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Ultrasound Examination of Thyroid Cancer

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Abstract: *according to statistics in Ukraine, the thyroid cancer incidence is about 11 per 100,000 people in the capital region, 6 per 100,000 in other districts. Women are more often affected than men (4:1); it is mainly found in patients aged 40-55 years. After the accident at the Chernobyl nuclear power plant, there was an increase in the number of patients with thyroid cancer, especially among children under the age of 15 (boys – 4% and girls – 9%).*

Keywords: endocrine system, iodine, radiation exposure, thyroid cancer, thyroid gland.

Introduction

For the first time, information about ultrasound examination of small organs appeared in Nowrey and co-authors in 1955. For the first time, the ultrasound of the thyroid gland, in A- and B-mode, was performed in clinical practice in 1966-1967 (Fujimoto Y. et al., 1997).

Aim

Find out what proportion of thyroid cancer is detected by ultrasound. Get acquainted with the etiology, risk factors for the development of thyroid cancer, the clinic, methods of diagnosis and prevention of oncological diseases of the thyroid gland

Review and discussion

The thyroid gland is one of the essential organs of the endocrine system, which produces hormones that control almost all processes in the body. Malignant neoplasms of the thyroid gland take the first place among tumours of the endocrine system, because they arise during abnormal division of the cells of the gland itself. For the first time, Japanese researchers Yamakawa and Naito performed an ultrasound examination of the thyroid gland in 1966 (with a low-frequency sector sensor), though it was not possible to obtain a high-quality image. Risk factors for the development of oncological neoplasms of the thyroid gland are: radiation exposure (x-rays of teeth and chest organs, radioactive dust containing iodine I-131, as a result of the use of nuclear weapons or accidents during the operation of nuclear reactors, the risk of malignancy increases to 28%); benign tumours of the thyroid gland; lack of iodine (in countries with low iodine content in food); heredity (children with hyperplasia of the thyroid gland, medullary carcinoma in anamnesis, adenoma or recurrent euthyroid goitre in endemic areas).

The main symptoms for conducting an ultrasound of the thyroid gland are an increase in its size, a change in the level of thyroid hormones, a neck injury, an increase in cervical lymph nodes, hoarseness of the voice, attacks of hypothyroidism, the need to perform thin-needle aspiration

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puncture biopsy (TAPB) under ultrasound control. It is necessary to assess the volume of the thyroid gland; carry out an ultrasound characterization of the detected diffuse or nodular formations; assess the state of lymph nodes in the case of an inflammatory or malignant process; when performing TAPB – choose a place for a puncture, guide the puncture line, carry out visual control of the location of the needle when receiving the material; intraoperative ultrasound. For ultrasound examination, linear sensors used – 5-15 MHz when examining a very enlarged thyroid gland, it is better to choose a convex sensor (3.5-5 MHz); for a transthoracic location – a convex or sector sensor 4-5 MHz). Landmarks for finding the lobes of the thyroid gland during a transverse scan are the large vessels of the neck (internal jugular vein and common carotid artery), cartilaginous larynx, trachea and oesophagus. When using modern methods of researching the linear dimensions of the gland, the probability is 100% (with ultrasound), while with palpation, it is only 35-40%. The different methods of measuring the volume of the thyroid gland are the mode of integral calculation (Rasmussen, 1974); the formula of the ellipsoid (Brun, 1981. It's a simplified method in which the obtained maximum dimensions of the length, width and thickness of the lobes are multiplied by the coefficient of the ellipsoid – 0.479); formula of the correlated ellipsoid (Miki, 1983); three-dimensional echography (Mitkov V.V., Bataieva R.S., 2003). When receiving examination results, it is urgent the gland volume increase (in women > 18 ml, in pregnant women > 20 ml; in men > 23-25 ml). During an ultrasound examination of the thyroid gland, the main thing is to determine its location, anatomical and ultrasound structure, blood supply and dimensions. The most common types of thyroid cancer are papillary (78%), follicular (12%), medullary (6%), undifferentiated and anaplastic cancer (3%), sarcoma, lymphoma, fibro sarcoma and metastatic cancer – 1%.

Microscopic forms of thyroid tumours are subdivided into highly differentiated (papillary, follicular cancer) and poorly differentiated forms (medullary and undifferentiated cancer). Highly differentiated forms having a less aggressive course, are more common. Most often, the spread of metastases occurs by the lymphogenic route (diffuse tumour growth) in the paratracheal lymph nodes and along the jugular vein. Distant metastases are detected in the lungs – 10-14% and in the bones – 8-12%.

Laboratory research methods include enzyme-linked immunosorbent assay and radioimmunoassay for the determination of thyroid hormones (TG, T3, T4, TSH), determination of monoclonal antibodies to thyroglobulin (detection of metastases in the lymph nodes of papillary and follicular cancer).

Operative treatment is the principal method of thyroid cancer treatment (extra fascial hemithyroidectomy, subtotal resection) with case-fascial cervical lymphadenectomy.

Conclusions

Therefore, timely treatment of diseases of the thyroid gland, regular preventive examinations (in risk groups), and consumption of food rich in iodine are the main methods that prevent the appearance of oncological diseases in the gland. Ultrasound examination takes the first place among the radiation diagnostics methods of the thyroid gland, so it is performed as a primary examination. Its main directions are: assessment of the structure and size of neoplasms before and after surgical treatment; for timely detection of recurrences; marking the field before irradiation (aiming), etc.

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Conflict of interest

The authors certify the absence of conflicts of interest.

Consent to publish

All authors have read the text of the manuscript and have given their consent for its publication

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A – Research concept and design. B – Collection and/or assembly or data. C – Data analysis and interpretation. D – Writing the article. E – Clinical revision of the article. F – Final approval of the article

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Ультразвукове дослідження раку щитоподібної залози

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Аннотація. *Згідно зі статистикою в Україні захворюваність на рак щитоподібної залози складає близько 11 на 100 тис. населення в столичному регіоні, в інших регіонах 6 на 100 тис. Частіше хворіють жінки ніж чоловіки (4:1), переважно виявляється у хворих віком 40-55 років. Після аварії на ЧАЕС спостерігається збільшення кількості хворих на рак щитоподібної залози, особливо серед дітей до 15 років (хлопчики – 4% та 9% – дівчатка).*

Ключові слова: діагностика, йод, рак щитоподібної залози, радіаційне опромінення, ультразвукове дослідження.