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Observation on the value of ultrasound combined with CT in diagnosing thyroid calcified nodules

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Abstract: *To investigate the efficacy of ultrasound in conjunction with CT scans for diagnosing thyroid calcified nodules, a retrospective analysis was conducted on data from 30 patients with such nodules who underwent random CT and ultrasound examinations between February 2018 and July 2022. The study aimed to compare and analyze the impact of different examination methods on the detection rate and diagnostic accuracy of thyroid calcified nodules. Among the 30 patients reviewed in our hospital, 40 nodules were identified following pathological biopsy, all of which were confirmed as calcified nodules. Of these, 31 were diagnosed as malignant, while 9 were deemed benign. The experimental group, utilizing combined ultrasound and CT, exhibited a detection rate for thyroid calcified nodules of approximately 96.25%, surpassing the detection rate observed in the conventional examination group. The disparity between the two groups was statistically significant (P<0.05). Specifically, the experimental group demonstrated a detection rate of 96.77% for malignant calcifications and 100% for benign calcifications, both significantly higher than those in the control group (P<0.05).The application of ultrasound combined with CT in diagnosing thyroid calcified nodules exhibited substantial efficacy, notably enhancing the disease's diagnostic rate. This approach facilitates accurate determination of the nature of calcified nodules, emphasizing its potential for clinical implementation with judicious intervention.*

Keywords: *Ultrasound; CT Diagnosis; Thyroid Calcified Nodules; Value*

1. Introduction

At present, people's life and work pressure will be relatively high. People's life schedule is irregular, and their eating habits are unreasonable. It is easy to cause thyroid nodules, and the incidence rate of its diseases is rising. Thyroid function can affect the secretion of thyroid hormones. If it produces problems, the metabolism and growth and development of the human body will be affected accordingly[1]. Therefore, it is necessary to pay attention to thyroid related diseases. Thyroid nodules can be further divided into two categories: malignant nodules and benign nodules. The nature of the disease may vary, and the treatment plan may also vary. Therefore, it is necessary to diagnose the nature of the disease. In clinical practice, the nature of thyroid nodule disease can be determined by the presence of calcification. The operational difficulty of ultrasound technology is relatively small, and the time is relatively short. Patients with thyroid calcified nodules can use ultrasound combined with CT diagnosis to ensure disease detection rate, accurately determine the nature of the disease nodules, make up for the shortcomings of traditional pathological biopsy, and provide reference basis for the development of clinical plans.

Thyroid calcified nodules refer to the presence of calcified substances and the formation of nodules in the thyroid gland. Calcified nodules are usually benign, but may also be one of the manifestations of thyroid cancer. This condition is usually found in ultrasound examination, and the calcified substances are distributed in dots, spots, or masses[2]. The symptoms of thyroid calcified nodules are usually no obvious discomfort, but some patients may experience thyroid enlargement, compression, or local pain. If the nodule is large, it may affect the function of the throat area or cause breathing difficulties. In short, thyroid calcified nodules are a common thyroid disease, most of which are benign. Accurate diagnosis and appropriate treatment plans are crucial for the health of patients.

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2. Experimental Materials and Methods

2.1 Experimental data

A retrospective study was conducted on patients with thyroid calcified sarcoidosis admitted to our hospital from February 2018 to July 2022. Thirty patients were randomly selected, including 11 male patients and 19 female patients; The minimum age is 31 years old, the maximum age is 66 years old, and the overall average age is 47 years old. These 30 patients were all found to have 40 thyroid calcified nodules through pathological examination, 31 malignant nodules, and 9 benign nodules. Set the criteria for selecting experimental patients: all patients meet the surgical indications, undergo initial surgery, and sign relevant experimental written documents on a voluntary and informed basis. Set exclusion criteria: presence of infectious diseases, mental health issues, deaf-mute individuals, or consciousness disorders.

2.2 Experimental Methods

Initially, ultrasound examinations were conducted on 30 patients, and their test outcomes were incorporated into the control group for statistical analysis. Patient positioning was adjusted to ensure optimal exposure of the neck area. Parameters of the color Doppler ultrasound instrument were judiciously set within a frequency range of 5 to 14MHz, and a coupling agent was applied to the ultrasound probe. Comprehensive longitudinal and transverse scans of the patients' thyroid and adjacent tissues were performed to document water flow distribution and accurately determine the characteristics of thyroid calcified nodules.

The CT protocol was used for detection, and its values were recorded as statistical detection data for the experimental group. The diagnostic method of the CT protocol is to adjust the patient's detection position, set 320 row volume CT instrument parameters, such as a pitch of 1 mm and a layer thickness of 3.75 mm. After the plain scan, enhanced scanning is performed, and the injection speed of the high-pressure syringe is controlled at 3 milliliters per second. Multiple physicians need to cooperate in various examinations to determine the nature of the patient's disease [3]. For disputed results, confirmation from a third physician is required.

In the diagnostic process combined with CT, spiral CT was selected with 64 rows. In terms of scanning range, from the hyoid bone to the thoracic entrance, the layer thickness was set to 2.5mm, the screw distance was set to 1.5mm, the tube current was set to 180mAs, and the tube voltage was set to 120kV. After routine plain scanning, iodohexanol injection was carried out. Combining high-pressure injectors for injection work, select intravenous injection method with a flow rate of 3ml/s, and perform enhanced scanning [2]. When conducting ultrasound diagnosis, combined with color Doppler ultrasound, exploration work needs to be carried out on the thyroid gland and surrounding tissues in the patient's neck position. When setting the probe frequency, it should be set between 5MHz and 14MHz. For the patient, the neck should be fully exposed[4]. When applying the coupling agent to the probe, exploration work should be carried out from both longitudinal and transverse sections, and detailed records should be made of the blood flow distribution, thoroughly analyze the nature of the nodules.

3. Results

Table 1: Comparison of detection rates of thyroid calcified nodules between groups (n,%)

Group	Detect the number of calcified nodes	Microcalcification	Coarse calcification	Circular calcification	Detection rate
Regular group	40	19(46.25)	12(31.25)	4(10.00)	35(87.50)
experimental group	40	20(50.00)	14(33.75)	5(12.50)	34(96.25)
X2					8.976
P					0.003

The detection rate of thyroid calcified nodules in the experimental group was about 96.25%, which was higher than the detection rate of thyroid calcified nodules in the conventional group. There was a difference between the two groups ($P<0.05$). The detection rate of malignant calcification in the experimental group was 96.77%, and the detection rate of benign calcification was 100%, both of which were significantly higher than those in the control group. The difference between the two groups

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was statistically significant (P<0.05), as shown in Tables 1 to 2.

Table 2: Comparison of detection rates of benign and malignant calcifications between groups (n,%)

Group	Detect the number of calcified nodes	Malignant (n=62)	Benign (n=9)
Regular group	32	27(88.70)	7(77.78)
experimental group	39	30(96.77)	9(100.00)
X2		4.904	4.667
P		0.027	0.031

4. Discussion

In recent years, because the incidence rate of thyroid diseases is getting higher and higher, the clinical requirements for clear diagnosis of thyroid diseases are also getting higher and higher. Thyroid nodule is a common thyroid disease. Its lesions can be benign or malignant. Most lesions are difficult to identify their types in the early stage. Therefore, with the increase of its incidence rate, the pressure of clinical diagnosis is increasing, as shown in Figure 1.

Figure 1: Thyroid nodule

In order to further diagnose the benign and malignant nature of thyroid nodules, Doppler ultrasound imaging is often used in clinical practice to examine them. Related studies have shown that the occurrence of calcification in thyroid nodules is closely related to the malignancy of the lesion, making it a highly diagnostic clinical examination[5]. Clinical experience has shown that thyroid cancer is more prone to calcification than benign thyroid lesions, and the reason for this has not been clearly explained, which may be related to metabolic changes in cancer cells leading to calcium deposition. Screening for calcified lesions in thyroid nodules through ultrasound imaging is a thorough examination that does not miss important details and has a low rate of missed detections. It is helpful for clinical diagnosis and is highly favored by physicians, making it the first choice for examining thyroid diseases. This study showed that through ultrasound examination images, the number and types of nodules detected between groups (coarse calcification, micro calcification) were compared. The total number of calcifications in the benign group was significantly lower than that in the malignant group, and in the malignant group, micro calcification had an absolute advantage in quantity, P<0.05; By comparing the morphology and boundaries of nodules between groups, it was found that benign nodules were mostly characterized by regular morphology and clear boundaries, while malignant nodules exhibited irregular morphology and blurred boundaries, with P<0.05; Comparing the sensitivity of intergroup calcification in diagnosing benign and malignant thyroid lesions, the malignant group has a higher sensitivity to calcification, P<0.05.

Thyroid nodules are a common endocrine system disease in clinical practice, caused by the proliferation of thyroid fibrous tissue, local hardening, and abnormal structural changes leading to the

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formation of tissue masses. In the early stages of the disease, there are generally no typical clinical features, only symptoms such as thickening of the neck, presence of masses, bilateral asymmetry, difficulty breathing and swallowing, and hoarseness. During ultrasound examination, calcification of thyroid nodules is common, and both benign and malignant nodules may have calcification. Among them, calcification within the thyroid Ca is caused by the rapid growth of cancer cells, excessive proliferation of fibrous tissue and tumor blood vessels, leading to calcium deposition and calcification[6]. At the same time, some secretions of the tumor itself may also cause calcification, such as mucopolysaccharides, glycoproteins, etc. Benign thyroid nodules with calcification may be caused by the alternation of proliferation and involution, which leads to the proliferation of thyroid fibrous tissue and affects the blood flow of thyroid follicles. As a result, the thyroid gland may experience bleeding, necrosis, and the formation of hematoma. After absorption, calcification may form, including calcification of the fibrous septa and nodule wall. In clinical practice, thyroid nodules are usually judged as benign or malignant based on the location, shape, size, quantity, and distribution of calcification indicated by ultrasound examination results, and calcified nodules are divided into two types: microcalcifications and coarse calcifications. Clinical research reports indicate that the accuracy of ultrasound diagnosis of calcification reaches 92.34%, which is an important method for preliminary differentiation of benign and malignant thyroid nodules. In ultrasound imaging, microcalcifications are generally located inside or around the lesion, with an arc-shaped distribution, and are more common in malignant thyroid tumors[7]. Coarse calcification manifests as patchy or clustered, accompanied by irregular strong echoes. A large number of research results have shown that thyroid nodule calcification is caused by the rapid growth of cancer cells, which leads to the deposition of calcium salts in thyroid fibrous tissue, gradually forming nodule wall calcification and fibrous septal calcification. Ultrasound diagnosis of thyroid cancer shows high specificity, as shown in Figure 2.

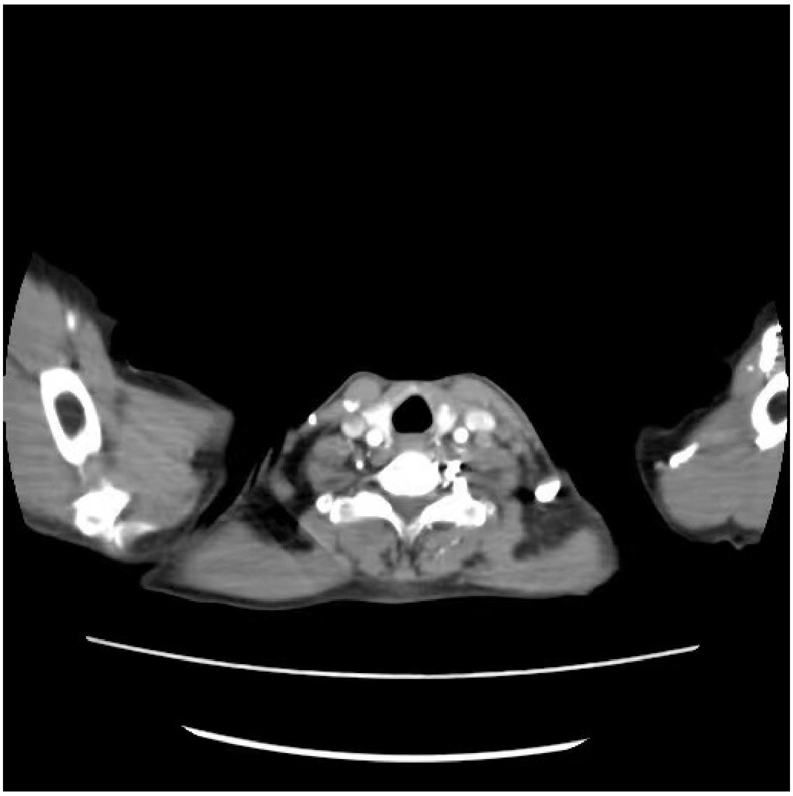

Figure 2: Thyroid ultrasound examination

Thyroid nodule disease is common in daily life, and can occur at all ages. The incidence rate of women is much higher than that of men. Chronic inflammation of the thyroid gland, thyroid cysts, and other conditions can cause thyroid nodules. After the formation of this disease, it not only forms neck edema, but also causes symptoms such as poor breathing and shortness of breath, weight loss, palpitations, and fear of cold, which can have adverse effects on the patient's quality of life and daily life. Therefore, it is necessary to receive treatment as soon as possible and develop a reasonable and effective treatment plan. It will be related to the precise diagnosis and treatment results. Moreover, there may be differences between malignant and benign thyroid nodules. After confirming the nature of the disease, personalized treatment methods should be implemented to improve the patient's discomfort

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and ensure their prognosis. In clinical practice, there are many diagnostic methods for benign and malignant thyroid nodule diseases, such as imaging examinations, blood tests, pathological biopsies, etc. Among them, blood tests can determine whether thyroid function is in a state of hypothyroidism or hyperthyroidism, but cannot effectively determine the nature of good or bad. Pathological biopsy has always been the gold standard for clinical diagnosis of thyroid calcified nodules, but it is a invasive procedure that can cause significant damage to the patient's body. Imaging examinations have a certain degree of repeatability and medical costs are relatively low, so the scope and frequency of application of imaging examinations in clinical practice are relatively high. The diagnostic value of applying them to thyroid calcified nodules is extremely strong, and the use of CT and ultrasound diagnostic methods can make their diagnostic results more objective. Related researchers believe that ultrasound has the advantages of strong reliability, non-invasive, and fast, which can serve as the initial diagnosis direction for benign and malignant thyroid nodules. It is convenient to analyze whether pathological examination is necessary based on ultrasound results, which can improve diagnostic efficiency and reduce the probability of misdiagnosis and missed diagnosis. Ultrasound diagnosis has certain advantages and disadvantages, and can be combined with CT to further ensure diagnostic effectiveness, The two diagnostic methods each have their own advantages, and the combined diagnostic results are relatively close to the pathological results, which can gradually replace pathological examination and is also suitable for clinical popularization and application[8].

Thyroid calcified nodules refer to nodular lesions with calcified lesions in the thyroid gland. Ultrasound combined with CT diagnosis is a commonly used diagnostic method, and ultrasound and CT are commonly used imaging examination methods. The two complement each other and can improve the diagnostic accuracy of thyroid calcified nodules. Ultrasound can visually observe the shape, boundary, internal echo characteristics of nodules, etc. CT can provide more detailed structural information, such as nodule density, degree of calcification, etc.[3]. Ultrasound has the characteristics of high resolution, non-invasive, and non radiation, which can clearly display the morphology and internal characteristics of thyroid calcified nodules. CT can provide more accurate three-dimensional images, which help evaluate the position, size, and relationship with surrounding tissues of nodules. Ultrasound can observe the blood flow of thyroid nodules in real time, which helps to determine the malignancy of the nodules. CT can perform enhanced scanning to observe the degree of enhancement of the nodules and further evaluate their properties [4]. Ultrasound and CT can evaluate the condition of lymph nodes around the thyroid gland and determine the presence of metastasis. Ultrasound can observe the morphology and echo characteristics of lymph nodes, CT can provide more comprehensive lymph node imaging, and ultrasound combined with CT can provide guidance for the diagnosis and treatment of thyroid calcified nodules[9]. By combining the results of two imaging examinations, the nature of the nodule can be more accurately evaluated to determine whether further biopsy or surgical treatment is needed. The results of this study showed that the accuracy, specificity, and sensitivity of the study group were higher than those of the control group ($P<0.05$). The calcification situation and examination results of the research group were better than those of the conventional group ($P<0.05$).

5. Conclusion

In summary, it is necessary to use ultrasound combined with CT to diagnose thyroid calcified nodules, which has strong diagnostic value and advantages. It can accurately determine the benign and malignant nature of the patient's disease, effectively identify the type of calcified nodules, and lay the foundation for the subsequent clinical work.

References

[1] Junsheng Zhang, Huawen Zhang, Liaoshen Zhang.To explore the diagnostic value of thyroid nodular lesions.Chinese Journal of CT and MRI, 2021.

[2] Daiying Lin, Xianheng Wu. Jiangshuang Yang, Xufeng Zheng, Yaobin Wu. Stepwise discriminant analysis of CT differential diagnostic factors for benign and malignant thyroid nodules.Radiological Practice, 2020.

[3] Liqiang Zhu.Jian Wang. Established a CT classification model for benign and malignant thyroid nodules. Chinese Journal of Medical Imaging, 2019.

[4] Desheng Sun, Xiaona Lin, Jieyu Zhong, Zhengming Hu.Huali Cai.Yongbin Li.To explore the ultrasound characteristics and diagnostic value of diffuse sclerosing papillary carcinoma of the thyroid gland. Journal of Rare Diseases, 2019.

ISSN 2618-1584 Vol. 6, Issue 1: 30-35, DOI: 10.25236/FMSR.2024.060106

[5] Zhen Zhang.To explore the diagnostic value of papillary thyroid carcinoma.Journal of China Medical University, 2019.
[6] Ying Kong. Nana Yu.Xueyuan Wu.Cuiping Han, Kai Xu.The value of CT manifestations of thyroid nodule calcification in distinguishing between benign and malignant.Journal of Clinical Radiology, 2019.
[7] Zengfa Huang, Yuanliang Xie, Xiang Wang.To explore the differential diagnostic value of benign and malignant thyroid nodules. Journal of Clinical Radiology, 2019.
[8] Suisheng Zheng. Liwei Zou,Xianjing Fang, Fang Bao. To explore the CT diagnostic value of thyroid calcified nodules. Chinese Journal of Modern Medicine, 2019.
[9] Qiusheng Lin, Ke Qi.Tianwen Chen, Hongxian Wang. Panmei Wei, Yao Liu, Tianhui Zou.Heng Kong.Xiaofei Deng.The predictive value of a scoring system based on clinical and ultrasound features in the diagnosis of thyroid nodules, Chongqing Pharmaceutical, 2019.