

THE IMPORTANCE OF RADIOLOGICAL EXAMINATION METHODS IN THE EARLY DIAGNOSIS OF THYROID CANCER

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Abstract. *This thesis highlights the diagnostic importance of radiological examination methods in the early detection of thyroid cancer. The role of ultrasound, computed tomography (CT), and magnetic resonance imaging (MRI) in the early diagnosis of thyroid malignancies, assessment of tumor spread, and selection of appropriate treatment strategies is discussed.*

Furthermore, the study emphasizes the contribution of modern radiological techniques to improving diagnostic accuracy and clinical decision-making.

Keywords: *Thyroid cancer, early diagnosis, radiological examination, ultrasound, computed tomography.*

Introduction

Thyroid cancer is one of the most common malignant tumors of the endocrine system, and its early diagnosis plays a crucial role in improving treatment outcomes and patients' quality of life. In recent years, radiological examination methods, particularly ultrasound, computed tomography (CT), and magnetic resonance imaging (MRI), have been widely used to detect pathological changes in the thyroid gland. These imaging techniques make it possible to evaluate the size, location, and extent of tumor spread, thereby facilitating early diagnosis. Therefore, investigating the diagnostic significance and effectiveness of radiological examination methods in the early detection of thyroid cancer has become one of the priority research areas in modern medicine.

Relevance

Thyroid cancer is one of the most common endocrine malignancies, and its early detection significantly improves treatment effectiveness and patient survival. Therefore, evaluating the diagnostic capabilities of radiological examination methods and expanding their clinical application is an important and relevant scientific issue.

Main Part

Thyroid cancer is among the most frequently diagnosed malignant diseases of the endocrine system, and its incidence has been increasing worldwide in recent years. Several factors contribute to its development, including genetic predisposition, exposure to ionizing radiation, iodine deficiency, and specific genetic mutations. During the early stages, thyroid cancer is often asymptomatic, making timely diagnosis challenging. Early detection, however, substantially increases the effectiveness of treatment.

Patients diagnosed at an early stage generally have better surgical outcomes, a lower risk of metastasis, and improved long-term survival. Consequently, screening programs and preventive medical examinations play an important role in reducing disease burden. Modern clinical practice widely uses the Thyroid Imaging Reporting and Data System (TI-RADS) to assess thyroid nodules and estimate the risk of malignancy. Early diagnosis not only improves patients' quality of life but also reduces healthcare costs. Therefore, the early detection of thyroid cancer remains one of the leading priorities in contemporary oncology.

Radiological imaging methods play a central role in the diagnosis of thyroid diseases.

Ultrasound examination is considered the primary imaging modality because it provides detailed information about the size, structure, and characteristics of thyroid nodules. Color Doppler ultrasound is useful for evaluating the vascularity of thyroid lesions. Computed tomography is valuable for assessing tumor invasion into adjacent tissues, while magnetic resonance imaging offers superior visualization of soft tissue structures. In selected cases, positron emission tomography combined with computed tomography (PET/CT) is applied to detect metastatic lesions. These imaging techniques are non-invasive and cause minimal discomfort to patients. In addition, radiological findings provide essential information for planning surgical treatment. Advances in imaging technology have significantly improved diagnostic accuracy.

Artificial intelligence-assisted image analysis is also increasingly being introduced into radiological practice, helping to reduce diagnostic errors and improve clinical efficiency.

The effectiveness of radiological examination methods is evaluated based on their sensitivity and diagnostic accuracy. Ultrasound is capable of detecting even very small thyroid nodules. The TI-RADS classification system assists clinicians in estimating the likelihood of malignancy. Computed tomography and magnetic resonance imaging are particularly valuable for determining the stage of the disease and evaluating regional tumor extension. These techniques provide comprehensive preoperative assessment and facilitate treatment planning. Diagnostic accuracy is further enhanced when radiological findings are combined with cytological examination. Recent advances in artificial intelligence have enabled automated interpretation of radiological images, reducing diagnostic time while improving accuracy.

In the future, radiomics and machine learning technologies are expected to play an increasingly important role in thyroid cancer diagnosis. Moreover, telemedicine has expanded opportunities for remote radiological consultations, improving access to high-quality diagnostic services for patients living in remote areas. Therefore, the continuous development and implementation of advanced radiological technologies remain promising directions in modern medical practice.

Conclusion

In conclusion, radiological examination methods play a crucial role in the early diagnosis of thyroid cancer. Ultrasound, computed tomography, and magnetic resonance imaging are highly effective for detecting thyroid malignancies at an early stage, evaluating tumor extension, and determining appropriate treatment strategies. Combining radiological imaging with other diagnostic methods significantly improves diagnostic accuracy and enables timely medical intervention.

Consequently, the broader implementation of modern radiological technologies can contribute to reducing complications, improving survival rates, and enhancing the overall quality of thyroid cancer management.

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