

CONTRIBUTION OF THYROID GLAND ULTRASOUND FOR SCREENING OF PATIENTS WITH SUSPECTED SUBCLINICAL THYROID GLAND DISORDERS

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PRÍNOS ULTRASONOGRAFICKÉHO VYŠETRENIE ŠTÍTNEJ ŽLAZY PRI VYHLADÁVANÍ CHORÝCH S PODOZRENÍM NA SUBKLINICKÚ TYREOPATIU

Abstract

Tajtakova M, Langer P, Semanova Z, Tomkova Z:
Contribution of Thyroid Gland Ultrasound for Screening of Patients with Suspected Subclinical Thyroid Gland Disorders
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Thyroid gland ultrasonography is recommended in patients with nonspecific clinical symptoms such as fatigue, weightgain, dry skin, amnesic symptoms, depression, bradycardia, abnormal myocardial contractility, increased diastolic pressure, hypercholesterolemia, menstrual abnormalities, infertility, fibrocystic breast disease, anxiety, insomnia, tachycardia, paroxysmal atrial fibrillation and osteoporosis. Subclinical hypothyroidism or hyperthyroidism can cause any of the above mentioned symptoms. Diffusely decreased, decreased and inhomogenous thyroid gland echogenicity requires laboratory examination.

Thyroid gland ultrasonography is recommended also in patients with type I. diabetes mellitus and vitiligo because of increased incidence of thyroid disorders in these patients. Clinical observation of patients treated with Lithium, Amiodaron or Interferon is also recommended. (Tab. 2, Fig. 6, Ref. 18.)

Key words: thyroid gland, screening, subclinical hypothyroidism, subclinical hyperthyroidism, ultrasonography.

Thyroid disorders without any clinical manifestation at the time of the examination are subclinical hypothyroidism, subclinical hyperthyroidism or a solitary nodule in thyroid gland. Typical method for screening the thyroid gland disorders is the assessment of serum TSH and thyroxin levels (5).

Subclinical hypothyroidism is characterized by increased serum TSH level and normal thyroxin level. Clinically evident hypothyroidism is characterized not only by increased serum TSH level, but also by decreased serum thyroxin level. Significantly lowered or nondetectable TSH level and normal thyroxin level are typical signs of subclinical hyperthyroidism. When elevated thyroxin le-

Abstrakt

Tajtková M., Langer P., Semanová Z., Tomková Z.:
Prínos ultrasonografického vyšetrenie štítnej žľazy pri vyhladávaní chorých s podozrením na subklinickú tyreopatiu
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Ultrasonografické vyšetrenie (USG) štítnej žľazy sa indikuje u chorých s nešpecifickými príznakmi, ako sú únava, prírastok hmotnosti, suchá koža, poruchy pamäti, depresia, sklon k bradykardii, poruchy kontraktility myokardu, diastolická hypertenzia, hypercholesterolémia, poruchy menštruačného cyklu a fertility, benígna mastopatia, nervozita, únava, nespavosť, tachykardia alebo paroxyzmálna fibrilácia predsiene a osteoporóza. Tieto príznaky môžu súvisieť aj so subklinickou hypotyreózou alebo hypertyreózou. Difúzna, predovšetkým znížená, znížená a nehomogénna alebo ložisková zmena echogenity štítnej žľazy pri USG vyšetrení v týchto prípadoch indikuje aj funkčné vyšetrenie štítnej žľazy. USG štítnej žľazy by sa malo robiť aj u chorých s DM I. typu, vitiligom a u chorých liečených lítium, cordaronom a interferónom. (Tab. 2, obr. 6, lit. 18.)

Kľúčové slová: štítna žľaza, skrining, subklinická hypotyreóza, subklinická hypertyreóza, ultrasonografia.

vels are present with increased TSH serum level, patient has clinically apparent hyperthyroidism (2, 5, 9).

Screening is usefull for clinically apparent disorder detection, when clinical symptoms are already present, but were not attributed to thyroid disease.

Thyroid disorders are more frequent in females, especially in those over 50 years of age. In this group the screening for thyroid disorders is reasonable.

The aim of presented study is to assess the value of thyroid gland ultrasound as a screening method for thyroid gland disorders.

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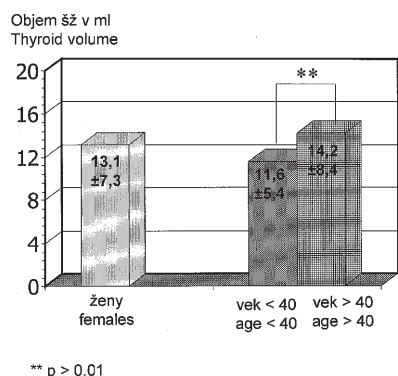


Fig. 1. Thyroid volume (in ml).
Obr. 1. Objem štítnej žľazy v ml.

Technique

The study group consisted of 293 randomly selected female patients from Košice and vicinity with age range of 20—60 years. Of the 293 examined patients 91 patients were less than 40 years old and 202 patients were over 40. Following examinations were performed:

1. Ultrasonographic examination of thyroid gland. Sanoline LS 1 ultrasonographic measuring unit was used. Important parameters were thyroid gland volume in ml (Brunn) and its echogenicity.

2. Serum TSH level, anti TPO, anti TG and anti TSHr antibodies assessment. These parameters were measured in 107 patients (RIA or IRMA kit). Normal serum TSH level ranges between 0.4 and 5.0 mU/l. Levels of anti TPO, anti TG over 200 U/ml and anti TSHr over 9.0 U/ml were considered increased.

3. Iodine urine excretion in 82 patients. Determination was performed by alkali burning at 600 °C (Sandell-Kolthoff reaction) and spectrophotometry.

Results

1. Thyroid gland volume

Average thyroid gland volume was 13.1±7.3 ml, median 12.0 ml, dispersion 4.0—50.5 ml. Women up to 40 years had smaller thyroid glands than older patients (11.6±5.4, 14.2±8.4, $p \leq 0.01$) (Fig. 1).

37 patients had a goiter, with thyroid gland volume ≥ 18 ml. This represents 12.6 % (one woman younger than 40—1.2 %, 36 of them older than 40—17.8 %). Large goiters were present only in patients older than 40.

2. Thyroid gland echogenicity

Homogenous and appropriate echogenicity was present in 208 patients (71.0 %). 63 patients (21.5 %) had decreased or decreased and inhomogenous echogenicity. 17 women (5.8 %) had a solitary nodule in thyroid gland all of them being over 40 (Fig. 2, 3, 4, 5).

Multinodular goiter was present in 5 cases (1.7 %) (Fig. 6). All these patients were older than 50 and their thyroid gland volume was greater than 30 ml. Two of them had an upper airways compression.

A solitary nodule in the thyroid gland was already detected in 6 patients before scintigraphic examination. Scintigraphy showed a hot nodule in 4 cases and a cold one in 2 cases. After the examination 10 further scintigraphies were done. One patient refused



Fig. 2. Ultrasound scanning of the thyroid. Echogenicity homogenous — normal echopattern.

Obr. 2. Ultrasonografický obraz štítnej žľazy. Echogenita homogenná, primeraná.



Fig. 3. Ultrasound scanning of the thyroid. Hypoechogenicity.
Obr. 3. Ultrasonografický obraz štítnej žľazy. Echogenita difúzne znížená.

scintigraphy. Three hot nodules and 5 cold nodules were found. Two of the nodules were not confirmed by scintigraphy (Tab. 1).

3. Antibodies

16 patients (14.9 %) had elevated two antibody levels (anti TPO and anti TG). Fifteen patients (14.0 %) had elevated only anti TPO level, 8 patients (7.5 %) only anti TG level and 3 patients (2.8 %) only anti TSHr level. Totally increased antibody levels were present in 42/107 cases (39.2 %). Nine cases were in group under 40 years and 33 cases in group over 40. Fourteen women (33.3 %) had simultaneous increase of both antibodies and TSH levels.

Fourteen patients (33.3 %) with elevated antibody levels had increased thyroid gland volume as well, ten with a diffuse goiter and 4 with a solitary nodule. Echogenicity changes were found in 23 women with elevated antibody levels (54.7 %). Four patients had a nodule and 19 (45.2 %) had decreased or inhomogenous echogenicity (Tab. 2).

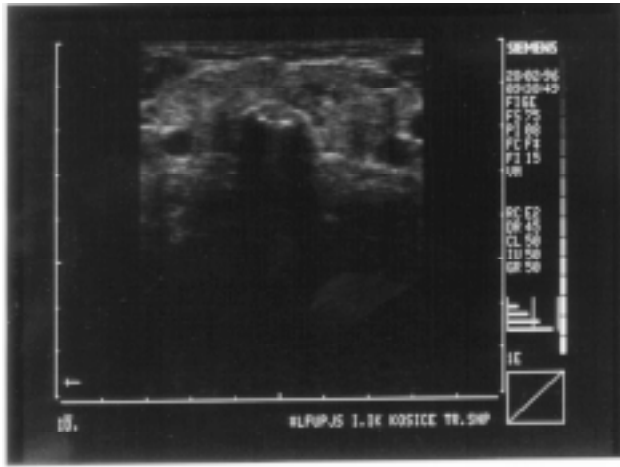


Fig. 4. Ultrasound scanning of the thyroid. Hypoechoogenicity and inhomogeneity.
Obr. 4. Ultrasonografický obraz štítnej žľazy. Echogenita difúzne znížená a nehomogénna.

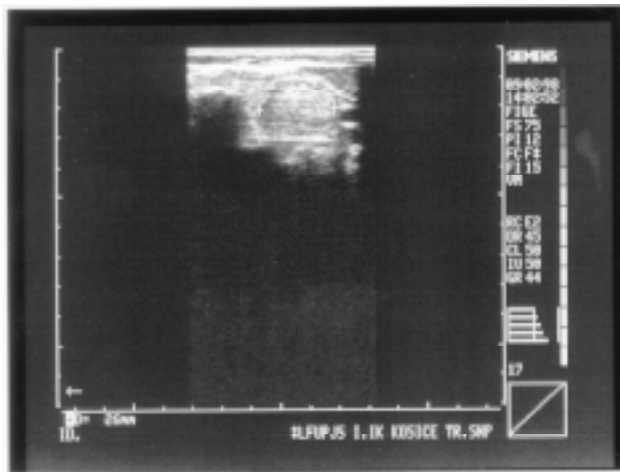


Fig. 5. Ultrasound scanning of the thyroid. Solitary nodule in the thyroid.
Obr. 5. Ultrasonografický obraz štítnej žľazy. Ložisková zmena echogenity — uzol v ľavom laloku.

4. Iodine urine excretion

Ioduria median was 14.4 µg/dl. This reflects normal iodine intake. 20 patients (24.3 %) excreted less than 10 µg/dl of iodine and 7 of them (8.5 %) excreted less than 5 µg/dl of iodine.

Discussion

Decreased or inhomogenous thyroid gland echogenicity is a sign of possible autoimmune disease and subclinical hypothyroidism. If not treated, hypothyroidism can accelerate atherosclerosis, especially of coronary arteries (2, 3, 6, 9). Its prevalence is 7.5 % in women and 2.8 % in men (10, 11, 12). Subclinical hypothyroidism prevalence significantly increases with age — 13.8 % in women older than 60 years (2, 5, 6).

Subclinical form of hypothyroidism is not manifested by typical clinical symptoms of the disease. Subclinical hypothyroidism

echogenita homogenná, primeraná
echogenicity homogenous (normal echpatern)

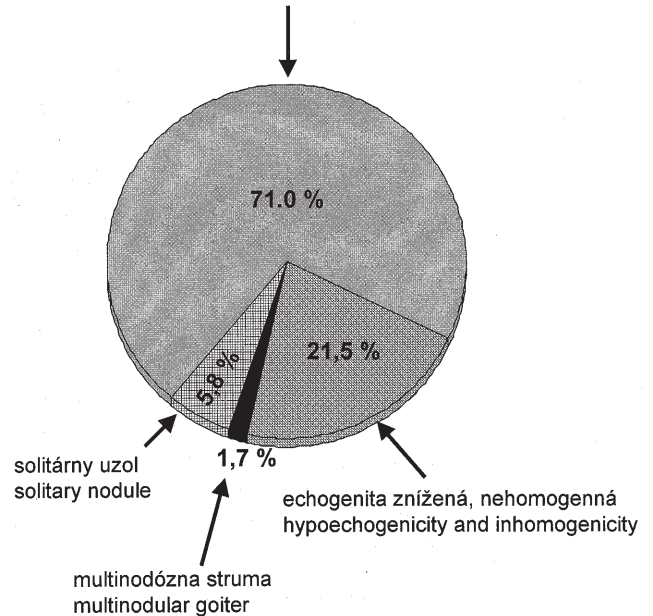


Fig. 6. Echopatterns of the thyroid.

Obr. 6. Echogenita štítnej žľazy zistená pri ultrasonografickom vyšetrení.

Tab. 1. Final results.

Tab. 1. Konečné výsledky.

Thyreopathy Tyreopatia	Treatment Liečba		Total Celkom
	before examination pred našim vyšetrením	after examination po našom vyšetrení	
Hyperthyroidism Hypertyreóza	8	2	11
Hypothyroidism Hypotyreóza	4	9	13
Hot nodule Uzol horúci	4	3	7
Cold nodule Uzol studený	2	5	7
Multinodular goiter Multinodózna struma	4	1	5
Surgery Operácia	5 (1x papil.ca)	1	6
Total	27		47
Celkom	(9.2%)	20	(16%)

should be suspected in patients complaining of fatigue, weightgain, dry skin, amnesic symptoms, depression, bradycardia, in patients with abnormal myocardial contractility, increased diastolic pressure, hypercholesterolemia, fibrocystic breast disease, menstrual abnormalities and infertility (2, 3, 7, 10, 17).

Tab. 2. Females with thyroid antibodies.
Tab. 2. Ženy s antityreoidálnymi protilátkami.

Thyroid antibodies present			
Protilátky anti TPO,Tg alebo TSHr prítomné	N 42		
Thyroid volume		nodule	
Objem ŠZ		uzol	4
≥18 ml	N 14	goiter struma	10
Changed echopatterns			
Zmena echogenity	N 23		
Hyperthyroidism			
Thyroid dysfunction		hyperfunkcia	2
Porucha funkcie	N 14	hypothyroidism hypofunkcia	12

TSH level assessment is indicated when ultrasound reveals changes in thyroid gland echogenicity and nonspecific clinical symptoms are present. TSH level can be elevated (≥ 5 mIU/l) even though T3, T4, fT3 and fT4 levels are normal. Simultaneous antibody level increase, especially anti TPO, is usually a signal of developing hypothyroidism (6, 7, 10, 11, 12, 14, 16).

Subclinical hypothyroidism is more frequent in patients with type I. diabetes mellitus and vitiligo (2, 15). When ultrasound examination reveals some echogenicity abnormalities in such patients, their TSH and thyroxin levels should be examined.

Lithium, Amiodaron or Interferon treatment may also cause subclinical hypothyroidism or hyperthyroidism (2, 18). Early signs of such side effects are volume expansion, echogenicity changes and blood supply differences. Thus it is recommended to perform an ultrasonography before the beginning of such treatment with at least one further examination following in 3 months. When any ultrasonographic abnormalities are found, TSH and anti TPO levels should be monitored.

A solitary nodule in thyroid gland can also be a malignant tumor therefore its finding requires further investigation!

A solitary nodule can lead to subclinical hyperthyroidism, especially in elderly patients. These patients usually show only nonspecific symptoms such as anxiety, insomnia, fatigue, osteoporosis, cardiac symptoms, often paroxysmal atrial fibrillation (3, 7, 9). Amiodaron treatment (with high iodine containment) can worsen their symptoms (18). Consequently, patients with paroxysmal atrial fibrillation should be properly examined by thyroid gland ultrasound before starting antiarrhythmic therapy. Their FT3 and FT4 levels are normal, but their TSH level is already decreased (≤ 0.2 mIU/l).

Conclusion

Complete endocrinologic examination is necessary, when thyroid gland ultrasound shows increased volume or echogenicity changes (nodular or diffuse).

The number of patients who need endocrinologic treatment increased after examination from 27 (9.2 %) to 47 (16.0 %). Eleven

women were included (2 for hyperthyroidism, 9 for hypothyroidism) to a group of 12 patients that were already treated because of thyroid disease (8 for hyperthyroidism and 4 for hypothyroidism). From this group of 23 patients echogenicity changes were found in 21 cases and thyroid gland volume increased over 18.0 ml in 7 cases. Six women with a nodule were amongst our patients at the beginning (2 had cold and 4 hot nodules). Hot nodules were detected in 3 patients (one of them was already treated for sinus tachycardia) and cold ones in 5. None of cold nodules showed signs of malignancy after cytological examination. In one patient was surgically treatment (thyroidectomy) was performed because of follicular adenoma (Tab. 1).

Women over 40 years increased incidence of thyroid enlargement and echogenicity changes were detected (including solitary nodules).

References

1. Brander A., Viikinkoski P., Nickels J. et al.: Thyroid gland: US screening in a random adult population. *Radiology*, 181, 1991, 683—687.
2. Fenzi G., Salvatore D., De Riu S. et al.: Subclinical hypothyroidism. P. 305—314. In: *The thyroid and age*. Merck Eur. Thyroid Symposium 1998.
3. Foldes J.: Risk/benefit of thyroid hormone treatment in subclinical hypothyroidism. P. 201—211. *The thyroid and tissues*. Merck Eur. Thyroid Symposium, Strassburg 1994.
4. Gutekunst R., Haferman W., Mansky T. et al.: Ultrasonography related to clinical and laboratory findings in lymphocytic thyroiditis. *Acta endocrinol.*, 121, 1989, 129—136.
5. Helfand M., Redfern C.C.: Screening for thyroid disease: an update. *Ann. Intern. Med.*, 129, 1998, 144—158.
6. Hershman M.J., Pekary E.A., Berg L. et al.: Serum thyrotropin and thyroid hormone levels in elderly and middleaged euthyroid person. *J. Amer. Geriatr. Soc.*, 41, 1993, 823—828.
7. Jayme J.J., Ladenson W.P.: Subclinical thyroid dysfunction in the elderly. *TEM*, 5, 1994, 79—86.
8. Klima G.: L'échographie de la thyroïde. Munich—Vienne—Baltimore, Urban-Schwarzenberg 1995, 148 p.
9. Koutras A.D.: Subclinical hyperthyroidism. 315—324. In: *The thyroid and age*. Merck Eur. Thyroid Symposium 1998.
10. Langer P.: Hypotyreoza dospelých. P. 159—164. In: *Praktická endokrinológia*, Bratislava, SAP 1993.
11. Lima N., Cavaliere H., Medeiros-Neto G.: A retrospective study of thyroid autoimmunity and hypothyroidism in a random obese population. *Med. Sci. Res.*, 15, 1987, 31—32.
12. Límanová Z., Barkmanová J., Friedmannová Z.: Funkce štítné žlázy u žen s karcinomem prsu. *Vnitř. Lék.*, 9, 1996, 605—609.
13. Marcocci C., Vitti P., Cetano F. et al.: Thyroid ultrasonography helps to identify patients with diffuse lymphocytic thyroiditis who are prone to develop hypothyroidism. *J. clin. Endocrinol. Metab.*, 72, 1991, 209—213.
14. Saller B.: Laboratory tests in the diagnosis of thyroiditis. *Der Nuclearmediziner*, 16, 1993, 175—182.
15. Schaaf L., Pohl T., Schmidt R. et al.: Screening for thyroid disorders in a working population. *Clin. Invest.*, 71, 1993, 126—131.
16. Scherbaum W.A.: Pathogenesis of autoimmune thyroiditis. *Der Nuclearmediziner*, 16, 1993, 241—249.
17. Trejbal D., Gonsorčíková V., Lazúrová I. et al.: Klinický obraz latentnej hypotyreozy u žien. *Vnitř. Lék.*, 42, 1996, 162—165.
18. Wémeau L.J., Bauters C.: Iatrogenic thyroid disease. P. 225—248. In: *The thyroid and age*. Merck Eur. Thyroid Symposium 1998.

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