International Journal of
Current Pharmaceutical & Clinical Research

www.ijcpcr.com

DISTINGUISHED PRESENTATION OF PEDIATRIC MALIGNANCY THYROID NODULES IN PEDIATRIC BASED ON US RISK STRATIFICATION AND ELASTOGRAPHY.

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ABSTRACT

Pediatric thyroid nodules are much more likely to be malignant may additionally have special concerning ultrasound (US) capabilities. Recent grownup tips stratify malignancy danger by means of US features. The reason for our examination was to evaluate the utility of the American Thyroid Association (ATA), British Thyroid Association (BTA) ultrasound risk-type structures and also involved strain elastography in the management of thyroid nodules in youngsters. Total of 170 thyroid nodules in children elderly 5 to 18 years underwent thyroid ultrasonography and FNAC on the Department of Pediatrics and Radio diagnosis, Sree Lakshmi Narayana Institute of Medical Sciences, Pondicherry. Two pediatric radiologists independently studied all US snapshots, defined more than one function, and stated their ordinary impression: benign, indeterminate, or malignant. Each nodule became assigned an ATA danger stratification category. Radiologists' impressions and ATA chance stratification were as compared to histology, cytology, and strain elastography effects. Twenty-one single nodules out of one hundred seventy biopsied sufferers (12.3%) had peculiar FNAB outcomes and had been qualified for similar analysis. There have been statistically crucial differences among the nodules finally diagnosed as malignant and benign in phrases of age and laboratory findings, even though malignant lesions additionally were statistically substantially large than benign lesions. At our organization, pediatric radiologists' overall impressions had ATA or BTA stratification machine and elastography may be a suitable approach for assessing the level of suspected malignancy in thyroid nodules in kids and assist make a clinical selection approximately the want for in addition invasive prognosis of thyroid nodules in children.

Key words: Thyroid nodules, Pediatrics , Thyroid cancer , elastography ,Ultrasonography.

INTRODUCTION

Thyroid most cancers is the general public frequent pediatric endocrine cancer. When a child presents with a thyroid nodule, that nodule is as a minimum 2–4 instances more likely to be malignant as compared to that in an person. [1] Recent malignancy price estimates in youngsters with thyroid nodules happens up to 40% in children with a records of radiation publicity. In addition, children often have extra advanced cancer on the time of analysis compared to adults, with extra lymph node extension, metastases, and chance for recurrence. [2]

Initial assessment of a affected person discovered to have a thyroid nodule both clinically or by the way ought to consist of an in depth and applicable records plus physical examination

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Laboratory tests ought to begin with measurement of serum thyroid-stimulating hormone (TSH). Thyroid scintigraphy/radionuclide thyroid test have to be carried out in patients presenting with a low serum TSH. [3] Thyroid ultrasound have to be completed in all those suspected or acknowledged to have a nodule to affirm the presence of a nodule, examine for additional nodules and cervical lymph nodes and examine for suspicious sonographic functions. The subsequent step inside the evaluation of a thyroid nodule, if they meet the criteria as discussed later, is a high-quality needle aspiration (FNA) biopsy.[4]

The cause of thyroid ultrasound stratification tips is to discover nodules which can be at excessive hazard for malignancy on the idea of ultrasound appearance and that warrant fine-needle aspiration biopsy (FNAB).Thyroid ultrasonography (US) has to turn out to be the most beneficial imaging to decide whether or not a thyroid nodule may also require similarly invasive strategies to reach a definitive prognosis.

The process is without difficulty handy, cheaper and can be performed now not simplest in specialised departments, but additionally in outpatient clinics. The primary downside of the method is the operator dependence. According to the Polish Guidelines US must constantly be achieved in kids with palpable thyroid nodules, thyroid asymmetry and unusual cervical lymphadenopathy discovered in the course of the bodily exam. Thyroid US need to additionally be repeated yearly in each child with autoimmune thyroid sickness (AITD). [5]

Many authors underline the importance of some feature ultrasound capabilities of malignancy. Hypoechogenicity without a halo, shape"taller than huge", irregular margins, microcalcifications, chaotic vascularity, anterior subcapsular area, fast boom and cervical lymphadenopathy are all capabilities that imply a malignancy in US. However, there's no single sonographic characteristic touchy or precise sufficient to pick out all malignant nodules. Numerous research have proven that the coexistence of a few suspicious features in a single nodule incorporates a higher sensitivity and specificity for malignancy as compared to each function on my own. [6]

Hence, various ultrasound-primarily based hazard stratification systems which integrate function ultrasound functions of the nodules were proposed in adults to assess the danger of malignancy. Two commonly applied are the ATA (AmericanThyroid Association) ultrasound criteria for satisfactory needle aspiration biopsy and the BTA (British Thyroid Association ultrasound) (U) classification. Thyroid nodules are commonplace, their clinical significance is particularly associated with apart from malignancy comparing their useful reputation The purpose of study to outstanding presentation of pediatric malignancy thyroid nodules in pediatric primarily based on US chance stratification and management system.

MATERIAL AND METHODS

Total of 170 thyroid nodules in children aged 5 to 18 years underwent thyroid ultrasonography and FNAC at the Department of Pediatrics and Radio diagnosis, Sree Lakshmi Narayana Institute of Medical Sciences, Pondicherry. Written informed consent was obtained from all parents of the participating patients and children older than 16 years of age and the ethics committee approved our study. All the patients were euthyroid at the moment of biopsy All the enrolled thyroid nodules had divided on cytology category III -follicular lesion of undetermined significance by AUS/FLUS, IV-follicular neoplasm by FN/SFN, V- suspicious for malignancy by SUS or VI - malignant according to the Bethesda System for Reporting Thyroid Cytopathology in FNAB.

Blood for analysis was collected on an empty stomach in the morning hours from the basilic vein and centrifuged for 10 min at 2000 rpm. Sera were stored at □85 _C until the required number was collected. Serum levels of free thyroxine (fT4) and TSH were determined on electrochemiluminescence "ECLIA" with a Cobas e 411 analyzer. Normal values for fT4 ranged between 0.71 and 1.55 ng/dl and for TSH between 0.32 and 5.0 mIU/mL. Antithyroperoxidase (anti-TPO) was measured in all samples using electrochemiluminescence The negative values for anti-TPO-Abs were between 0 and34 IU/mLV

Patients underwent conventional ultrasonography followed by FNAB. One experienced ultrasonographer evaluated US features of the thyroid nodules and provided biopsy recommendations based on his own practice patterns. Both conventional US and elastography parameters were acquired with the Toshiba Aplio MX SSA-780A system equipped with a 12 MHz linear transducer. The echostructure and vascularity of the thyroid gland, as well as the nodule, were first evaluated with B-mode and Doppler US imaging. After the evaluation of ultrasonographic characteristics of the nodule, its bend was assessed using strain elastography.

Elastography was performed by a real-time free-hand technique by fivefold light compression and decompression of the thyroid tissue. The elasticity result was presented as a strain ratio (SR) which indicates the deformation of the region of interest (ROI 1), i.e., region of the nodule (avoiding cystic component and calcifications) in comparison to the region of interest of the healthy tissue (ROI 2) as a reference (ROI1/ROI2 index). About an hour after the strain ratio assessment in every patient FNAB was obtained with ultrasonographic guidance and using the antiseptic technique.

US-guided FNAB was performed with a 23-Gauge needle attached to a 5-mL disposable plastic syringe. Aspirates were spread onto glass slides and immediately fixed in 95% alcohol for both H-E staining and May-Grunwald-Giemsa staining. The criterion for an adequate smear was the presence of 6 groups of cells with >10 cells per group. Cytological diagnosis was made by a

pathologist experienced in thyroid cytology and presented in the Bethesda system.

In a retrospective review, ultrasonographic features of each thyroid nodule were assessed according to biopsy results and ATA guidelines, BTA U classification as well as elastography accuracy.

RESULTS

Twenty one single nodules out of 170 biopsied patients (12.3%) had abnormal FNAB results and were qualified for further analysis. There were statistically important differences among the nodules finally diagnosed as malignant and benign in terms of age and laboratory findings, even though malignant lesions also were statistically significantly larger than benign lesions (Table 1).

According to the Bethesda System for Reporting Thyroid Cytopathology in FNAB 5 patients were assessed as stage VI (malignant), four patients as stage V (suspicious for malignancy), two patients as stage IV (follicular neoplasm/suspicious for a follicular neoplasm) and ten patients as stage III (atypia of undetermined significance/follicular lesion of undetermined significance).

Histopathological results were available for 11 cases after surgical treatment. The final malignant diagnosis was confirmed in histopathology in five patients out of the study group. In all cases, the histological diagnosis was papillary thyroid carcinoma.

Five of them were located in the right lobe diffuse sclerosing variant with metastases to the central lymph node compartment (10/13) and lateral compartments, pT3aN1bMX, multifocal and diffused papillary carcinoma stage pT2b in both lobes withCK19+ and Ki67+ cells in immunohistochemistry, pT1b—1.6 cm in diameter—with CK19+; factor VIII+ and Ki67+ on singular cells in immunohistochemistry).

The three patients with suspicion of follicular neoplasm (Bethesda IV) had no features of malignancy in histopathology. Four of the patients with AUS/FLUS had thyroid lobe removed and histologically assessed (one follicular adenoma, two others with no features of malignancy).

In three other patients with AUS/FLUS, FNAB was repeated and having obtained stage II, the patients remained under close monitoring. Three other patients remained in observation without being re-biopsied and one patient with this category was still diagnosed while the data were analyzed.

Seven out of twenty one analyzed patients with an abnormal cytological result (33%) had positive thyroid peroxidase antibodies (TPO) and/or lymphocytic infiltration in cytology. Five of them were malignant in the postoperative pathology.

Fifteen out of twenty one patients were assessed in elastography. The highest value of the SR (over 5), indicating hard lesion, were observed in both patients with Bethesda VI, one patient with Bethesda V and one patient with Bethesda III (benign in histopathology). The SR between 2 and 4.9, indicating intermediate lesion, was observed in one patient with Bethesda V, two patients with IV as well as four patients with Bethesda III. The SR below 2 was found in another three patients with Bethesda III, indicating soft tissue. PPV for SR was 80% and NPV for SR was 100%.

Table 1: Characteristics of the study group.

	All	Malignant	Benign	P value
Number of patients	21	9(43%)	12(57%)	
Sex(boy/girl)	10/11	5/4	5/7	No significant
Age	5-16	4-16	5-16	
history of cervical irradiation	6/21	2/9	4/12	
nodular goitre in family history	4/21	1/9	3/12	
palpable thyroid nodule	5/21	3/9	2/12	
TPO (_lU/L)	1-365	9.4-234	1-356	significant
size I (mm)	3.4–21.0	6.0–21.0	3.4–17.9	<0.01
size II (mm)	2.0–22.6	4.5–19.0	2.0–22.6	<0.05

DISCUSSION

The diagnosis of thyroid nodules is a clinical challenge for pediatric endocrinologists. As all thyroid nodules with diagnostic classes in line with the Bethesda System in youngsters are said to be at better malignancy hazard pediatric and more competitive management. [7] It is in particular relevant in children with AUS/FLUS, where elimination of the thyroid lobe and histopathologic examination is probably recommended to make a definitive diagnosis.

On the opposite hand, studies show that there may be still a huge number of thyroid techniques achieved unnecessarily as no malignancy is discovered on histopathological examination. This is in particular genuine for sufferers classified as Bethesda III or IV. Thus, a technique is sought to improve the very last analysis.

In depth evaluation of suspicious thyroid nodules which can require surgical operation usually starts with ultrasonography. Over the last decade, the utility of ultrasound-based danger stratification systems in diagnostics of thyroid nodules in adults has been demonstrated. Utility of assessing thyroid nodules in pediatric sufferers the use of scales such as the ATA, TI-RADS, ACR-TIRADS and EU-TIRADS, mainly after exclusion of the dimension criterion. [8] Both analyzed classifications executed properly in predicting malignancy in our examine group.

The software of the ATA or BTA stratification system appears to also be beneficial in younger sufferers with an indeterminate cytological diagnosis of AUS/FLUS that characterizes better malignancy danger compared to adults, even though in present examine 57% of benign nodules were categorized as high suspicion in ATA and 18% as U4 or U5 in line with BTA U type, indicating that the ultrasound danger stratification systems had been less correct in predicting benign nodules in children. [9]

Evaluating the diagnostic performance of US standards of the ATA Guidelines, 39 thyroid nodules in pediatric sufferers have been assessed. The authors suggest the application of this technique to discover nodules in children that warrant biopsy. Martinez-Rios et al. Retrospectively look at the application of adult-primarily based US stratification techniques (ATA classification and TI-RADS) for evaluation of thyroid nodules in a collection of 124 youngsters. The look at of [10] established similar sensitivity for detecting malignancy in thyroid nodules in youngsters the usage of ATA stratification and the radiologists' basic influence, however lower specificity for detecting malignancy for ATA chance stratification that is correlated with our observe. EU-TIRADS ultrasound methods observed with the aid of youngsters mixed with clinical history are a reliable method to assess thyroid nodules in children. It also can be a diagnostic device to decide which nodules are appropriate for FNAB. [11]

In the stated analysis, the usage of actual-time strain elastography, we discovered that greater bendy thyroid nodules are at lower threat of malignancy, as there was a statistically substantially lower SR inside the organization of thyroid nodules sooner or later identified as benign in contrast to the malignant ones. Half of the difficult lesions in our take look at organization grew to become out to be malignant in postoperative pathology.

Only one thyroid nodule with intermediate flexibility turned out to be malignant, whereas amongst smooth nodules no cancers were detected in elastography. In our preceding evaluation of 58 thyroid nodules in pediatric patients, we tested that each one sufferer with bendy nodules showed benign cytological diagnosis, indicating a high poor predictive price of elastography for non-malignant outcomes. [12] In the work of Cunha et al., thirteen thyroid nodules in children and adolescents were assessed with ultrasound, elastography, and quality-needle aspiration biopsy. Similarly, to our consequences, high elasticity of the nodule becomes related to a low chance of thyroid cancer. [13]

Our outcomes need to be interpreted in the context of numerous limitations. First, we deliberately excluded sufferers who were offered thyroid nodules and did not have longitudinal compliance with-up at our institution to boom diagnostic validity. By doing so, we excluded many children with benign nodules who persevered to comply with-up at domestic institutions after an initial reassuring evaluation. Also, nodules had been analyzed other than patients that could inflate effects due to a clustering impact in patients with extra than 1 malignant nodule.

However, the general public of sufferers' handiest had 1 thyroid nodule, so we experience this effect, if present, is likely minimal. Lastly, we had the advantage of skilled pediatric radiologists whose diagnostic accuracy may not generalize universally among all radiologists. We additionally recognize the restricted potential to define what completely constitutes the radiologists' average influence and describe the whole breadth of the radiologists' diagnostic reasoning. It is possible that our radiologists' ability to shape exceptionally accurate average impressions is particular; however we assume it is enormously possibly that with training and enjoy, and it could be reproduced.

CONCLUSION

This take a look at showed that ultrasound class standards are a terrific device for identifying malignancy, but less effective for identifying benign nodules. Moreover, in multinodular goiter, elastography can be beneficial in choosing which lesion should be biopsied first. If our observations are showed in future studies, the utility of elastography collectively with US danger class structures in youngsters may additionally assist perceive maximum clinically tremendous lesions and reduce invasive tactics and needless thyroidectomies in benign nodules. It is well worth emphasizing that present day US standards do now not replace FNAB in organizing a definitive diagnosis in thyroid nodules. Further paintings is needed to outline thyroid nodule diagnostic strategies in kids, such as the USA-based scoring gadget precise to pediatric patients, that could also consist of elastography.

REFERENCE:
1. Canfarotta M, Moote D, Finck C, Riba-Wolman R, Thaker S, Lerer TJ*, et al.* McGill Thyroid Nodule Score in Differentiating Benign and Malignant Pediatric Thyroid Nodules: A Pilot Study. Otolaryngol Head Neck Surg. 2017 Oct; 157(4): 589–95.

2. Corrias A, Einaudi S, Chiorboli E, Weber G, Crinò A, Andreo M, et al. Accuracy of fine needle aspiration biopsy of thyroid nodules in detecting malignancy in childhood: comparison with conventional clinical, laboratory, and imaging approaches. J Clin Endocrinol Metab. 2001 Oct; 86(10): 4644–8.
3. Haugen BR, Alexander EK, Bible KC, et al. 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. Thyroid2016;26(1):1–133.
4. . Tunbridge WM, Evered DC, Hall R, et al. The spectrum of thyroid disease in a community: the Whickham survey. Clin Endocrinol (Oxf). 1977;7(6):481–93.
5. Niedziela, M.; Handkiewicz-Junak, D.; Małecka-Tendera, E.; Czarniecka, A.; Dedecjus, M.; Lange, D.; Kucharska, A.; Gawlik, A.;Pomorski, L.; Włoch, J.; et al. Diagnostics and treatment of differentiated thyroid carcinoma in children—Guidelines of PolishNational Societies. Endokrynol. Pol. **2016**, 67, 628–642.
6. Chng, C.L.; Tan, H.C.; Too, C.W.; Lim,W.Y.; Chiam, P.P.S.; Zhu, L.; Nadkarni, N.V.; Lim, A.Y.Y. Diagnostic performance of ATA, BTA and TIRADS sonographic patterns in the prediction of malignancy in histologically proven thyroid nodules. Singap. Med. J.**2016**, 59, 578–583.
7. Monaco, S.E.; Pantanowitz, L.; Khalbuss, W.E.; Benkovich, V.A.; Ozolek, J.; Nikiforova, M.N.; Simons, J.P.; Nikiforov, Y.E. Cytomorphological and molecular genetic findings in pediatric thyroid fine-needle aspiration. Cancer Cytopathol. **2012**, 120,342–350.
8. Arora, S.; Khoury, J.; Trout, A.T.; Chuang, J. Improving Malignancy Prediction in AUS/FLUS Pediatric Thyroid Nodules with the Aid of Ultrasound. Horm. Res. Paediatr. **2010**, 93, 239–244.
9. Lim-Dunham, J.E.; Toslak, I.E.; Alsabban, K.; Aziz, A.; Martin, B.; Okur, G.; Longo, K.C. Ultrasound risk stratification for malignancy using the 2015 American Thyroid Association Management Guidelines for Children with Thyroid Nodules and Differentiated Thyroid Cancer. Pediatr. Radiol. **2017**, 47, 429–436.
10. Creo, A.; Alahdab, F.; Al Nofal, A.; Thomas, K.; Kolbe, A.; Pittock, S.T. Ultrasonography and the American Thyroid Association Ultrasound-Based Risk Stratification Tool: Utility in Pediatric and Adolescent Thyroid Nodules. Horm. Res. Paediatr. **2016**, 90,93–101.
11. Fernandez, D.Y.; Amenabar, E.V.; Munoz, A.C.; Vallejo, A.L.; Leon, M.C.; Planes-Conangla, M.; Felip, I.C.; Alvarez, S.C.; Burrieza, G.G.; Campos-Martorell, A. Ultrasound criteria (EU-TIRADS) to identify thyroid nodule malignancy risk in adolescents.Correlation with cyto-histological findings. Endocrinol. Diabetes Nutr. (Engl. Ed.) **2014**, 68, 728–734.
12. Borysewicz-Sanczyk, H.; Dzieciol, J.; Sawicka, B.; Bossowski, A. Practical Application of Elastography in the Diagnosis of Thyroid Nodules in Children and Adolescents. Horm. Res. Paediatr. **2016**, 86, 39–44.
13. Cunha, G.B.; Marino, L.C.I.; Yamaya, A.; Kochi, C.; Monte, O.; Longui, C.A.; Cury, A.N.; Fleury, E.D. Elastography for the evaluation of thyroid nodules in pediatric patients. Radiol. Bras. **2016**, 52, 141–147.