalpable solid nodules of the thyroid. AJR 2002;178:687–691.
19. Mazzaferri EL. Management of a solitary thyroid nodule. N Engl J Med 1993;328:553–559.
20. Noguchi S, Yamashita H, Murakami N, et al. Small carcinomas of the thyroid: a long-term follow-up of 867 patients. Arch Surg 1996; 131: 187–191.