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The use of fine needle aspiration biopsy in the diagnosis of thyroid nodules

Zastosowanie biopsji cienkoigłowej w diagnostyce guzków tarczycy

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Key words

children, thyroid nodule, fine needle aspiration biopsy

Słowa kluczowe

dzieci, guzek tarczycy, biopsja aspiracyjna cienkoigłowa

Summary

Introduction. Fine needle aspiration (FNA) is a simple, inexpensive, easily performed outpatient procedure which can provide a rapid diagnosis. It is eminently suitable for the investigation of superficial palpable lesions in many sites, including the thyroid gland. Cytological examination of aspirated material can detect thyroiditis, toxic hyperplasia and colloid goiters as well as neoplastic processes, epithelial, lymphoid and metastatic changes.

Aim. The aim of this study was the analysis of the results of FNAB in thyroid nodules in children, the usefulness of FNAB in the therapeutic procedures and comparison of the cytologic changes with the postoperative changes of the thyroid.

Material and methods. Thirty seven patients (33 females and 4 males) of the Clinical Department of Endocrinology and Pediatrics in the Warsaw University of Medicine, were qualified to FNA because of the presence of thyroid nodules. The age of patients varied from 7 to 18 years old. The microscopical changes were described according the cytological picture and graded by recommended diagnostic categories using Bethesda System.

Results. In most patients (31/37) the results of FNA were consistent with the grade 2 according to Bethesda System, in one patient with the grade 1, in two patients with the grade 3, in another two patients with the grade 5, and finally in one patient with the grade 6 corresponding to papillary carcinoma. The patients presented in the article did not follow the core needle biopsy, but we have demonstrated that in our group of patients FNA was a sensitive test. The results of FNA coincided with the histopathological results of surgical specimens.

Conclusions. We have demonstrated that the main purpose of this technique is to provide a differential diagnosis between benign and malignant changes enabling appropriate therapeutic management and the determination of the correct surgical procedure when surgery is required.

Streszczenie

Wstęp. Biopsja cienkoigłowa (FNA) jest inwazyjną, jednak stosunkowo prostą i niedrogą procedurą medyczną łatwo wykonywaną w warunkach przychodni bez konieczności hospitalizacji pacjenta. Ma zastosowanie głównie w diagnostyce wyczuwalnych palpacyjnie guzków, w szczególności guzków tarczycy. Badanie cytologiczne aspirowanego materiału pozwala na wykrycie zmian towarzyszących zapaleniu tarczycy, hiperplazji i wola koloidalnego, jak również zmian nowotworowych o podłożu nabłonkowym, limfoidalnym i zmian metaplastycznych.

Cel pracy. Celem pracy była analiza wyników biopsji cienkoigłowej guzków tarczycy u dzieci, użyteczność FNAB przy wyborze odpowiedniego leczenia i korelacja wyników cytologicznych z wynikami histopatologicznymi pooperacyjnymi tarczycy.

Materiał i metody. Trzydziestu siedmiu pacjentów (33 dziewczynki i 4 chłopców) hospitalizowanych w Oddziale Endokrynologii i Pediatrii Uniwersytetu Warszawskiego zostało zakwalifikowanych do FNA z powodu palpacyjnie wykrytych guzków tarczycy. Wiek chorych wynosił od 7 do 18 lat. Zmiany mikroskopowe były opisywane w zależności od obrazu cytologicznego, stosując kryteria diagnostyczne według skali Bethesda.

Wyniki. Większość pacjentów wykazywała zmiany łagodne określone jako 2 stopień skali Bethesda (31/37 pacjentów). U jednego pacjenta materiał pobrany za pomocą FNAB

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był niediagnostyczny, 2 pacjentów wykazywało zmiany atypowe określone jako 2 stopień skali Bethesda, a 3 pozostałych pacjentów zmiany rakowe określone jako 5 i 6 stopień wg skali Bethesda. Zmiany łagodne i rakowe rozpoznane za pomocą FNAB zostały potwierdzone w materiale histopatologicznym pooperacyjnym.

Wnioski. W pracy wykazano, że głównym celem tej metody jest umożliwienie diagnostyki różnicowej pomiędzy łagodnymi i złośliwymi zmianami w tarczycy, co w konsekwencji ułatwia podjęcie decyzji odnośnie leczenia i ewentualnego zabiegu chirurgicznego.

INTRODUCTION

Fine needle aspiration (FNA) is a simple, inexpensive, easily performed outpatient procedure which can provide a rapid diagnosis. It is eminently suitable for the investigation of superficial palpable lesions in many sites, including the thyroid gland. Thyroid FNA has a high diagnostic accuracy rate ~ about 90 to 100% and its role is either diagnostic or therapeutic (1). The main purpose of thyroid FNA is to provide a rational approach to management to determine the appropriate surgical procedure in cases of thyroid cancer. It is important in pre-operative diagnosis by identifying the disease process in both solitary nodules and in diffuse enlargement of the thyroid gland. A specific diagnosis cannot always be arrived at as sampling is variable and not always representative, but the surgeon is provided with information which helps in deciding management options. Cytological examination of aspirated material can detect thyroiditis, toxic hyperplasia and colloid goiters as well as neoplastic processes, epithelial, lymphoid and metastatic changes. The Bethesda System for reporting cervical cytology interpretations, was first developed at the National Center Institute (NCI) workshop in 1988 and widely adopted in the United States for reporting Papanicolaou test results (2). The notes and recommendations were updated in 2007 improving the clarity of communication among cytopathologists and other health care providers, predicting the cancer risk and reducing unnecessary surgery for patients with benign nodules (3). The 6 general diagnostic categories are shown in bold type in the table 1. Each of the categories has an implied cancer risk (ranging from 0 to 3% for the benign category to virtually 100% for the malignant category) that links it to a rational clinical management guideline.

AIM

The aim of this study was the analysis of the results of FNAB in thyroid nodules in children, the usefulness of FNAB in the therapeutic procedures and comparison of the cytologic changes with the postoperative changes of the thyroid.

MATERIAL AND METHODS

Thirty seven patients (33 females and 4 males) of the Clinical Department of Endocrinology and Pediatrics in the Warsaw University of Medicine, were qualified to the fine needle aspiration biopsy (FNA) because of the presence of thyroid nodules. The age of patients varied from 7 to 18 years old. The material obtained by FNA was immediately fixed in 96% ethanol with naphthol ether (1:1) and stained with Hematoxylin and Eosin. The microscopical

Table 1. The Bethesda System for Reporting Cytopathology: Recommended Diagnostic Categories (2).

Diagnostic category	Risk of malignancy	Usual management
I. Nondiagnostic or unsatisfactory	0	Repeat FNA with ultrasound
Cyst fluid only		
Virtually acellular specimen		
Other (obscuring blood, clotting artifact, etc)		
II. Benign	0-3	Clinical follow-up
Consistent with a benign follicular nodule (includes adenomatoid nodule, colloid nodule, etc.)		
Consistent with lymphocytic (Hashimoto) thyroiditis in the proper clinical context		
Consistent with granulomatous (subacute) thyroiditis		
III. Atypia of undetermined significance/follicular lesion of undetermined significance	5-15	Repeat FNA
IV. Follicular neoplasm/"suspicious" for follicular neoplasm Specify if Hürthle cell type	15-30	Surgical lobectomy
V. Suspicious for malignancy	60-75	Near-total thyroidectomy or surgical lobectomy
Suspicious for papillary carcinoma		
Suspicious for medullary carcinoma		
Suspicious for metastatic carcinoma		
Suspicious for lymphoma		
VI. Malignant	97-99	Near-total thyroidectomy
Papillary thyroid carcinoma		
Poorly differentiated carcinoma		
Medullary thyroid carcinoma		
Undifferentiated (anaplastic) carcinoma		
Squamous cell carcinoma		
Carcinoma with mixed features		
Metastatic		

FNA – fine needle aspiration

changes were described according the cytological picture and graded by recommended diagnostic categories using Bethesda System (tab. 1). The results of FNA have been compared with the histopathological examination of the specimens after lobectomy and total thyroidectomy.

RESULTS

The results of the reporting thyroid cytopathology are shown in the table 2.

In most patients (31/37) the results of FNA were consistent with a benign follicular nodule, grade 2 according to Bethesda System (fig. 1).

In one patient (1/37) FNA was evaluated as nondiagnostic, grade 1 according to Bethesda System. Two FNA smears (2/37) were categorized as grade 3 according to Bethesda System revealing the feature of thyrocytes with hyperplastic and degenerative changes and oncocyctic type cells with trabecular formations, respectively. In another two patients (2/37) FNA were evaluated as grade 5

according to Bethesda System, both features were consistent with papillary structures and cellular atypia. Atypical thyrocytes, without papillary formations consistent with grade 6 according to Bethesda System were described in one FNA (1/37). The results of FNA coincided with the histopathological results of surgical specimens. In the case of non diagnostic smear, the colloid cyst was found by surgical procedure.

DISCUSSION

FNA is the most common method for evaluation of a suspicious thyroid nodule and has been one of the most useful, safe and accurate tool in the diagnosis

Table 2. Diagnosis made by fine needle aspiration biopsy in patients with thyroid nodule.

No.	Sex	Age (years)	FNA	BS	Final diagnosis
1	F	14	Thyrocytes, Colloidi, numerous lymphocytes	2	Chronic inflammation
2	F	15	Colloid, thyrocytes	2	Colloid nodule
3	F	13	Colloid, thyrocytes	2	Colloid nodule
4	F	9	Colloid, thyrocytes	2	Colloid nodule
5	F	17	lymphocytes	2	Hashimoto thyroiditis
6	F	16	Atypical cells with groove, papillary formations	5	Papillary carcinoma
7	F	16	Colloid, thyrocytes	2	Colloid nodule
8	F	15	Thyrocytes with hyperplastic and degenerative changes	3	Colloid nodule
9	F	13	Lymphocytes, histiocytes, oxyphilic cells, colloid	2	Hashimoto thyroiditis
10	M	15	Groups of hyperplastic thyrocytes, colloid	2	Adenomatoid nodule
11	F	10	Groups of hyperplastic thyrocytes, oxyphilic cells, numerous lymphocytes	2	Chronic thyroiditis
12	F	13	Thyrocytes,	2	Cyst
13	F	14	Thyrocytes, colloid	2	Colloid nodule
14	F	17	Thyrocytes, degenerative changes	2	Adenomatoid nodule
15	F	16	Histiocytes with hemosiderin	2	Granulomatous thyroiditis
16	F	14	Acellular specimen, blood	1	Colloid nodule
17	F	17	Atypical thyrocytes, without papillary formations	6	Papillary carcinoma
18	F	14	Papillary structures with cellular atypia	5	Papillary carcinoma
19	F	15	Thyrocytes, colloid	2	Colloid nodule
20	F	17	Thyrocytes, numerous lymphocytes	2	Autoimmune disease
21	F	13	Thyrocytes, colloid	2	Benign lesion
22	F	12	Thyrocytes with degenerative changes, epithelioid cells, macrophages	2	Granulomatous subacute thyroiditis
23	M	9	Oncocyctic type cells, trabecular formations	3	Adenomatoid nodule
24	F	8	Blood, thyrocytes, Colloidi, lymphocytes	2	Hashimoto thyroiditis
25	M	15	Histiocytes, lymphocytes, thyrocytes	2	Chronic thyroiditis
26	F	15	Thyrocytes, colloid	2	Colloid nodule
27	F	16	Thyrocytes, colloid	2	Colloid nodule
28	F	12	Thyrocytes, colloid	2	Colloid nodule
29	F	18	Thyrocytes, colloid	2	Colloid nodule
30	F	17	Thyrocytes, lymphocytes, colloid	2	Hashimoto thyroiditis
31	F	13	Thyrocytes, colloid	2	Colloid nodule
32	F	17	Thyrocytes, lymphocytes	2	Hashimoto thyroiditis
33	F	13	Erythrocytes, numerous lymphocytes, eosinophilic granulocytes	2	Thyroiditis
34	F	7	Thyrocytes, colloid, lymphocytes	2	Colloid nodule
35	F	8	Thyrocytes, colloid, lymphocytes	2	Hashimoto thyroiditis
36	M	8	Colloid, macrophages	2	Colloid nodule
37	F	16	Thyrocytes, colloid	2	Colloidal cyst

FNA – thyroid fine needle aspiration biopsy, BS – diagnostic category using Bethesda system

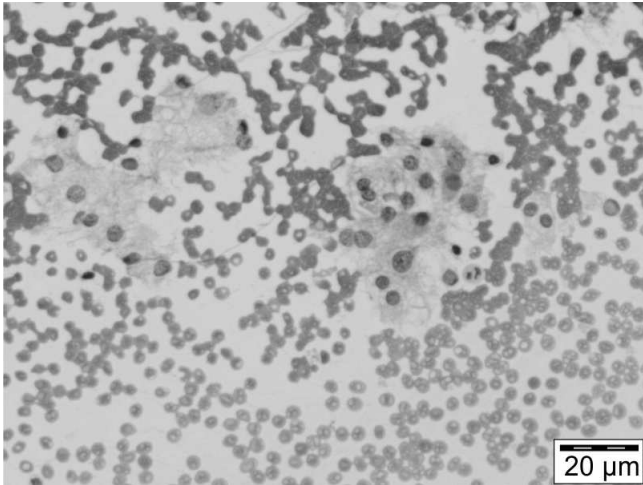


Fig. 1. Benign changes, diagnostics criteria 2 according to the Bethesda System for Reporting Cytopathology (H.E 400x).

of thyroid pathology (4). Although it may be either diagnostic and therapeutic, its fundamental role is to rule out the presence of cancerous cells, specially in elderly. It has a high diagnostic accuracy rate about 90-100% (1). However, considering patients with negative FNA, some authors report the diagnostic sensitivity to be approximately 80%, and FNA could miss up to a third of all thyroid malignancy (1, 5, 6). The use of core needle biopsy can reduce false negative results reported by TNAB but a local anesthetic is administered and patients can refuse this more aggressive diagnostic method. This method enables the final histologic examination and has a diagnostic accuracy significantly higher than that of FNA (7). The patients presented in the article did not follow the core needle biopsy, but we have demonstrated that in our group

of patients FNA was a sensitive test, what support an international meta-analysis in the pediatric population (8).

In patients with already diagnosed thyroid cancer, the main purpose of FNA is to provide a definite diagnosis of malignancy, with tumor type, enabling appropriate therapeutic management and to determine the correct surgical procedure when surgery is required. In such a situation, many health care providers are involved thus clear terminology and other issues related to thyroid FNA are of great importance. To address this problem NCI hosted the Science Conference (October 2007) that finally led to the Bethesda Thyroid Atlas Project and form the framework for The Bethesda System for Reporting Thyroid Cytopathology (TBSRTC) (2, 4). It was intended as a flexible framework that can be modified to suit the needs of the particular laboratory and the patients it serves. The Report should be in common usage by now, thus we had performed FNA in all presented patients and than evaluated the cytology results according to Bethesda System. Disagreement regarding the use of TBSRTC terminology for classifying the results of thyroid FNA mainly occurred in the most-often criticized categories of atypia/follicular lesion of undetermined significance (AUS/FLUS) and FN/SFN (3, 10). In conclusion the Bethesda System for Reporting Thyroid Cytopathology resulted in more frequent repeat FNA, fewer thyroidectomies and no change in malignancy rate (9, 11, 12).

CONCLUSIONS

Fine needle aspiration biopsy is a good diagnostic tool in the evaluation of the thyroid nodule in pediatric patients.

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