

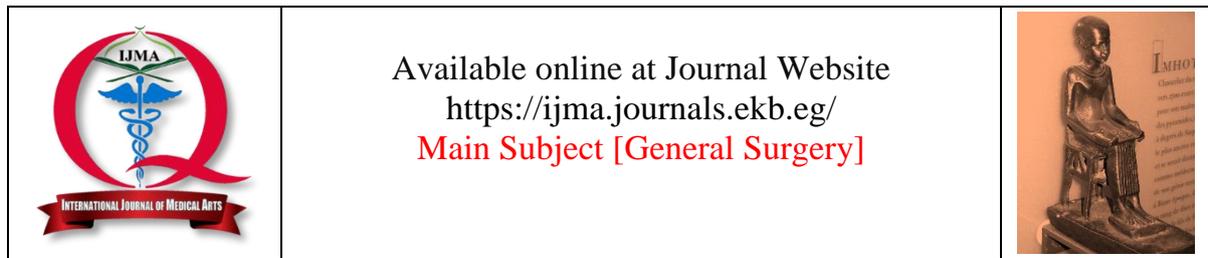
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Original Article

The Role of Sentinel Lymph Node Biopsy in Patients with Papillary Thyroid Carcinoma

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ABSTRACT

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Background: Patients who have already been diagnosed with cancer are candidates for a technique known as sentinel lymph node biopsy [SLNB]. During this surgery, the sentinel lymph node is found, removed, and biopsied in order to determine whether or not it contains cancer cells.

The aim of the work: The aim of this study was to discuss the validity of SLN biopsy in guiding Central Compartment Neck Dissection [CCND] in patients with papillary thyroid carcinoma and clinically negative lymph nodes [PTC cN0] using histopathology as a standard.

Patients and Methods: The Department of Oncologic Surgery at Al-Azhar University Hospitals in Cairo, Egypt conducted this prospective, randomized study. Thirty patients were diagnosed with papillary thyroid cancer. Patients underwent complete thyroidectomies and sentinel lymph node biopsies. A consulting surgeon performed or oversaw all procedures.

Results: Thirty patients with papillary thyroid cancer visited the Oncologic surgical outpatient clinic. Of the 30 patients with malignant cases, 24 [accuracy] had lymph nodes that were initially regarded as sentinels. Lymph node metastasis in SLN was found to be positive in 60% and negative in 20% of the detected SLNs [65% & 15% of overall patients], but in non-SLN was positive in 53.3% and negative in 46.6% of the detected NSLNs [47% & 45% of overall patients]. From our outcomes, SLN had a Sensitivity, Specificity, positive and negative Predictive Values of 91.61%, 100%, 100 percent and 75 percent respectively, with an overall accuracy of 18/30 [60%].

Conclusion: Although SLNB may have a place in the normal care of thyroid cancer, its efficacy needs more research and evaluation on larger patient series before it can be recommended for this purpose.

Keywords: Papillary Thyroid Carcinoma; Sentinel Lymph Node Biopsy; Central Compartment Neck Dissection; Clinically Node-Negative.



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INTRODUCTION

The thyroid gland is the primary target of endocrine system malignancies. However, accurate and specific markers for the diagnosis and stage of this illness are still lacking. Although fine needle aspiration biopsy is currently the gold standard for diagnosing thyroid cancer, it has significant limitations, such as producing inconclusive results or being unable to discriminate among distinct carcinomas, necessitating additional surgical procedures for a definitive diagnosis [1].

As a result of a rise in its prevalence all over the world over the course of the last three decades, papillary thyroid carcinoma [PTC], also known as papillary thyroid adenoma, has emerged as the most common kind of thyroid cancer [2].

Iodine-131 [¹³¹I] therapy, lifetime TSH-suppressive thyroid hormone replacement, and complete or near-total thyroidectomy are the usual treatments for papillary thyroid cancer, these procedures are performed in conjunction with loco-regional lymphadenectomy [3]. The primary tumor's lymphatic drainage begins at the [SLN]. It has been shown that nodal status may be accurately predicted in melanoma and breast cancer using [SLNB] [4].

However, there is still debate about whether or not SLNB is effective in treating thyroid cancer. It is currently believed that patients with PTC would not have a better prognosis if they have nodal illness. Despite the fact that the prognostic importance of occult lymph node metastases in PTC is debatable, identifying individuals who have these metastases could be helpful in formulating treatment plans [5].

Patients diagnosed with PTC who have lymph node metastases in their local area have a worse prognosis, yet aggressive resection may be of assistance to them in this situation. Although it has been established that nodal involvement has little impact on the long-term survival of persons with PTC, the presence of extra-capsular invasion of lymph node metastases is predictive of distant metastases and a bad prognosis. This is because extra-capsular invasion of lymph node metastases occurs when the cancer has spread beyond the lymph nodes. Several studies have demonstrated that the SLN in PTC may be located utilizing a vital dye technique [6].

Some of these drawbacks could be overcome by combining preoperative lymphoscintigraphy

with radio-colloids and intraoperative detection using a gamma probe, as has been proposed by the authors [7].

The SLN approach in PTC aids in the recognition of lymph node metastases located in regions other than the core compartment, hence facilitating more precise surgical extension planning. Lymphoscintigraphy/gamma probe and blue dye testing can be used together since they complement one another [8].

THE AIM OF THE WORK

This study aimed to discuss the validity of SLN biopsy in guiding Central Compartment Neck Dissection [CCND] in patient with papillary thyroid carcinoma and clinically negative LNs [PTC cN0] using histopathology as a standard.

PATIENTS AND METHODS

surgery. Thirty people over 18 with papillary thyroid cancer participated. Before any data was gathered or processed before or after any diagnostic surgical procedures were conducted, all cases underwent a comprehensive medical history & physical examination, The institutional review board gave their approval for the study, and informed consent was obtained from each and every participant in the research. Patients' ages, genders, diagnoses, presenting symptoms, surgeries, histology, postoperative course, and oncological outcomes have all been examined.

Inclusion criteria: Fine needle aspiration cytology [FNAC] confirmed a papillary thyroid carcinoma diagnosis in patients aged 18 and up, and agreed to take part in it.

Exclusion criteria: Ultrasonography [U/S]-suspicious lymph nodes, lymph node metastases confirmed by [FNAB], numerous malignancies in both lungs, incidental carcinoma.

Pre-operative assessment: TSH, free thyroxine, and free thyroxine levels, neck ultrasound, baseline thyroglobulin level, fine-needle aspiration cytology [FNA] of thyroid nodule, routine evaluation of vocal cords, full blood count, coagulation profile, liver and kidney function tests, viral markers, plain chest X-ray, electrocardiogram [ECG] and echocardiogram [if indicated].

Preparation for Surgery: The management of any comorbid medical condition, but especially

if it involves chest issues. Patients were administered dexamethasone during the induction of anesthesia, after signing an informed consent form.

Surgical procedure and detection of SLN

After injecting 0.2-0.3 ml of patent blue dye, 1%, peritumorally into the thyroid parenchyma at the 3, 6, 9, and 12 o'clock locations, a typical transverse low-collar incision, sub-platysmal skin flap, and minimum dissection were utilized to mobilize the gland. This procedure was performed while the patient was under general anesthesia. In cases where there were numerous tumor nodules, the largest one was chosen for injection.

The blue dye travelled quickly through the lymphatic system, first staining the ipsilateral thyroid lobe and then the central compartment. It took around 30 seconds to inject, and an additional minute was allowed for lymphatic drainage. After waiting for about 2 minutes, we meticulously traced the stained lymphatic channels to locate the blue-stained lymph nodes in the centre compartment. Each patient then underwent a successful complete thyroidectomy followed by CCND. Lymph nodes [SLNs] that were stained blue were positively detected. Non-sentinel lymph nodes [NSLNs] are central lymph nodes that did not tint blue. Before the pyramidal lobe and isthmus of the thyroid are moved, the prelaryngeal lymph nodes are dissected. These lymph nodes can be found in the intermuscular region just anterior to the cricothyroid membrane.

The pretracheal and paratracheal level VI lymph nodes were dissected after the thyroid gland was removed. By making an incision in the midline through the fibrofatty tissue, the trachea is exposed from below the brachiocephalic arteries to above the prevertebral fascia. The hyoid cartilage marks the upper boundary of the dissection. Using diathermy and ligatures, the prevertebral fascia, oesophagus, and trachea are freed from the tissue envelope enclosing the unilateral level VI lymph nodes, and then the envelope is retracted medially and removed en bloc. After completing the central neck dissection on the ipsilateral side, the procedure was repeated on the contralateral side to clean the necks bilaterally. All patients had their SLN and NSLN samples permanently sectioned and stained with haematoxylin and eosin, and those with negative results merely had their samples immune-stained.

The locations, quantities, and frequency of SLN detection were studied, together with patient and tumor characteristics. Researchers looked into SLNB FNRs. Complications experienced after surgery were also assessed. All patients with suspected vocal cord paralysis underwent preoperative and postoperative flexible laryngoscopy. Regardless of the presence or absence of hypocalcemic symptoms, a fall in blood parathyroid hormone below the normal limit was considered diagnostic of hypoparathyroidism. Non-recovery within 6 months was considered permanent vocal cord palsy or hypoparathyroidism.

Examples of cases with Papillary Thyroid Carcinoma

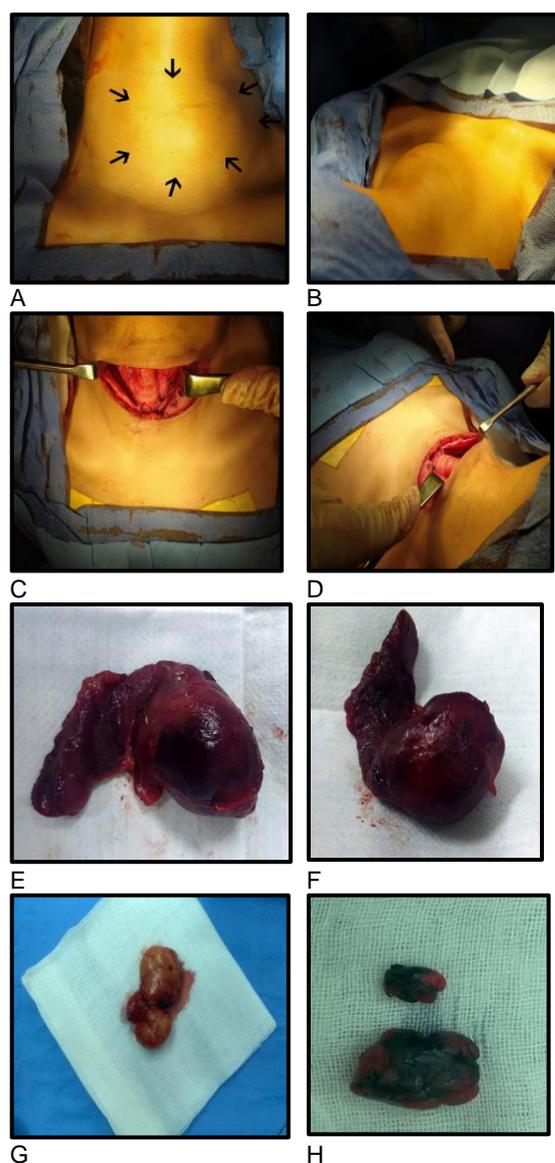


Figure [1]: A case of female patient 36-yr-old, presented by Papillary Thyroid Carcinoma. E & F: different views of the removed thyroid gland. G & H: different views of the removed lymph nodes

Data analysis: Data entry and analysis will be made by using SPSS software [SPSS 20.0 Version]. Mean, proportion and percentage were calculated. Chi square test was applied for establishing association.

RESULTS

Patients aged 18-60 years old presented with PTC to the outpatient clinic at Al-Azhar University Hospitals' Onco Surgery Department. Of the total 30 patients, 19 were female and 11 were male. All tumors were papillary carcinomas ranging in size from 0.5 to 4 cm, with 12 patients experiencing malignancies in the left lobe and 18 in the right. 90% of the cases with SLN were identified and 60% of the patients had positive SLN [Table 1].

The differences among [SLNs] and other lymph nodes. The SLN identification rate was

80%, while the non-SLN rate was 93.3%. The number of LNs found was 0–6 in the SLN population and 0–9 in the non-SLN population. The percentage of cases with positive results for LN metastasis was 60% in SLN and 36.7 % in non-SLN [Table 2, 3].

In contrast, 24 of 30 individuals had active lymph node disease. Out of a total of 30 instances, 3 were negative for both SNL and NSL, while 6 were negative for both SNL and NSL and 0 were positive for both [Table 4].

SLN biopsy had 91.6 percent sensitivity, 100 percent specificity, 100 percent positive predictive value, 75 percent negative predictive value& accuracy of 60 % [Table 5].

Thirty percent of the cases had positive margins and underwent additional resections [Table 6].

Table [1]: Demographic distribution of the studied cases.

All patients [n=30]		
Age [years]	Mean ± SD	41.53 ± 8.62
	< 45 years	11 [36.7%]
	≥ 45 years	19 [63.3%]
BMI [kg/m ²], Mean ± SD		25.47 ± 2.65
Residence	Rural	17 [56.7%]
	Urban	13 [43.3%]
Sex	Males	11 [35%]
	Females	19 [65%]
Rt lobe		18 [60%]
Lt lobe		12 [40%]

Table [2]: Characteristics of SLN distribution among the studied patients

	All patients [n=30]	
	N	%
Sentinel lymph node		
Patients with SLN mapping	30	100%
Patients with SLN identified	24	80%
Positive SLN	18	60%
Total number of SLN identified	42	
Mean number of SLN per patient	1.85 ± 2.76	

Table [3]: Characteristics of [SLN] & [NSLN]

	SLN	Non SLN
	No & Percentage	No & Percentage
Identification rate of SLN	24/30 [80%]	28/30 [93.3%]
Number of LN detected [range, mean± SD]	0-6 [2.8±1.9]	0-9 [2.4±1.3]
Size of SLN detected [range cm]	0.1-1.6 cm	0.1-1.5 cm
LN metastasis found positive	18/30 [60%]	16/30 [53.3%]
LN metastasis found negative	12/30 [36.7%]	14/30 [46.6%]

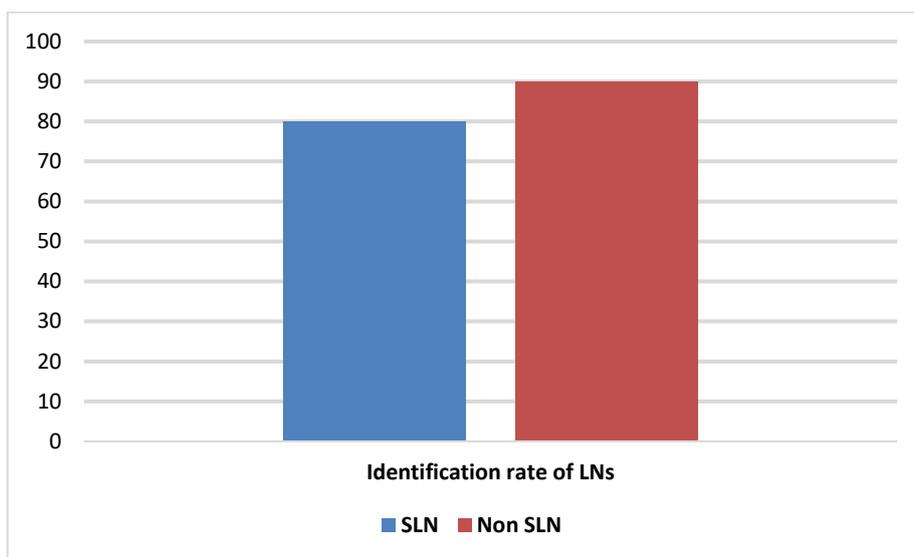


Figure [2]: Identification rate

Table [4]: Features of [SLN] and [NSLN] when compared to final pathology

Total number of cases positive SNL & NSLN: [total cases with Actual LN disease present]	24/30
Total number of cases –ve SNL&NSLN: [total cases actual LN disease absent]	6/30
Number of cases negative SNL & negative NSLN [true –ve]	6
Number of cases negative SNL & positive NSLN [false –ve]	2
Number of cases positive SNL & negative NSLN [false +ve]	0

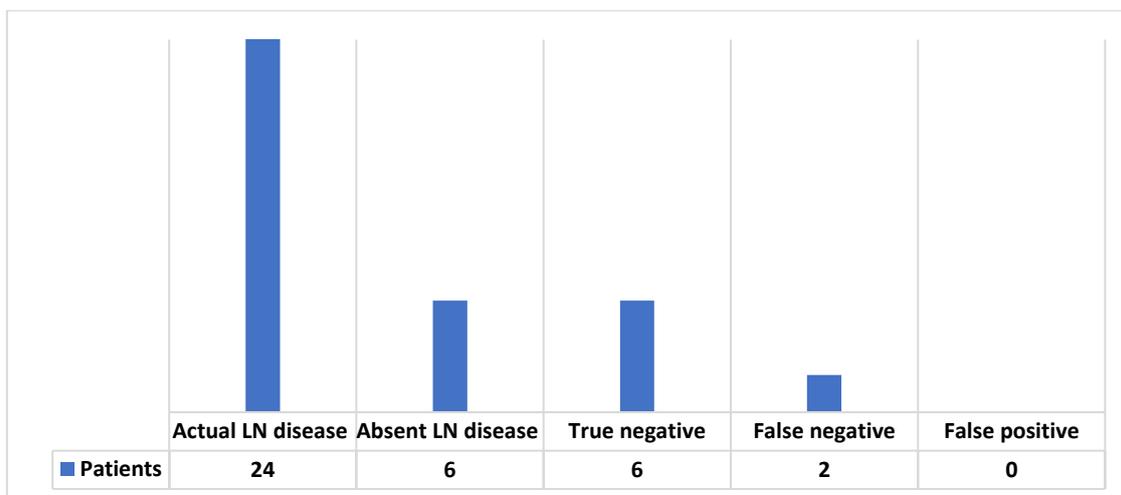


Figure [3]: Comparison of SLN and NSLN characteristics to those found in the final pathology report

Table [5]: Summary of Results

Statistic	Value	Number
Sensitivity	91.6%	22/24
Specificity	100%	6/6
Positive Predictive Value [PPV]	100%	18/18
Negative Predictive Value [NPV]	75%	6/8
Accuracy	60%	18/30

Table [6]: Complications distribution among the studied patients

	All patients [n=30]	
	No.	%
Hypocalcemia [asymptomatic]	4	13.3%
Temporary RLN paralysis	2	6.7%
Wound infection	2	6.7%

DISCUSSION

Subclinical LN metastasis could be diagnosed with [SLN] since it is easy to detect metastases to lateral neck LNs clinically and with cervical US but more difficult to detect in the central compartment [9].

Patients with clinically node-negative PTC may not require prophylactic CCND. Several writers have investigated the use of SLNB as a means of more effectively selecting candidates for CCND. To detect SLN, use either a blue dye or a radioisotope. There are a number of benefits to using a radioisotope and an intra-operative gamma probe for SLNB. Among the 30 patients enrolled in our study had Papillary Thyroid Carcinoma [10].

Malignant nodules varied in size from 0.5 to 4 centimetres. The majority of the nodules were between 1 and 3 centimetres in size, and they were distributed more heavily throughout the left lobe [60%] than the right [40%] of the lung. To locate the SLN in our cases, we injected patent blue directly into the thyroid nodule [peri-tumoral]. The blue dye technique [11] has numerous benefits. It doesn't call for much in the way of time, energy, or money. Methylene blue and isosulfan blue are only two examples of the blue dyes that can be utilized. There have been incidents of anaphylaxis from using isosulfan blue, but patent blue appears to be less dangerous [12]. However, the blue dye method is not without its drawbacks. The detection rate is lower, and the parathyroid gland, as well as nearby soft tissue, may falsely stain positive. The detection rate of thyroid cancer using a blue dye approach was 15% lower than the detection rate using a radioisotope technique, according to a meta-analysis of SLNB for the disease [13].

Twenty-four out of thirty individuals with malignant cases had sentinel lymph nodes located. From zero to nine [1.85 ± 2.76], LNs were found in sizes from 0.3 to 1.6 cm. Based on our data, the SLN was accurate 60% of the time [18/30], with a sensitivity of 91.6 percent specificity of 100 percent positive predictive values of 75 percent and negative predictive values of 75 percent previously performed a larger trial including 300 patients also utilizing methylene blue dye, and reported even more encouraging outcomes; they found that The sensitivity of their SLN biopsy technique was

89.6%, while its specificity was 100%, its positive predictive value was 100%, and its negative predictive value was 98.1% [95% confidence interval [CI]] [14].

The sensitivity, specificity, positive predictive value, and negative predictive value of SLNB employing methylene blue were shown to be 64.9 percent, 100 percent, and 78.3 percent, respectively, in a study involving 114 cases of clinically node-negative papillary thyroid cancer [15].

Prophylactic lateral neck node dissection is not suggested since it is not linked to increased overall survival in patients and because it necessitates a much more comprehensive operation that violates multiple planes. However, patients with lateral neck nodal illness can be identified through physical examination and ultrasound during follow-up of those with thyroid cancer, allowing for more targeted treatment compartmental node dissection [16].

In our study, 4 out of 30 patients [13.3%] experienced transient symptomatic hypocalcemia after surgery. There was no death or dye-related problems; however, two patients experienced transient paralysis of the unilateral vocal cord following surgery.

Conclusion: Patients with PTC who did not have obvious lymph node involvement on clinical exam or US scan yet had occult metastases detectable by SLN biopsy. It's possible that this strategy could also be used to identify patients in need of a central neck dissection. The use of the methylene blue dye method in PTC is also a feasible and secure procedure.

Further assessment and evaluation on larger case series is required before recommending SLNB for use in regular therapy of thyroid cancer. This cannot happen until the function of SLNB in the treatment of thyroid cancer is established.

Disclosure: None to be disclosed

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