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Thyroid Scan and Thyroid Disorders in Adolescent: 5-year Experience

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Abstract

Thyroid gland enlargement is a common problem in clinical practice. The clinical presentation and etiology of thyroid disorders differ substantially in adolescents from that in adults.

Purpose: This study was conducted to describe clinical characteristics of adolescent patients referred for thyroid scan during 5-years period in Mansoura University Hospital.

Methods: this retrospective study included all adolescent patients referred for thyroid scan during the period from 2010-2015 in nuclear medicine unit in Mansoura University Hospital. Full history was taken from each patient including family history. Both general and local examinations were performed. Thyroid scan was carried out through intravenous injection of 3-5mCi of technetium-99 pertechnetate. Then 20 minutes post injection; anterior and oblique views were acquired on a gamma camera. Many features of thyroid scan can be found and final diagnosis based on scanning features and laboratory results.

Results: This retrospective study included 60 adolescent patients referred for thyroid scan. They were 46 (76.7%) females and 14males (23.3%) with female to male ratio of 3.3:1 Simple multinodular goitre was the most common finding (46.7%) followed by Graves'disease (25%) then Hashimoto's disease (11.7%). Ectopic thyroid was reported in 2 female patients (3.3%) Solitary thyroid nodule was found in 6 patients (10%) with toxic finding in one case and simple in five. Papillary thyroid carcinoma was diagnosed in 2 female patients (3.3%).

Conclusion: This study is retrospective with relatively small number of patients; so these preliminary results need to be confirmed through a prospective study with larger number of patients.

Keywords: Thyroid scan; Graves'disease; Hashimoto's disease; Thyroid disorders

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Introduction

Thyroid gland is a subject of interest; its enlargement is a common problem in clinical practice [1]. In our life cycle, puberty is a period of hormonal interactions [2]. So marked changes in function of thyroid occur during puberty as an adaptation to sexual and body development [3].This can explain the common occurrence of thyroid disorders during adolescence by incidence of about 3.7% [4].The clinical presentation and etiology of thyroid disorders differ substantially in adolescents from that in adults [5]. Thyroid disorders can presented as goiter, some abnormal symptoms and physical or laboratory findings [2]. There are some risk factors for development of thyroid diseases as: female gender, iodine deficiency, head and neck irradiation, age of puberty and family history of thyroid diseases [6,7]. Many studies reported association between development of thyroid cancer and exposure to radiation with an average latency time between diagnosis of thyroid cancer and exposure of 8.5 years [8-12]. Nearly 41% of children with thyroid nodules have a family history of thyroid disorders [7]. In 1990s, thyroid scintigraphy was used to differentiate between functioning and non-functioning nodules [13]. Scintigraphy classify thyroid nodules as hot or cold according to its iodine-trapping function, but this finding cannot differentiate between benign and malignant nodule [14-16]. It was reported that incidence of malignancy detection by scintigraphy was only 17% [17]. Hot nodule may represent colloid goiter, chronic lymphocytic thyroiditis, adenomatous goitre hyperplasia, follicular adenoma or rarely cancer [18]. Cold nodules are often benign with

Table 1: Gender distribution of thyroid disorders.

Male	Female	Thyroid disorder
8	20	Simple mulinodular
2	4	Solitary nodule
4	11	Graves' disease
0	7	Hashimoto's thyroiditis
0	2	Thyroid cancer
0	2	Ectopic thyroid

Table 2: Incidence of thyroid disorders.

%	N	Thyroid disorder
46.7	28	Simple mulinodular
25	15	Graves' disease
11.7	7	Hashimoto's thyroiditis
10	6	Solitary nodule
3.3	2	Thyroid cancer
3.3	2	Ectopic thyroid

incidence of being malignant in range of 20-60% [19]. Also, thyroid scintigraphy can be used to detect ectopic thyroid tissue in children [20].

This study was conducted to describe clinical characteristics of adolescent patients referred for thyroid scan during 5-years period in Mansoura University Hospital.

Methods

This retrospective study included all adolescent patients aged from15-21years referred for thyroid scan during the period from 2010-2015 in nuclear medicine unit in Mansoura University Hospital.

Full history was taken from each patient including family history. Both general and local examinations were performed. General examination was aimed to looking for signs associated with thyroid dysfunction while local one included examination of thyroid gland and neck lymph nodes.

Thyroid scan was carried out through intravenous injection of 3-5mCi of technetium-99 pertechnetate. Then 20 minutes post injection; anterior and oblique views were acquired on a gamma camera. The patient was placed in supine position and the neck comfortably extended. Lead marks were used to identify anatomic land marks as suprasternal notch. Location of any palpable nodules must be confirmed using lead marker image for anatomic correlation.

Many features of thyroid scan can be found and final diagnosis based on scanning features and laboratory results.

In the scan, when a nodule can be distinguished from surrounding thyroid tissue; it was considered a solitary thyroid nodule. According to functional status of a nodule, it was classified as functioning (hot) and non- functioning (cold) according to amount of radioactivity in it.

Simple multinodular goitre was considered if more than one functioning and/or non- functioning nodules were detected in the gland associated with normal thyroid laboratory tests. But if it was associated with biochemical status of hyperthyroidism, we diagnosed it as toxic multinodular goitre.

Hypothyroidism was diagnosed when free T4 (FT4) level was low (<11.0 pmol/L) associated with increased TSH (>5.0mIU/L).While hyperthyroidism was associated with high FT4 level (>22.0 pmol/L) and low level of TSH (<0.1mIU/L).

Patient was diagnosed as simple goitre when he had diffusely enlarged gland with normal thyroid function tests. But if diffusely enlarged gland was associated with hyperthyroidism we suspected Graves 'disease.

Hashimoto's disease was suspected when there was goitre with hypothyroidism and high level of anti-thyroid antibodies as anti-perioxidase and anti-thyroglobulin antibodies.

When cancer was suspicious ultra-sound-guided biopsy was taken.

Results

This retrospective study included 60 adolescent patients referred for thyroid scan, etiology of reference were: enlarged thyroid gland in 24 patients (40%), toxic symptoms in 17 patients (28.4%), abnormal laboratory finding in 15 patients (25%),enlarged lymph node in 2 patients (3.3%) and absent thyroid in 2 patients (3.3%).

They were 46 (76.7%) females and 14 males (23.3%) with female to male ratio of 3.3:1, as shown in Table 1.

Simple multinodular goitre was the most common finding (46.7%) followed by graves' disease (25%) then Hashimoto' s disease (11.7%). Patients with Hashimoto' s disease were diagnosed by diffuse thyroid enlargement associated with hypothyroidism and elevated level of antithyroid globulin and thyroid perioxidase antibodies.

Ectopic thyroid was reported in 2 female patients (3.3%) Solitary thyroid nodule was found in 6 patients (10%) with toxic finding in one case and simple in five.

Papillary thyroid carcinoma was diagnosed in 2 female patients (3.3%) (Table 2).

Discussion

Enlargement of thyroid gland can be detected during routine physical examination or observed by the patients themselves or discovered during imaging of the neck incidently [21]. But the patient can presented by clinical symptoms of: 1) hyperthyroidism such as tachycardia, increased appetite with weight loss, increased sweating, heat intolerance, exophthalmos and diarrhea. 2) Hypothyroidism as bradycardia, decreased appetite with weight gain, tremors and constipation [22]. 3) Compression as hoarsness of voice, dysphagia and shortness of breath [23].

Incidence of thyroid diseases in adolescent were reported to be more frequent in female than male with a ratio of 3:1 or more [24-26]. In our study it was 3.3:1.This can be contributed to increased levels of sex hormones during puberty in females [27].

About 1 in 600.000 live births presented with lingual thyroid during adolescence or childhood [28]. Lingual thyroid is diagnosed when thyroid gland fails to descend to its normal position in the neck. In 90% of cases the gland found within the tongue while 10% in the anterior neck above the hyoid bone [29].This anomaly is more prevelant in female. In our series, lingual thyroid was diagnosed in 3.3% of cases and they were female.

Graves 'disease is the most common etiology of thyrotoxicosis in children and adolescence [30,31].The cause of this disease is possibly

the presence of autoantibodies against TSH receptors that stimulate thyroid follicles to increase iodine uptake and cyclic adenosine monophosphate production causing enlargement of the gland and increase production of thyroid hormones. Studies supposed that bacterial infection may induce the production of these antibodies which react with TSH receptors [32]. In our series, graves' disease was reported in 25% of cases.

When focal nodular hyperplasia occurs, it causes nodular formation in the gland; some of these nodules have the ability to secrete thyroxin and others become inactive. Fibrous septae result from necrosis and scarring lead to multinodular goitre [33]. Simple multinodular goitre was reported in about 47% of our patients; comparable to that found by Rallison ML et al. [34]. Although solitary thyroid nodule is common in general population; it is less common in adolescent and children [35]. A solitary nodule may represent an area of functional hyperplasia (adenoma) that may be associated with secondary hyperthyroidism .Six cases of our patients (10%) presented with solitary nodule with toxic finding in one case only. In the United States, thyroid carcinoma is the second most common cancer in females aged 15-19years [36]. Papillary thyroid carcinoma is the most common cancer in adolescent [37]. It was diagnosed in 2 cases of our series. Hashimoto's thyroiditis was found in 7 patients (11.7%). Hashimoto's thyroiditis was reported to be uncommon in adolescent [38].

Conclusion

These study is retrospective with relatively small number of patients; so this preliminary results need to be confirmed through a prospective study with larger number of patients.

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