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ORIGINAL ARTICLE

Evaluation of preoperative Ultrasonography in the Surgical Management of Papillary Thyroid Cancer

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ABSTRACT:
Background: Papillary thyroid carcinoma (PTC) accounts for approximately 1% of all cancers and constitutes 70–80% of thyroid malignancies. Hence; the present study was conducted for evaluating preoperative Ultrasonography in the Surgical Management of Papillary Thyroid Cancer (PTC). **Materials & methods:** A total of 100 patients who underwent thyroid surgery were enrolled. Medical records were analyzed to gather information on patient demographics, preoperative clinical assessments, radiological evaluation results, surgical procedures, and postoperative follow-up. The accuracy of ultrasonography was evaluated solely for the lateral compartment nodes in patients who underwent initial surgery, while both central and lateral compartment nodes were assessed in the reoperative cohort. Out of 100 patients, 65 patients were initially operated group while the remaining 35 patients were reoperative group. all the results were recorded in Microsoft excel sheet and were subjected to statistical analysis using SPSS software. Univariate analysis was done for evaluation of level of significance. **Results:** In a cohort of 65 patients who underwent initial surgical interventions, thyroidectomy was conducted in 29 cases, near-total thyroidectomy in 22, lobectomy in 11 (15.1%), isthmectomy in 2, and a biopsy in 1 patient. The average size of the excised tumors was 2.1 cm, with 13 tumors measuring 5 mm or less. Among these patients, 28 exhibited multicentric papillary thyroid carcinoma (PTC), while 21 had bilateral disease; additionally, 16 tumors showed signs of extrathyroidal invasion. In total, cervical lymph node metastases (LNMs) were identified in the central compartment of 23 patients and in the lateral compartment of 28 patients. When ultrasound (US) was utilized prior to the initial surgery for PTC, it demonstrated a true-positive rate of 16.5%, a true-negative rate of 78.3%, a false-positive rate of 2.3%, and a false-negative rate of 2.9%. The sensitivity of US was recorded at 85.6%, with specificity at 98.3%, a positive predictive value of 90.2%, and an overall accuracy of 97.3%. In cases of reoperation, US exhibited a sensitivity of 92.3%, specificity of 80.7%, a positive predictive value of 94.5%, and an overall accuracy of 89.2%. **Conclusion:** The surgical risks associated with re-explorations highlight the importance of preventing unproductive dissections. The intricacies involved in managing patients with recurrent PTC significantly elevate the requirement for multidisciplinary expertise in their care.
Key words: Ultrasound, Papillary, Thyroid

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INTRODUCTION

Papillary thyroid carcinoma (PTC) accounts for approximately 1% of all cancers and constitutes 70–80% of thyroid malignancies. The development of this neoplasm is linked to several factors, including genetic mutations, growth factors, and exposure to radiation. The prognosis for patients with PTC is closely related to various clinical parameters, including age, tumor size, and histological characteristics such as extracapsular extension, extrathyroidal extension, lymph node involvement, distant metastasis, and histological subtypes.[1, 2]

Clinical and histological characteristics are utilized to categorize these carcinomas into distinct clinical stages, which subsequently inform treatment strategies and survival outcomes for individuals diagnosed with PTC. The RET/PTC oncogene plays a significant role in the early stages of cancer development and is often rearranged in individuals with a history of radiation exposure. Additionally, the BRAF gene is implicated in approximately 45% of sporadic mutations, which lead to heightened BRAF kinase activity. Notably, around 80% of these mutations involve transversion events, specifically the conversion of thymine to adenine at nucleotide 1799.[3, 4]

Two notable technological advancements have brought about a substantial transformation in the clinical management of papillary thyroid carcinoma (PTC). The development and enhancement of high-resolution cervical ultrasonography (US) and recombinant human thyrotropin (Thyrogen) have made it possible to screen for and accurately locate microscopic recurrent lymph node metastases in patients diagnosed with PTC.[5, 6]Hence; the present study was conducted for evaluating preoperative Ultrasonography in the Surgical Management of Papillary Thyroid Cancer.

MATERIALS & METHODS

The present study was conducted for evaluating preoperative Ultrasonography in the Surgical Management of Papillary Thyroid Cancer. A total of 100 patients who underwent thyroid surgery were enrolled. Medical records were analyzed to gather information on patient demographics, preoperative clinical assessments, radiological evaluation results, surgical procedures, and postoperative follow-up. High-resolution ultrasonography was utilized for the examinations. Each assessment encompassed the central compartment, defined as the area between the carotid arteries laterally, the thyroid cartilage superiorly, and the sternal notch or innominate artery inferiorly, as well as the lateral compartments of the neck. The accuracy of ultrasonography was evaluated solely for the lateral compartment nodes in patients who underwent initial surgery, while both central and lateral compartment nodes were assessed in the reoperative cohort. This evaluation was based on the radiologist's interpretation and any ultrasound-guided fine-needle aspiration (FNA), in comparison to the final histological findings. Ultrasonography was deemed advantageous for patients with palpable nodes only if it revealed pathologically significant nonpalpable nodes that were outside the expected dissection area indicated by the palpable nodes. Out of 100 patients, 65 patients were initially operated group while the remaining 35 patients were reoperative group. all the results were recorded in Microsoft excel sheet and were subjected to statistical analysis using SPSS software. Univariate analysis was done for evaluation of level of significance.

RESULTS

In a cohort of 65 patients who underwent initial surgical interventions, thyroidectomy was conducted in 29 cases, near-total thyroidectomy in 22, lobectomy in 11 (15.1%), isthmectomy in 2, and a biopsy in 1 patient. The average size of the excised tumors was 2.1 cm, with 13 tumors measuring 5 mm or less. Among these patients, 28 exhibited multicentric papillary thyroid carcinoma (PTC), while 21 had bilateral disease; additionally, 16 tumors showed signs of extrathyroidal invasion. In total, cervical lymph node metastases (LNMs) were identified in the central compartment of 23 patients and in the lateral compartment of 28 patients. When ultrasound (US) was utilized prior to the initial surgery for PTC, it demonstrated a true-positive rate of 16.5%, a true-negative rate of 78.3%, a false-positive rate of 2.3%, and a false-negative rate of 2.9%. The sensitivity of US was recorded at 85.6%, with specificity at 98.3%, a positive predictive value of 90.2%, and an overall accuracy of 97.3%. In cases of reoperation, US exhibited a sensitivity of 92.3%, specificity of 80.7%, a positive predictive value of 94.5%, and an overall accuracy of 89.2%.

Table 1: Study groups

Variable	Number	Percentage
Intimal operation	65	65
Reoperation	35	35
Total	100	100

Table 2: Efficacy of US

Variable	Sensitivity (%)	Specificity (%)	Diagnostic accuracy (%)
Initial surgery	85.6	98.3	97.3
Reoperation	92.3	80.7	89.2

DISCUSSION

Papillary carcinoma is recognized as the predominant malignant neoplasm of the thyroid gland. Its macroscopic characteristics exhibit considerable variability, influenced by the specific microscopic variants and the occurrence of degenerative alterations. The diverse histological variants present challenges for pathologists, with certain variants holding clinical significance due to their prognostic implications. This brief review aims to outline a systematic approach to papillary carcinoma, addressing the diagnostic challenges and controversies that may arise, as well as the ancillary studies, such as immunohistochemistry and molecular analyses, that can aid in their resolution.[6- 8]Thyroid cancer stands as the most prevalent endocrine malignancy, accounting for approximately 1% of all cancer cases. It is also noted for being the fastest-growing cancer type among women. In 2004, the United States reported around 26,000 new cases of thyroid cancer, with 75% occurring in female patients, making it the eighth most common cancer among women. Papillary thyroid carcinoma (PTC) constitutes the majority of thyroid cancers, estimated at 80%. Despite its high incidence, mortality associated with thyroid carcinoma remains infrequent, and the majority of patients exhibit favorable responses to surgical intervention and targeted therapies, including radioactive iodine treatment.[9- 11]Hence; the present study was conducted for evaluating preoperative Ultrasonography in the Surgical Management of Papillary Thyroid Cancer.

In a cohort of 65 patients who underwent initial surgical interventions, thyroidectomy was conducted in 29 cases, near-total thyroidectomy in 22, lobectomy in 11 (15.1%), isthmectomy in 2, and a biopsy in 1 patient. The average size of the excised tumors was 2.1 cm, with 13 tumors measuring 5 mm or less.

Among these patients, 28 exhibited multicentric papillary thyroid carcinoma (PTC), while 21 had bilateral disease; additionally, 16 tumors showed signs of extrathyroidal invasion. In total, cervical lymph node metastases (LNMs) were identified in the central compartment of 23 patients and in the lateral compartment of 28 patients. Stulak JM et al conducted an evaluation involving a total of 770 patients, of whom 551 received initial surgical intervention and 219 underwent cervical reoperation for papillary thyroid carcinoma (PTC). Preoperative ultrasonography was performed on 486 patients from the initial cohort and 216 from the reoperative group. Prior to the subsequent surgical procedure, therapeutic radioactive iodine was administered to 151 (68.9%) of the reoperative patients. The ultrasonographic examination revealed nonpalpable lateral jugular lymph node metastases (LNMs) in 70 (14.4%) of the patients undergoing initial surgery. In the reoperative cohort, nonpalpable lateral LNMs were identified in 106 (64.2%) of the patients, with 61 (28.2%) exhibiting LNMs in the central neck region. Notably, even among patients with palpable nodes preoperatively (37 [6.7%] in the initial group and 56 [25.6%] in the reoperative group), the ultrasonographic evaluation of LNM involvement led to modifications in the surgical approach for 15 (40.5%) of the initial patients and 24 (42.9%) of the reoperative patients. The sensitivity, specificity, and positive predictive value of ultrasonography were recorded as 83.5%, 97.7%, and 88.8% for the initial patients, and 90.4%, 78.9%, and 93.9% for the reoperative patients. Overall, preoperative ultrasonography successfully identified nonpalpable LNMs in 231 (32.9%) of the 702 patients with PTC who underwent the imaging, thereby influencing the surgical procedures performed.[10]

In the present study, when ultrasound (US) was utilized prior to the initial surgery for PTC, it demonstrated a true-positive rate of 16.5%, a true-negative rate of 78.3%, a false-positive rate of 2.3%, and a false-negative rate of 2.9%. The sensitivity of US was recorded at 85.6%, with specificity at 98.3%, a positive predictive value of 90.2%, and an overall accuracy of 97.3%. In cases of reoperation, US exhibited a sensitivity of 92.3%, specificity of 80.7%, a positive predictive value of 94.5%, and an overall accuracy of 89.2%.Moreno MA et al. conducted an evaluation of the long-term outcomes and prognostic significance of a sonographically guided surgical technique for addressing lateral neck recurrences in patients with papillary thyroid cancer (PTC). The study involved a cohort of 331 consecutive individuals who received primary treatment for PTC at a specialized cancer center. Among these patients, 112 were male and 219 were female, with a median age of 44.7 years. The median duration of follow-up for the cohort was 77.9 months. Preoperative ultrasound (US) abnormalities were identified in the right neck in 13.3% of cases, in the left neck in 12.3%, and bilaterally in 11.2%; all patients with these findings underwent lateral neck dissection concurrent with their thyroidectomy. The study reported 11 recurrences (0.3%), with a median time to recurrence of 22.8 months. Factors predictive of a disease-free interval in the lateral neck included T stage, the presence of distant disease at initial presentation, and the sonographic assessment of both the ipsilateral and central neck. The number of abnormal neck compartments detected via US was found to correlate with the likelihood of regional failure. Notably, the existence of US abnormalities in the lateral neck was associated with a reduction in 10-year disease-specific survival rates from 98.3% to 66.9%. The findings suggest that preoperative US serves as a robust predictor for both lateral neck disease-free intervals and disease-specific survival in PTC. The sonographically guided surgical approach demonstrates commendable long-term regional control and supports existing treatment protocols.[11]

CONCLUSION

The surgical risks associated with re-explorations highlight the importance of preventing unproductive dissections. The intricacies involved in managing patients with recurrent PTC significantly elevate the requirement for multidisciplinary expertise in their care.

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