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Original Research Article

Study about Sonographic Features of Thyroid Nodules to Differentiation between Benign and Malignant Among Patients from El-Beida City

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Abstract

British Thyroid Association (BTA) recently produced Ultrasonography (US) classification (U1–U5) of thyroid nodules to facilitate the decision-making process regarding the need to perform fine-needle aspiration cytology (FNAS) in suspicious/unequivocal cases. This study was aimed to evaluate whether a relation between classify thyroid FNAS cytology, ultrasound feature diagnoses and compare with BTA-U classification. All the FNAS of thyroid lesions came during November 2017 to November 2018 were classified depended one echogenicity and size vascularity and type of calcification by assed the indication of FNAS and final cytology results. During the study period, total of 165 (89.7% females and 10.3% males) was enrolled in this study. Thyroid FNAS were reported to benign lesion, malignant, inflammatory, indeterminate and non-diagnostic were reported in (76.5 and 87.8%), (5.9 and 2.03%), (5.9 and 6.8%), (0 and 2.03%) and (11.8 and 1.35%) in cases of (male and female) respectively. Benign cases were found 757 (95.2%) out of total 795. This category includes hypo echogenic, hyper echogenic, iso echogenic, highly vascular nodules, calcification, well defined nodular surface, lymph adenopathy, mixed solid& cystic and halo sign depending to sonographic description comparison with BTA- U. This study concluded that Use of BTA for thyroid FNAC reporting helps to highlight increased malignancy risk associated with US and FANS malignant categories as well as provide more details related to cytology of thyroid lesions.

Keywords: British Thyroid Association (BTA), Ultrasonography (US), fine-needle aspiration cytology (FNAS), El-Beida and Libya.

INTRODUCTION

Thyroid enlargement has high prevalence rate reaching up to 4-7% of general population [1]. This rate can reach up to 60% when high resolution Ultrasonography (US) is used [1-3]. Palpable nodule greatly increase anxiety in patients even though only small proportion of all this cases turn out to be malignant and hence surgical removal of thyroid is indicated in some cases only. US is the most sensitive evaluation of the thyroid gland findings and procedure to details accurately calculate their dimensions. Identify the internal structure and vascularization using Color Doppler Imaging (CDI) and evaluate diffuse changes for a variety of indications and applications in the thyroid parenchyma [4]. Thyroid US was performed by a single radiologist with a high-resolution ultrasound instrument with a 7-12-MHz linear array transducer [5]. A nodule appearance were evaluated according to the following criteria: size (maximal dimension), shape (ovoid to round, taller than wide, or irregular), margin (smooth, ill-defined, or spiculated), internal echogenicity (hypoechoic, isoechoic, or hyperechoic compared to the background thyroid tissue), the presence of calcifications (micro-calcifications, macro-calcifications, or rim calcification), and the presence of tiny echogenic foci with comet-tail artifacts (colloid microcrystals) [6, 7]. Thyroid nodules are very common in clinical practice. The incidence of thyroid nodules is 10%-67% in adults undergoing US. However, most thyroid nodules are benign, and only a small percentage (9.2%-14.8%) of nodules are malignant [1, 2]. Since the late 1990s, many studies have reported specific US features of thyroid nodules that may predict malignancy [2, 3]. A few reports have evaluated the specific US features of benign thyroid nodules that do not require US-guided fine needle aspiration (FNAS) [8, 9]. In light

of previous research on this topic, determining specific US findings capable of differentiating benign thyroid nodules from malignant nodules is helpful in avoiding unnecessary FNAS or frequent follow-up US Thyroid.

FNAS biopsy is the most reliable, safe, and cost-effective diagnostic tool used in the definitive evaluation of thyroid nodules, especially when done under US-guidance, Based on current evidence, the British Thyroid Association (BTA) recently produced a US classification (U1–U5) (Table-1) of thyroid nodules to facilitate the decision-making process regarding the need to perform FNAS cytology in suspicious/unequivocal cases [10]. This study was aimed to evaluate whether a relation between classify thyroid FNAS cytology, US feature diagnoses and compare with BTA classification among patients who visited radiology department in El-Beida city, Libya.

Table-1: BTA- U Classification [11]

BTA-U Classifications	Thyroid US description	FNAS	Result cytology
U1	Normal	Not Require	Normal
U2	A- Iso or mildecho ,halo sign B- Cystic change +ring down sign "colloid" C- Microcystic spongiform D- E-Peripheraleggshell calcification E- Peripheral vascularity	Not Require	Benning
U3	A- High echo-solid, halo sign "follicular B- Low echo ,cystic change C- Mixed vascularity	Required	In-detrmenate
U4	A- Low echo B- Solid very hyper echo C- Peripheral calcification D- Labulated out line &low echo	Required	Suspicious
U5	A- Solid, hypoecho, labulated margin, microcalcification "Papillary" B- Solid, hypoecho, irregular margin, globular calcification" Medullary C- Intra nodular vascularity D- Shape taller than wide E- Lymph node	Required	Malignancy

METHODOLOGY

Patients were referred to the radiology department in Al-Thawra Hospital at El-Beida City-Libya in the period between November 2017 and November 2018.The total thyroid US examination was 250 patients, 85 of them was normal. A total of 165 thyroid nodules patients (148 women and 17 men) were enrolled this study. Each thyroid nodule was classified depended one echogenicity and size vascularity and type of calcification by assed the indication of FNAS and final cytology result. During this year the total number of thyroid ultrasound examination with nodules referred to FNAS to compare the US feature with BTA classification.

RESULTS

Over a year, 165 patients from 250 patients were underwent FNAS at Al-Thawra Hospital in El-Beida City-Libya. During this year the total number of thyroid ultrasound examination with nodules was referred to FNAS to compare the US feature with BTA classification. A total number 165 patients was enrolled to this study, 148 (89.7%) females and 17 (10.3%) males. The female: male incidence ratio was 9:1. The patients' ages ranged from 10 years to 80 years. The mean age for all the patients at diagnosis was 40 years. Upon age groups, (as each group consist of 10 years intervals), highest prevalence was noted in age groups 31-40 and 41-50 years for male subjects. While, highest prevalence was noted in age group 41-50 years followed with age groups 31-40 years with for female subjects. Lowest prevalence was observed in the age group of 71-80 years for couple genders (Table 2). Overall 165 patients, percentage of other symptoms present in subjected to thyroid nodules were included neck swelling, dypagia, palpitation, pain…etc as shown in Table 3. These symptoms were diagnosis with sonographic description including echo, vascularity and calcification. Neck swelling, dysphagia, dyspnea and palpitation were seen in 66 (60%), 39 (23.6%), 33 (20%) and 23 (13.9%) patients respectively.

Results from FANS for all cases were presented in Table 3 & 4 (with more details about age) as following categories:

- Benign (non-cancerous=abundant colloid and typical follicular cells) were found most commonly in couple gender with 13 (76.5%) for male and 130 (87.8%) for female. 43 cases was found at age group (41-50) then 38 cases at age group (31-40) in couple gender.
- Malignant (cancerous atypical follicular cells with malignant nuclear) was found as 1 (5.9%) for male that seen at age group 41-50 years and 3 (2.03%) for female, couple cases seen at age (31-40) and one at age group (41-50). Most of the malignant lesions were seen in the 41–50 years and 41–50 years age group.
- Inflammatory was found as second highest cases with 1(5.9%) in male and 10 (6.8%) of female. Male case was seen at age 31-40, while female cases seen from age 31- 50 years as well at age more than 50 years.

- Indeterminate (follicular and Hürthle cell neoplasms as well as specimens considered suspicious for malignancy) was seen three cases only in female subject (2.03%) at different age group from 10 to 60 years.
- Non-diagnostic (fewer than six clusters of follicular cells visualized on at least two smears) was seen equally in male and female in term of number of cases (2 cases) at different age group from 10 to 50 years.

Distribution of US results category among patients 165 who went through FANS with different diagnosis. These results was compared to description with BTA-U on sonographic description as shown in Table-5. The US feature was found iso echogenic with 140 nodules which diagnosed by FANS into one malignant and 139 benign. The US feature was also found the hyper echogenic nodules in 100 nodules and all of them was benign. However results from FNAS was found six cases of hypo echogenic nodules were malignant from a hundred cases. Vascularity peripheral or intra-nodular was found with 70 nodules in US, only five was malignant. Only well-defined nodular surface was gave same diagnosis.

Table-2: Age distribution for 165 patients, number with percentage for each gender separately

Age (Years)	Male. N (%)	Female. N (%)
10- 20	1 (5.9)	10 (6.8)
21- 30	1 (5.9)	25 (16.9)
31- 40	7 (41.2)	38 (25.7)
41- 50	7 (41.2)	43 (29.1)
51- 60	0	20 (13.5)
61- 70	1 (5.9)	11 (7.4)
71 – 80	0	1 (0.7)
Total	17	148

Table-3: Percentage of other symptoms present in 156 patients subjected to thyroid nodules

Type of presented symptoms	No. of patients (%)
Neck swelling	99 (60)
Dysphagia	39 (23.6)
Dyspnea	33 (20)
Palpitation	23 (13.9)
Pain	12 (7.27)
Horseness of voicey	6 (3.6)
Abnormal TFT	5 (3.03)
Accidental finding	5 (3.03)
h/o thyroid operation	2 (1.2)
Fh/o thyroid cancer	2 (1.2)
h/ocerebro vascular disease	2 (1.2)

Table-4: Distribution of FANS results category for each gender separately

Diagnosis	Male. N (%)	Female. N (%)
Benign Lesion	13 (76.5)	130 (87.8)
Malignant	1 (5.9)	3 (2.03)
Inflammatory	1 (5.9)	10 (6.8)
Indeterminate	0	3 (2.03)
Non Diagnostic	2 (11.8)	2 (1.35)
Total	17	148

Table-4: Correlation between age groups and results from FANS for each gender separately

Age (Years)	No		Benign		Malignant		Inflammatory		In determinant		Non Diagnostic	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
10-20	1	10	0	9	0	0	0	0	0	1	1	0
21-30	1	25	1	24	0	0	0	0	0	0	0	1
31-40	7	38	6	32	0	2	1	3	0	1	0	0
41-50	7	43	5	38	1	1	0	3	0	0	1	1
51-60	0	20	0	18	0	0	0	1	0	1	0	0
61-70	1	11	1	9	0	0	0	2	0	0	0	0
71-80	0	1	0	0	0	0	0	1	0	0	0	0
Total	17	148	13	130	1	3	1	10	0	3	2	2

Table-5: Distribution of US results category among 165 patients with different diagnosis (Depends on sonographic description comparison with BTA- U)

US description	No. of diagnosis	FANS results	
		Benign	Malignant
Hypo echogenic	6	3	3
Hyper echogenic	100	94	6
Iso echogenic	140	139	1
Highly vascular nodules	49	45	4
Peripheral vascular nodules	70	69	1
Calcification	20	6	14
Well defined nodular surface	150	150	0
Ill defined nodular surface	2	0	2
Lymph adenopathy	3	1	2
Mixed solid &cystic	130	126	4
Halo sign	125	124	1
Total	795	757 (95.2 %)	38 (4.8%)

DISCUSSION

Thyroid diseases are, arguably, among the commonest endocrine disorders worldwide second only to diabetes [12]. In our study, the age of the participants ranges from 10-80 years, with median of 40 years, female subjects were also commonly affected and male to female ratio was 1:9 in our study. These observations were agree to recent study at same City [13]. The indications for US still important over the last years, In addition several studies have looked at alternatives in the investigation of thyroid gland, with various combinations of US description analysis for more help and to complete evaluation [14]. The FNAS biopsy is the most reliable, safe, and cost-effective diagnostic tool used in the definitive evaluation of thyroid nodules, especially when done under US-guidance. FANS also has a 95–97% accuracy rate [15-17]. Benign cases were found 757 (95.2%) out of total 795 diagnosis. This category includes hypo echogenic, hyper echogenic, iso echogenic, highly vascular nodules, calcification, well defined nodular surface, lymph adenopathy, mixed solid& cystic and halo sign depending to sonographic description comparison with BTA- U. Frequency of cases in benign category in our study was 95.2 % which was comparable with those reported in the other studies [6, 7, 10, 17, 18]. The analysis of FNAS results after the comparative with BTA-U category/ US description showed specificity for highly suggestive of malignancy [19]. 20 cases was descripted as calcification with US, 14 of them was malignant. Calcification if associated with intra-nodular vascularity and ill-defined margin and present lymph node. Thus must be recorded in the report of thyroid examination because have highly percentage of malignancy like the BTA-U classification. From US description in BTA-U classification which corresponding to this study was echo genicity the marked hypo, hyper and iso echogenicity. The hypo echogenicity for the diagnosis of malignant thyroid nodules was found with highest percentage about 50% followed with 6% for hyper echogenicity. Malignancy risk reported in literature was 53%. This hospital is even though medical college, serving as initial referral center for patients of local district. This help to understand small number of malignant reports. In our study no case reported as malignancy by cytology, available for follow up hence malignancy risk was not studied. This study was present FANS results with US images that correspond to each feature as described in the BTA-U guideline in order to help radiologists and clinicians readily recognize the sonographic patterns and classify nodules into categories of U1 to U5.

CONCLUSION

In providing a report after the US examination of the thyroid nodule, the practitioner should aim to several factors regarding the nodule. The report should include a detailed description of the nodule with regard to its size, location, composition and echogenicity in relation to surrounding structures. The efficacy of FNAS for diagnosing thyroid lesions (benign versus malignant) in our institute was quite reliable.

REFERENCES

1. Brander, A., Viikinkoski, P., Nickels, J., & Kivisaari, L. (1991). Thyroid gland: US screening in a random adult population. *Radiology*, *181*(3), 683-687.
2. Kim, J. Y., Lee, C. H., Kim, S. Y., Jeon, W. K., Kang, J. H., An, S. K., & Jun, W. S. (2008). Radiologic and pathologic findings of nonpalpable thyroid carcinomas detected by ultrasonography in a medical screening center. *Journal of Ultrasound in Medicine*, *27*(2), 215-223.
3. Kim, M. J., Kim, E. K., Park, S. I., Kim, B. M., Kwak, J. Y., Kim, S. J., ... & Park, S. H. (2008). US-guided fine-needle aspiration of thyroid nodules: indications, techniques, results. *Radiographics*, *28*(7), 1869-1886.
4. MIYAKAWA, M., ONODA, N., ETOH, M., FUKUDA, I., TAKANO, K., OKAMOTO, T., & OBARA, T. (2005). Diagnosis of thyroid follicular carcinoma by the vascular pattern and velocimetric parameters using high resolution pulsed and power

Doppler ultrasonography. *Endocrine journal*, *52*(2), 207-212.

5. Cuomo, G., Zappia, M., Abignano, G., Iudici, M., Rotondo, A., & Valentini, G. (2009). Ultrasonographic features of the hand and wrist in systemic sclerosis. *Rheumatology*, *48*(11), 1414-1417.
6. Moon, H. J., Kwak, J. Y., Kim, E. K., & Kim, M. J. (2011). A taller-than-wide shape in thyroid nodules in transverse and longitudinal ultrasonographic planes and the prediction of malignancy. *Thyroid*, *21*(11), 1249-1253.
7. Triggiani, V., Guastamacchia, E., Licchelli, B., & Tafaro, E. (2008). Microcalcifications and psammoma bodies in thyroid tumors. *Thyroid : official journal of the American Thyroid Association*, 18, 1017-1018.
8. Bonavita, J. A. (2012). Sonographic patterns of benign thyroid nodules. *American Journal of Roentgenology*, *198*(1), W102-W103.
9. Wienke, J. R., Chong, W. K., Fielding, J. R., Zou, K. H., & Mittelstaedt, C. A. (2003). Sonographic features of benign thyroid nodules: interobserver reliability and overlap with malignancy. *Journal of Ultrasound in Medicine*, *22*(10), 1027-1031.
10. Perros, P., Boelaert, K., Colley, S., Evans, C., Evans, R. M., Gerrard BA, G., ... & Moss, L. (2014). Guidelines for the management of thyroid cancer. *Clinical endocrinology*, *81*, 1-122.
11. Xie, C., Cox, P., Taylor, N., & LaPorte, S. (2016). Ultrasonography of thyroid nodules: a pictorial review. *Insights into imaging*, *7*(1), 77-86.
12. Mohanty, S., Amruthlal, W., Reddy, G. C., Kusumanjali, G., Kanagasabapathy, A. S., & Rao, P. (2008). Diagnostic strategies for subclinical hypothyroidism. *Indian journal of clinical biochemistry*, *23*(3), 279.
13. Ali, M., Khaled, F., Moftah, S., & Ibrahim, M. (2017). Prevalence of Thyroid Functions & associated with sex and age in Northeast of Libya. *Global Scientific Journal of Biology*, 1, 1-6.
14. Haugen, B. R., Alexander, E. K., Bible, K. C., Doherty, G. M., Mandel, S. J., Nikiforov, Y. E., ... & Schuff, K. G. (2016). 2015 American Thyroid Association management guidelines for adult patients with thyroid nodules and differentiated thyroid cancer: the American Thyroid Association guidelines task force on thyroid nodules and differentiated thyroid cancer. *Thyroid*, *26*(1), 1-133.
15. Castro, MD, M. R., & Gharib, MD, FACP, FACE, H. (2003). Thyroid fine-needle aspiration biopsy: progress, practice, and pitfalls. *Endocrine Practice*, *9*(2), 128-136.
16. Cooper, D. S., Doherty, G. M., Haugen, B. R., Kloos, R. T., Lee, S. L., Mandel, S. J., ... & Tuttle, R. M. (2006). Management guidelines for patients with thyroid nodules and differentiated thyroid cancer: The American Thyroid Association Guidelines Taskforce. *Thyroid*, *16*(2), 109-142.
17. Frates, M. C., Benson, C. B., Charboneau, J. W., Cibas, E. S., Clark, O. H., Coleman, B. G., ... & Hay, I. D. (2005). Management of thyroid nodules detected at US: Society of Radiologists in Ultrasound consensus conference statement. *Radiology*, *237*(3), 794-800.
18. Kantasueb, S., Sukpan, K., & Mahanupab, P. (2010). The study of thyroid lesions and the correlation between histopathological and cytological findings at Maharaj Nakorn Chiang Mai Hospital Between 2003 and 2007. *Chiang Mai Med J*, *49*(3), 105-10.
19. Hathila, R., Patel, S., Vaghela, P., Makwana, G., & Parmar, P. (2016). Cytology findings of the thyroid lesions with the histopathology findings correlation. *Int J Med Sci Public Health*, *5*, 642-6.