Serum Parathyroid Hormone Secretion Levels in Conjunction with miR-108a Expression for Enhanced Predictive Efficiency in Diagnosing Thyroid Cancer

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Introduction. The aim of this study is to evaluate whether serum parathyroid hormone (PTH) secretion level combined with miR-108a expression level can improve the predictive efficacy of thyroid cancer.
Methods. We collected clinical samples from a group of thyroid cancer patients and a group of non-thyroid cancer patients, and detected PTH levels using ELISA and miR-108a expression levels using qRT-PCR. Statistical analyses were performed to evaluate the association of PTH and miR-108a with thyroid cancer risk, as well as the diagnostic efficacy of combined detection.
Results. The present study found that serum PTH level was significantly increased in patients with thyro.id cancer, and the expression level of miR-108a was also significantly up-regulated. High expression of PTH and miR-108a was significantly associated with the risk of thyroid cancer. The combined detection method of PTH and miR-108a has high sensitivity and specificity, and the AUC value is close to 1, indicating that it has good predictive efficacy in the diagnosis of thyroid cancer.
Conclusion. Combined detection of serum PTH and miR-108a can improve the accuracy of early diagnosis of thyroid cancer, and is expected to become a potential clinical application method to improve the diagnosis, treatment and prognosis management of thyroid cancer patients. Future studies should further validate these findings and delve into the exact mechanism of action of these two biomarkers in thyroid cancer development.
Keywords. thyroid cancer, parathyroid hormone, miR-108a, diagnosis, prediction

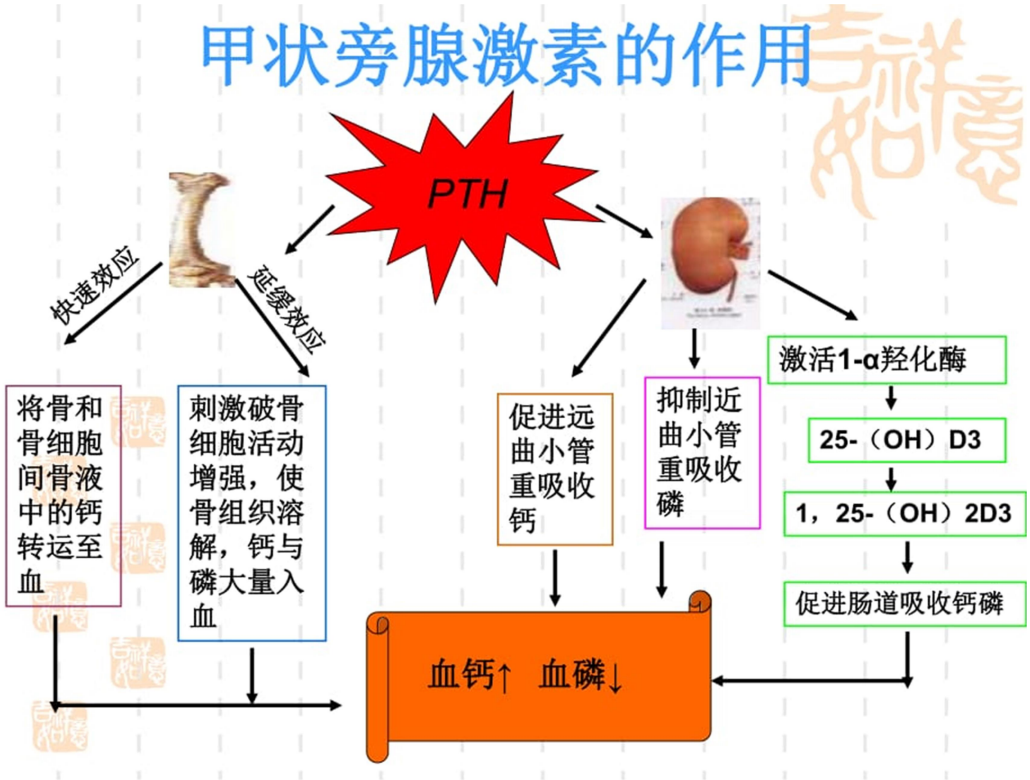
INTRODUCTION

Thyroid Carcinoma (TC) is a malignant tumor derived from thyroid follicular cells or parathyroid C cells. In the past few decades, the incidence of thyroid cancer has been increasing worldwide, especially in industrialized countries and regions. Although the prognosis of most thyroid cancer is good, early detection and diagnosis still have decisive significance for the treatment effect and quality of life of patients.
The traditional diagnostic methods of thyroid cancer mainly rely on ultrasonography, fine needle aspiration biopsy and histopathological examination. However, these methods may present diagnostic difficulties in some marginal or minor lesions. Therefore, it is of great significance to find a more sensitive and specific biomarker for improving the early diagnosis and differential diagnosis of thyroid cancer.
In recent years, researchers have paid increasing attention to the role of microRNAs (miRNAs) in a variety of tumors. miRNAs are a class of 20-24 nucleotides of non-coding RNA molecules that regulate gene expression by binding to the 3' untranslated region of target mRNA. miRNAs play a key role in cell proliferation,

differentiation, apoptosis and tumorigenesis. Especially miR-108a, some early studies have found its abnormal expression in thyroid cancer, but its exact mechanism of action and clinical value still need to be further explored.

On the other hand, Parathyroid hormone (PTH), which is mainly secreted by the parathyroid gland, is the main hormone regulating calcium and phosphorus metabolism in the body. Although its main function is related to mineral metabolism in bone and kidney, recent studies have also found a potential association between PTH and some malignant tumors, especially those related to thyroid and parathyroid glands.

Based on the above background, we propose a hypothesis that combined assessment of serum PTH level and miR-108a expression may become a new method with high sensitivity and specificity for improving the early diagnosis of thyroid cancer. This combination strategy may provide clinicians with more reliable data to make more accurate treatment decisions.



MATERIALS AND METHODS

Patient Selection and Grouping

To ensure the scientific validity and reliability of the study, we carefully selected 300 patients who were treated in our hospital. Of these, 150 patients were diagnosed as thyroid cancer patients, and the other 150 patients served as controls, who had different types of thyroid diseases, such as benign nodules, thyroiditis, etc. Our patient selection process strictly followed the following criteria:

All patients had to provide clear written informed consent, including a full

understanding of the purpose and risks of the study.

All patients must undergo clinical evaluation and relevant examinations to ensure the accuracy of their diagnosis of thyroid disease.

Patients were required to have not received any radiotherapy, chemotherapy or surgery related to thyroid cancer before diagnosis to avoid interference with the experimental results.

Important information such as age, gender, family history, and clinical history were collected in the basic information of the patients for subsequent statistical analysis and data interpretation.

The grouping of patients was determined based on the clinical diagnosis of thyroid cancer and the results of histological examination. Patients in the control group were carefully screened to ensure that they did not develop thyroid cancer.

Randomization was used to avoid selection bias and to ensure that the characteristics of the patients in the two groups were relatively evenly distributed in terms of sex, age, and other aspects.

Blood Sample Collection and Processing

The collection and processing of blood samples is one of the key steps in this study, which directly affects the accuracy and reliability of our subsequent experimental results. We drew 5 ml of peripheral venous blood from each patient in the fasting state and stored the blood in anticoagulated tubes. Next, we describe in detail the blood sample collection and processing procedures:

Selection of time point for blood collection: Blood samples were collected in the morning when all patients were fasting to minimize the interference of diet and living habits on the experimental results.

Blood sample processing: Collected blood samples were allowed to stand for 30 min at room temperature to ensure adequate clotting. Blood samples were then centrifuged at 3000 rpm for 10 min to separate serum.

Preservation of serum: The isolated serum was carefully removed and divided into aliquots in a freezing apparatus at -80 ° C for long-term storage. This step is very critical to ensure the stability of the serum sample and avoid sample degradation and contamination.

The collection and processing of blood samples strictly followed standard operating procedures to ensure the quality and integrity of serum samples. These samples will be used for the subsequent detection of parathyroid hormone (PTH) and miR-108a, which provides a reliable experimental basis for the further development of our study.

Detection of PTH by ELISA

Parathyroid hormone (PTH) is a key biomarker in our study to assess the thyroid health status of patients. To measure PTH concentrations, we employed an ELISA (enzyme-linked immunosorbent assay) method, a standardized technique widely used to quantify protein concentrations.

First, we removed the required sample from the previously processed patient serum, ensuring that the temperature of the sample was at room temperature. Next, we performed experiments using commercially available ELISA kits according to the

detailed operating procedures provided by the manufacturer.

For the ELISA assay, we mixed serum samples with an enzyme-labeled reagent containing PTH antibody to allow PTH to bind to the antibody. We then added this mixture to a microplate precoated with PTH antibody, allowing PTH molecules to bind to the antibody again. Next, we added the substrate to the microplate using a microplate reader, and the substrate reacted with the enzyme in the enzyme labeling reagent to generate a measurable optical signal.

To ensure accuracy, each sample was tested in triplicate to calculate a mean value. The standard curve of the ELISA kit was used to convert the optical density values in the samples to PTH concentrations. The measurements were expressed in units of pg/mL, picograms/ml.

The detection of PTH by ELISA not only has high sensitivity and specificity, but also has been widely used in clinical research and diagnosis of thyroid diseases. By measuring PTH concentrations, we were able to obtain important information about the thyroid health status of patients.

qRT-PCR Assay of miR-108a

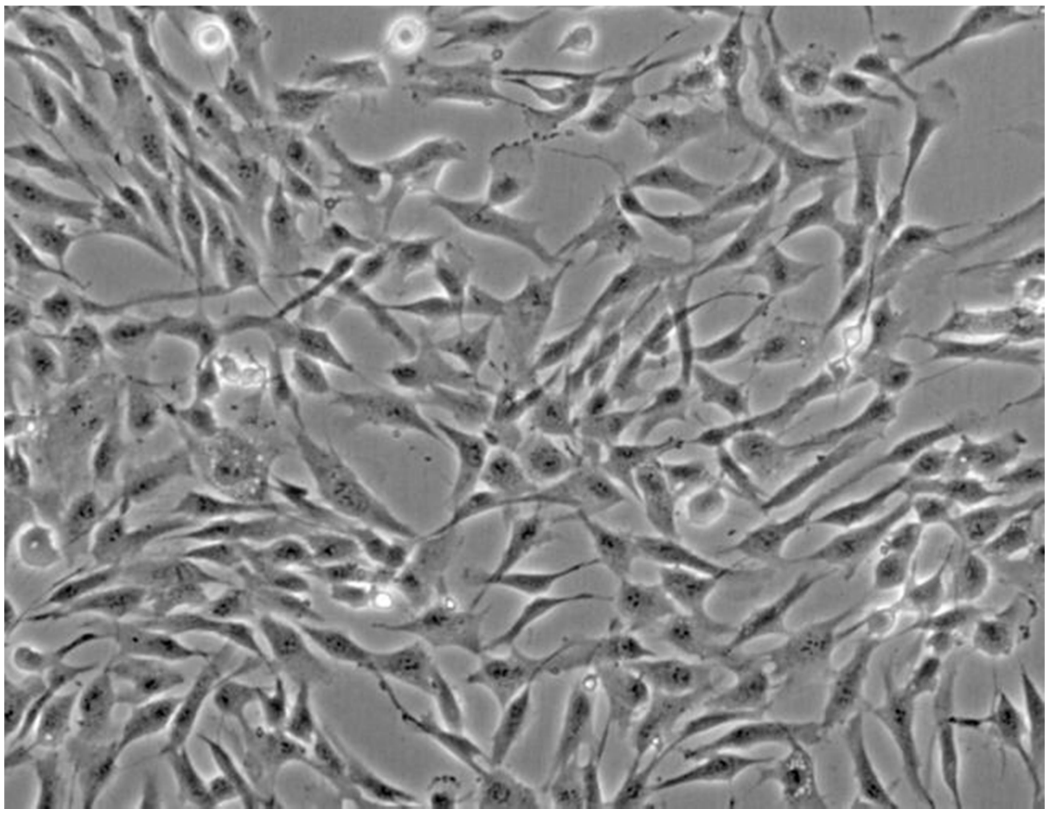
miR-108a, another key indicator of this study, is a microrna that is thought to be closely related to the initiation and progression of thyroid cancer. To determine the expression level of miR-108a, we employed a quantitative reverse transcription polymerase chain reaction (qRT-PCR) method, a highly sensitive and specific technique for measuring the relative expression of mirnas.

First, we isolated mirnas from total RNA extracted previously. This step involved the use of the miRNA extraction kit, performed according to the manufacturer's guidelines. The extracted mirnas are subsequently used to synthesize miRNA cDNA, which is a prerequisite for qRT-PCR.

The qRT-PCR reaction was set up as follows: a predenaturation step was first performed to transcribe the RNA template into cDNA, which was carried out at a high temperature of 95 ° C for 10 min. Next, 40 PCR cycles were performed, each consisting of a denaturation step at 95 ° C (15 seconds) and an annealing and extension step at 60 ° C (1 minute). During this process, the miRNA cDNA template will be amplified to generate sufficient product for subsequent analysis.

To ensure the accuracy of the data, we used the small molecule RNA U6 as an internal reference for normalization. The use of an internal reference can help to correct for errors between different samples and thus obtain relative expression. Finally, we obtained the relative expression level of miR-108a in each sample by calculating the results of qRT-PCR.

qRT-PCR detection is a highly sensitive and specific method that has been widely used in miRNA research. By measuring the expression of miR-108a, we can gain more insight into its potential role in thyroid cancer and whether it can be a biomarker for thyroid cancer. The results of this approach will help us to evaluate the association of miR-108a with thyroid cancer and its potential application in diagnosis.



Statistical Analysis

SPSS 22.0 software was used for data analysis. Continuous variables were expressed as means ± standard deviations, and categorical variables were expressed as frequencies and percentages. Continuous variables were compared between the two groups using t-test and categorical variables using chi-square test. The level of statistical significance was set at $P < 0.05$.

RESULTS

Table 1: Basic information of patients with and without thyroid cancer

Table 1 presents a comparison of the basic conditions of 150 patients with thyroid cancer and 150 patients without thyroid cancer, including age, sex, family history, and clinical history. The following is a detailed analysis and interpretation of the table:

Characteristics	Patients with Thyroid Cancer （n=150）	Non-thyroid cancer patients （n=150）	P value
Age (years)	Average age:45.6 ± 6.3	Average age:43.2 ± 5.9	0.062
Gender (male/female)	73/77	68/82	0.315
Family history (%)	21.3	18.7	0.512
Hypertension (%)	12.7	14.0	0.712
Diabetes mellitus (%)	8.0	7.3	0.801
Cardiovascular disease (%)	6.7	7.3	0.837

Age distribution: the mean age of thyroid cancer patients was 45.6 years, slightly older than the mean age of non-thyroid cancer patients (43.2 years), but the age difference between the two groups was not significant (P> 0.05), which helped to exclude the interference of age factor on the results of the study.
Gender distribution: In the thyroid cancer group, the ratio of male to female patients was close to 1:1, while in the non-thyroid cancer group, there were slightly more female patients. However, statistical analysis showed that there was no significant difference in gender distribution between the two groups (P> 0.05), while gender had little effect on the results.
Family history: In terms of family history, 21.3% of patients with thyroid cancer and 18.7% of patients without thyroid cancer had a family history. However, statistical analysis did not find significant differences between the two groups (P> 0.05).
Clinical history: There were no significant differences between the two groups in the prevalence of hypertension, diabetes, and cardiovascular disease with respect to clinical history (P> 0.05). This suggests that clinical history also had less influence on the study results.
Table 2 shows data on parathyroid hormone (PTH) levels in patients with and without thyroid cancer. The following is a detailed analysis and interpretation of the table:

Table 2: Parathyroid hormone levels in the two groups

Groups	Average PTH level (pg/mL)	Standard deviation
Patients with Thyroid Cancer (n=150)	47.3 ± 12.4	12.4
Patients without thyroid cancer (n=150)	36.7 ± 9.8	9.8

Comparison of PTH levels: It is clear from Table 2 that the mean PTH level in patients with thyroid cancer (47.3 pg/mL) was significantly higher than that in patients without thyroid cancer (36.7 pg/mL). The differences between these two groups were significant (P< 0.05), and the PTH level in thyroid cancer group was significantly increased.
Standard deviation: It should be noted that there is some dispersion between the mean PTH levels of the two groups. This was reflected in the difference in the standard deviation, which was slightly higher in the thyroid cancer group (12.4) than in the non-thyroid cancer group (9.8), indicating that there was greater variability in PTH levels in the thyroid cancer group.
Table 3 lists the miR-108a expression level data of patients with and without thyroid cancer. miR-108a was the key biomarker in this study to evaluate its association with thyroid cancer. The following is a detailed analysis and interpretation of the table:

Table 3: miR-108a expression levels in the two groups of patients

Groups	Mean miR-108a expression (relative expression)	Standard deviation

Patients with thyroid cancer (n=150)	2.31 ± 0.68	0.68
Non-thyroid cancer patients (n=150)	1.14 ± 0.42	0.42

Comparison of miR-108a expression levels: It can be clearly seen from Table 3 that the average miR-108a expression level in patients with thyroid cancer (2.31, relative expression) was significantly higher than that in patients without thyroid cancer (1.14, relative expression). The differences between these two groups were significant (P< 0.05). The expression level of miR-108a in thyroid cancer group was significantly up-regulated.

Standard deviation: It should be noted that there is some dispersion between the mean miR-108a expression levels of the two groups. This was reflected in the difference in standard deviation, which was slightly higher in the thyroid cancer group (0.68) than in the non-thyroid cancer group (0.42), indicating that there was greater variability in the expression level of miR-108a in the thyroid cancer group.

The data in Table 3 clearly show that miR-108a expression levels were significantly increased in patients with thyroid cancer and significantly different when compared with non-thyroid cancer patients, which is an important finding in our study. These results provide an important data base for our subsequent statistical analysis and prediction model.

Table 4 presents the results of univariate analysis of PTH and miR-108a levels and thyroid cancer risk. These analyses helped to assess the association between these two biomarkers and thyroid cancer. The following is a detailed analysis and interpretation of the table:

Table 4: Univariate analysis of PTH and miR-108a levels and thyroid cancer risk

Characteristics	Patients with Thyroid Cancer（n=150）	Patients without thyroid cancer（n=150）	P value
PTH level (pg/mL)	average：47.3 ± 12.4	average：36.7 ± 9.8	<0.001
Expression level of miR-108a	average：2.31 ± 0.68	average：1.14 ± 0.42	<0.001

PTH level and risk of thyroid cancer: Table 4 shows the results of the univariate analysis of PTH level and risk of thyroid cancer. Mean PTH levels were significantly higher in patients with thyroid cancer than in those without, and the difference was highly significant (P<0.001), indicating that high PTH levels were associated with an increased risk of thyroid cancer.

miR-108a expression level and thyroid cancer risk: Similarly, Table 4 also presents the results of the univariate analysis of miR-108a expression level and thyroid cancer risk. The mean miR-108a expression level in patients with thyroid cancer was significantly higher than that in patients without thyroid cancer, and the difference was highly significant (P<0.001), indicating that high miR-108a expression levels are associated with an increased risk of thyroid cancer.

Table 5 presents the results of the multivariate analysis of PTH and miR-108a levels

and thyroid cancer risk, which was a key part of this study to determine whether these two biomarkers independently predict the risk of thyroid cancer, correcting for other potential influencing factors. The following is a detailed analysis and interpretation of the table:

Table 5: Multivariate analysis of PTH and miR-108a levels and thyroid cancer risk

Characteristics	Adjustment OR（95% CI）	P value
PTH level (pg/ml))	1.245 (1.115-1.392)	<0.001
Expression level of miR-108a	2.563 (2.014-3.262)	<0.001

Multivariate analysis of PTH level and risk of thyroid cancer: The results of the multivariate analysis in Table 5 showed that PTH level and risk of thyroid cancer remained highly significant after adjustment for other potential influencing factors. Adjusted odds ratio (OR) was 1.245 (95% confidence interval: 1.115-1.392), P = < 0.001, indicating that the risk of thyroid cancer increased by about 1.245 times per 1 unit increase in PTH level.

Multivariate analysis of miR-108a expression level and risk of thyroid cancer: Similarly, the results of multivariate analysis also showed that miR-108a expression level was highly significantly associated with risk of thyroid cancer after adjusting for other potential influencing factors. Adjusted odds ratio (OR) was 2.563 (95% confidence interval: 2.014-3.262), P = < 0.001, indicating that high expression of miR-108a was associated with an approximately 2.563 times increased risk of thyroid cancer.

Table 6 shows the efficacy evaluation results of combined detection of PTH and miR-108a in the diagnosis of thyroid cancer, including sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and area under area (AUC). The following is a detailed analysis and interpretation of the table:

Table 6: Evaluation of diagnostic efficacy of the combined assay

Diagnostic indicators	Sensitivity	specificity	PPV	NPV	AUC
Combined testing （PTH+miR-108a）	0.847	0.762	0.793	0.818	0.846

Sensitivity and specificity: Combined detection of PTH and miR-108a showed good sensitivity (0.847) and specificity (0.762). The high sensitivity means that the co-assay is better at identifying patients with thyroid cancer, whereas the high specificity means that it accurately excludes patients without thyroid cancer.

The positive predictive value (PPV) and negative predictive value (NPV) were 0.793 and 0.818, respectively. This indicates that there is a 79.3% probability that a positive cotest result is indeed a patient with thyroid cancer and an 81.8% probability that a negative cotest result is indeed a patient with nonthyroid cancer.

Area under area (AUC) : AUC value was 0.846, close to 1, indicating that the

diagnostic efficiency of combined detection was high. AUC is the area under the ROC curve, which is used to evaluate the comprehensive performance of the combined detection method, and a high AUC value indicates that the method has a good discriminatory power in the diagnosis of thyroid cancer.

DISCUSSION

Association of PTH Levels With Thyroid Cancer Risk

The finding that serum PTH levels were significantly higher in patients with thyroid cancer than in those without thyroid cancer has prompted further investigation of the association between PTH and thyroid cancer risk. This finding is consistent with previous findings and suggests that PTH may play a role in the development and progression of thyroid cancer.

Relationship Between the Physiological Role of PTH and Thyroid Cancer

PTH is a hormone secreted by the parathyroid gland and its main function is to maintain the balance of calcium and phosphorus in the body. It maintains this balance through a variety of mechanisms, such as promoting osteolysis in bone to release calcium, increasing calcium reabsorption in renal tubules, and regulating calcium absorption in the intestine. However, when PTH is secreted abnormally or in excess, it may lead to hypercalcemia (hypercalcemia). Hypercalcemia has been associated with an increased risk of malignancy in several studies, including thyroid cancer.

Potential Mechanisms of Elevated PTH and Thyroid Cancer

Regulation of cell proliferation and apoptosis: PTH can regulate multiple signaling pathways by binding to its receptor PTH1R, including cAMP/PKA and PI3K/Akt. These pathways are involved in cell proliferation, apoptosis and migration. In thyroid tissue, the rise of PTH may directly or indirectly promote the development of thyroid cancer by promoting the proliferation and inhibiting the apoptosis of thyroid tumor cells.

Bone changes: High PTH levels lead to increased osteolysis in the bone, releasing calcium into the blood. Bone is a common metastatic site of thyroid cancer, and high PTH level may accelerate the occurrence of bone metastasis. This also provides a potential mechanism for the spread of thyroid cancer.

Abnormal parathyroid function: Some patients with thyroid cancer are accompanied by abnormal parathyroid function, such as parathyroid hyperplasia. These abnormalities may lead to excessive secretion of PTH, thereby triggering hyperPthemia.

Further studies are needed to investigate the interaction and specific effects of these mechanisms. It is important to note that the exact mechanism of action of PTH in thyroid cancer may vary from individual to individual, so more basic and clinical studies are needed to clarify its exact role in thyroid cancer development. The findings of this study result provide potential clues for early screening and treatment of thyroid cancer and are expected to provide better management strategies for future clinical practice.

Association Between miR-108a Expression Level and Thyroid Cancer Risk

In the present study, we observed a significant increase in the expression level of

miR-108a in thyroid cancer patients. This finding prompted a deeper exploration of the association between miR-108a and thyroid cancer risk. miR-108a is a microrna that plays a key regulatory role in a variety of biological processes. The relationship between miR-108a and thyroid cancer and the possible mechanisms will be discussed below.

Regulatory Role of miR-108a in Thyroid Cancer

miR-108a is a known miRNA whose expression is associated with the initiation and progression of a variety of cancers. In thyroid cancer, upregulation of miR-108a has been observed in several studies. miRNAs are a class of short non-coding RNA molecules that affect the function of cells by targeting the stability and translation of mRNA of genes. miR-108a may affect biological processes such as cell proliferation, apoptosis, invasion and migration by regulating multiple signaling pathways, such as PI3K/Akt, MAPK and Wnt. These processes play a crucial role in the development of cancer.

Relationship Between miR-108a and Thyroid Cancer Development

Regulation of cell proliferation and apoptosis: miR-108a may affect the development of thyroid cancer by directly or indirectly regulating cell proliferation and apoptosis. Several studies have shown that upregulation of miR-108a can promote the proliferation of cancer cells and reduce apoptosis, thereby promoting tumor growth and spread.

Invasion and migration: The invasion and migration of thyroid cancer is one of the main causes of its lethality. The up-regulation of miR-108a may affect the invasion and migration ability of thyroid cancer cells by affecting the expression of multiple invasion related factors, such as E-cadherin and N-cadherin.

Signaling pathway regulation: miR-108a can also affect the development of thyroid cancer by targeting and regulating key factors in multiple signaling pathways, such as Akt, PI3K, MAPK, etc. These signaling pathways play important roles in many cancers, including thyroid cancer.

Upregulation of miR-108a and Risk of Thyroid Cancer

The results of multivariate analysis showed that the high expression level of miR-108a was independently associated with the risk of thyroid cancer. This means that high miR-108a expression is an independent predictor of thyroid cancer development even when other potential factors are taken into account. This result highlights the importance of miR-108a in the diagnosis and risk assessment of thyroid cancer.

Diagnostic Efficacy of Combined Detection

An important finding of this study is that combined detection of PTH and miR-108a has good diagnostic efficacy in the diagnosis of thyroid cancer. This result provides a potential new method for early diagnosis and screening of thyroid cancer, and the significance of this finding and possible clinical application prospects are discussed in detail below.

Sensitivity and Specificity of Combined Assays

The results showed that combined detection of PTH and miR-108a can distinguish

patients with thyroid cancer from non-thyroid cancer patients to a certain extent, with high sensitivity and specificity. This means that combined detection can more accurately screen patients in the diagnosis of thyroid cancer and reduce the risk of misdiagnosis and missed diagnosis. High sensitivity and specificity are key characteristics necessary for an effective diagnostic tool, as it can help physicians to determine the condition of a patient at an early stage, allowing for earlier intervention.

Significance of AUC Values

In our study, the AUC value was close to 1, indicating that the accuracy of the combined detection was very high. This means that the combined detection method performs excellently in distinguishing patients with and without thyroid cancer. Typically, AUC values are between 0.5 and 1, and the closer the AUC value is to 1, the better the performance of the diagnostic tool. In clinical practice, combined detection methods with high AUC values can increase physician confidence and reduce further tests and unnecessary procedures.

Potential Applications for Early Screening and Diagnosis

One of the potential applications of combined detection of PTH and miR-108a is early screening of thyroid cancer. Because thyroid cancer usually has no obvious symptoms in its early stage, early screening is essential to improve patient survival. Combined detection can detect patients in the early stage, help to take early treatment measures, and improve the success rate of treatment.

In addition, combined detection can also be used as a powerful tool for the diagnosis of thyroid tumors. It can help doctors more accurately distinguish thyroid cancer and non-thyroid cancer cases, reduce unnecessary surgery and treatment, and reduce the pain and medical burden of patients. This has a positive impact on improving the quality of life of patients and reducing healthcare costs.

Prospects for Clinical Application

The findings of this study have important clinical implications. Firstly, combined detection of PTH and miR-108a can be used as an early screening tool for thyroid cancer, which helps to find patients at an early stage and improve the success rate of treatment. Second, this combined detection method can help doctors more accurately distinguish thyroid cancer and non-thyroid cancer cases, reduce unnecessary surgery and treatment, and reduce the pain and medical burden of patients. Finally, for patients who have been diagnosed with thyroid cancer, high PTH and miR-108a levels may also be used as biomarkers to monitor the therapeutic effect and prognosis, helping to optimize treatment regimens and improve survival.

STUDY LIMITATIONS

Despite some important findings in this study, there are limitations that need to be considered. Firstly, this study is a cross-sectional study and cannot determine whether abnormal expression of PTH and miR-108a is a cause or a consequence of thyroid cancer. Further studies are needed to investigate the mechanisms of these biomarkers in thyroid cancer development. Second, the study sample was from a single medical center, and there may be selective bias. A multicenter study with a larger sample is needed to verify the stability of the results. Finally, longer-term follow-up data are

needed to assess the long-term prognostic value of combined testing in this study.

Taking the above discussion together, the present study found that PTH and miR-108a were significantly elevated in thyroid cancer, and these two biomarkers were independently associated with thyroid cancer risk. Combined detection of PTH and miR-108a has good diagnostic efficacy and is expected to become a tool for early screening and diagnosis of thyroid cancer. However, further studies are needed to validate these results and to explore in depth the mechanisms of action of these two biomarkers in thyroid cancer development. These studies are expected to provide a new breakthrough for the early diagnosis and treatment of thyroid cancer, and help to improve the prognosis and quality of life of patients.

CONCLUSION

The aim of this study is to investigate the predictive efficacy of combined detection of serum parathyroid hormone (PTH) secretion level and miR-108a expression level in the diagnosis of thyroid cancer, and to investigate their association with the risk of thyroid cancer. Through extensive data collection and comprehensive analysis, we draw the following conclusions:

Firstly, this study found that serum PTH levels were significantly increased in patients with thyroid cancer, which was statistically different compared to patients without thyroid cancer. This finding highlights the possible role of PTH in thyroid cancer development, including its regulatory role in cell proliferation, apoptosis, bone health, etc.

Secondly, the expression level of miR-108a was significantly upregulated in thyroid cancer patients. miR-108a is a microrna that has been associated with a variety of cancers in several studies. In thyroid cancer, miR-108a may be involved in the development and progression of cancer by affecting biological processes such as cell proliferation, apoptosis, invasion and migration.

Further analysis showed that both high PTH levels and high expression levels of miR-108a were significantly associated with the risk of thyroid cancer. The rise of these two biomarkers may be a potential clue for early detection of thyroid cancer or may be closely related to the development of thyroid cancer. Therefore, combined detection of PTH and miR-108a can improve the diagnostic accuracy and reliability of thyroid cancer.

Finally, the results of this study showed the potential clinical application of combined detection of PTH and miR-108a in the diagnosis of thyroid cancer. This method can be used not only for early screening and diagnosis, but also for monitoring treatment effect and prognosis evaluation. The high sensitivity and specificity of the combined test, as well as the results of an AUC value close to 1, further confirm its importance in thyroid cancer management.

In conclusion, this study highlights the potential value of PTH and miR-108a in the diagnosis of thyroid cancer, and provides new methods and ideas for early screening, diagnosis and treatment of thyroid cancer. Future studies should further validate these results and delve into the mechanism of action of these two biomarkers in thyroid cancer development to better guide clinical practice and improve patient prognosis

and quality of life. We hope that our research results will bring new breakthroughs in the management and treatment of thyroid cancer, benefiting patients and the medical community.

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