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ORIGINAL ARTICLE

Thyroidectomy with or without Radioiodine in Patients incidentally discovered with low papillary Thyroid Cancer

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Abstract

Background: ***The initial tumour's histology is the most crucial determinant of prognosis for thyroid cancer. Papillary and follicular thyroid cancers are thyroid tumours originating from follicular cells and accounting for 90% of all thyroid cancers. The prognosis of papillary thyroid carcinoma is generally favourable, with a death rate of 1-2% during a 20-year period.***

Aim and objectives: ***To assess the role of radioactive iodine ablation after total thyroidectomy in low-risk papillary thyroid cancer. The secondary objective is to assess the toxicity of Radioiodine.***

Subjects and methods: ***The present work was prospective research of 30 individuals diagnosed with papillary thyroid cancer who presented to the General Surgery department, AL-Hussein University Hospital and Damanhur Medical National Institute from July 2022 to July 2023.***

Results: ***Both groups had a significant variance regarding thyroglobulin at 12 months. There was a significant variance among four, eight, and 12 months regarding thyroglobulin in the radioiodine group. There were significant variances among both groups regarding Post TSH. There was significant variance in each group group among Pre TSH and TSH.***

Conclusion: ***This research concluded that there was no significant variance among Radioiodine and non-radioiodine groups regarding response to Treatment at 4-8 Months and 1 Year. This suggests that non-radioiodine therapy has the same effect as radioiodine therapy after total thyroidectomy in individuals with low papillary thyroid cancer.***

Keywords: Thyroid Cancer; Papillary Thyroid Carcinoma, Thyroidectomy

1. Introduction

Thyroid cancer refers to the presence of cancerous cells in the thyroid gland. The thyroid parenchyma has two primary cell types: thyroid follicular cells, responsible for developing differentiated thyroid cancer (DTC), and parafollicular or C-cells, which give birth to medullary thyroid carcinoma (MTC). DTC include papillary thyroid cancer (PTC), follicular thyroid cancer (FTC), and Hurthle cell cancer (DTC), which collectively make up 90-95% of all thyroid malignancies. The incidence of medullary thyroid carcinoma (MTC) is around 1 to two per cent, while anaplastic thyroid carcinoma represents less than one per cent of all thyroid malignancies. [1]

Papillary thyroid carcinoma (PTC) is a kind of cancer originating from the thyroid gland's epithelial cells. Follicular cell differentiation and a specific set of nuclear characteristics characterize it. This neoplasm is the most often occurring thyroid tumour and has the most favourable overall prognosis. The tumour often manifests as an asymmetrical, compacted mass; however, it may exhibit cystic characteristics in some instances. An essential characteristic of PTC is its capacity to infiltrate neighbouring structures such as lymphatics. Approximately 10% of individuals may exhibit metastatic disease upon their initial presentation. A favourable prognosis is expected for individuals under the age of 45. [2]

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The primary approach for treating both PTC and FTC is surgical removal, followed by radioiodine ablation (RAI ablation) if necessary, and suppression therapy with thyroid hormone. Systemic radiation and chemotherapy seldom have a substantial impact on Treatment, but they may be employed in advanced instances that do not respond to traditional therapies. [3]

RAI therapy is administered following thyroidectomy to eliminate any remaining normal thyroid tissue, as an additional treatment for small, undetectable cancer spread, or as a treatment for cancer that has spread to nearby or distant areas.[4] RAI ablation benefits high-risk and a subset of carefully chosen intermediate-risk individuals based on the ATA risk classification approach. Candidates for RAI therapy should follow a low-iodine diet for one to two weeks before the procedure to guarantee that the cells have been depleted of iodine. They should also be advised against administering large amounts of iodine, such as amiodarone or iodinated contrast, as this will increase the avidity of the thyroid follicular cells to iodine. With a target TSH of 30 mIU/litre or more, RAI ablation functions best when removing thyroid hormone. Thyroid hormone withdrawal or exogenous recombinant human TSH injection can both be used to get this level of TSH. [5, 6]

The main goal was to determine if no radioiodine therapy is non-inferior to radioiodine therapy after total thyroidectomy in individuals with low papillary thyroid cancer.

2. Patients and methods

The current work was a prospective study of 30 cases with the diagnosis of papillary thyroid cancer who presented to the General Surgery department, AL-Hussein University Hospital, and Damanhur Medical National Institute from July 2022 to July 2023.

Inclusion Criteria: Age between 18 and 55years, cases with low papillary thyroid cancer, cases with low-risk papillary thyroid cancer (small tumour < 4 cm) confined to the thyroid and not mediatized to the neck lymph node) (no vascular invasion) , patients underwent total thyroidectomy. Exclusion Criteria: High-risk & intermediate-risk thyroid cancer cases. (Minor or gross extra-thyroid extension) (lymph node metastasis) (Vascular invasion) and Patients who underwent subtotal thyroidectomy, any metastatic disease, patients with double malignancy, pregnant and lactating patients,

Operative design

All cases involved in this research were subjected to total thyroidectomy (30 cases), pathologically proved papillary thyroid cancer with low-risk criteria according to NCCN guidelines 2022

Low-risk criteria:

No distant metastases

No lateral cervical lymph node metastases

No extrathyroidal extension

Tumor 1–4 cm in diameter

Informed consent was taken from every patient.

Complete history taking:

The standard surgical procedure was total thyroidectomy.

In this perspective, patients were assigned into one of two groups:

Group A: Cases received ablation with postoperative administration of Radioiodine (30mci) before hormonal replacement therapy.

Group B: Cases with no postoperative radioiodine. Only hormonal replacement therapy.

Surgical technique: All cases underwent total thyroidectomy (TT):

A standard collar incision was performed, and flaps were created behind the platysma muscle. The initial layer of deep fascia was cut, and the strap muscles were detached. Both thyroid lobes were examined visually and by touch, and an effort was made to feel the regions along the trachea and above the cricoid cartilage to verify the absence of affected lymph nodes.

The central thyroid veins were separated, and the thyroid lobe was pulled towards the centre. The superior parathyroid gland was located on the back of the thyroid lobe, just behind the higher pole, by moving the upper pole region inward and utilizing a tiny peanut sponge attached to a clamp. The branches of the superior thyroid veins were isolated from the superior pole of the thyroid and then separately tied off and cut. The rearmost branches of the superior thyroid artery and vein remained connected to the back surface of the thyroid gland until their connection to the superior parathyroid gland was established.

Once the superior parathyroid gland was adequately separated from the back surface of the thyroid gland, the parathyroid artery or the branch of the superior or inferior thyroid artery that supplied the parathyroid gland was identified. The remaining small blood vessels between the thyroid and the parathyroid were then cut while keeping the parathyroid gland and its artery attached to the supplying arterial branch.

Subsequently, the task involved finding and distinguishing the inferior parathyroid gland. The surgical procedure involved blunt dissection to remove the parathyroid gland from the thyroid progressively. This was achieved by opening and separating the joint tissue (pre-tracheal fascia or surgical thyroid capsule) that covered both glands. Small blood arteries were located among the parathyroid and thyroid glands, most of which ceased bleeding quickly. However, some may occasionally necessitate the use of cautery or ligatures for control.

The parathyroid gland was dissected sufficiently to disclose the parathyroid artery and its origin from a branch of the inferior thyroid artery. The arterial branch of the inferior thyroid artery, which originated from the parathyroid artery, was ligated and separated beyond the point where the inferior parathyroid artery originated. The parathyroid gland was allowed to descend to the side. At the same time, the other branches of the inferior thyroid artery and their occasionally accompanying veins were separately tied off and cut at their point of entry into the thyroid lobe.

The recurrent laryngeal nerve was then revealed and followed throughout its entire trajectory. After the gland was carefully separated from the nerve, the branches of the inferior thyroid artery were readily distinguished as they crossed the nerve, either in front or behind it.

Subsequently, each branch was separately ligated and separated at a location proximal to the intersection site with the recurrent nerve. We performed a whole thyroid resection using a tiny clamp to gradually expand it and allow the nerve to go to the side while dividing Berry's ligament. Subsequently, the thyroid lobe and isthmus were surgically separated from the trachea. Subsequently, the contralateral lobe was excised using the same technique, therefore accomplishing a complete thyroidectomy.

Statistical Analysis

The data underwent verification, input, and analysis using SPSS version 23 for data manipulation. The current research employed the following statistical approaches for analyzing findings. The data were presented as numerical values and percentages for qualitative factors and as the mean plus standard deviation (SD) for quantitative variables. The tests employed included the Student's t-test, Mann-Whitney test, Chi-square test (X2), Z-test for percentage, and odds ratio (OR).

3. Results

This table shows that There were insignificant difference between both groups as regard Age or Sex.

Table 1.Demographic data of examined cases.

	Radioiodine group	Non Radioiodine group	Test	P value
AGE			1.163	0.78
MEAN	53.2±5.1	52.9±5.5		
MIN.-MAX.	18-55	18-55		
SEX			0.14	0.70
MALE	6 (40%)	5 (33.3%)		
FEMALE	9 (60%)	10 (66.7%)		

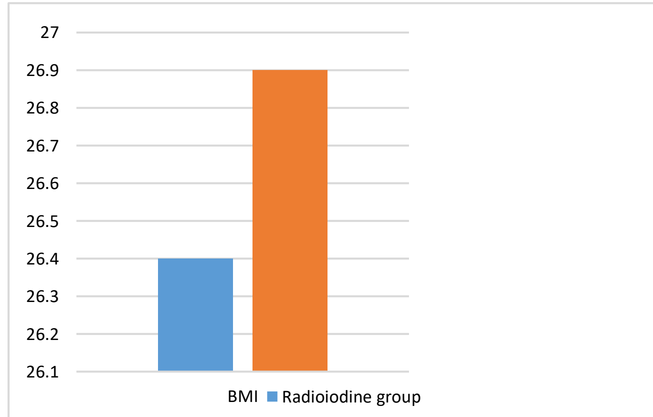

Figure 1. BMI distribution of studied cases.

This table shows There were insignificant difference between both groups as regard PRESENTING SYMPTOM

Table 2. PRESENTING SYMPTOM of studied cases.

	Radioiodine group	Non Radioiodine group	total	Test	P value
PRESENTING SYMPTOM					
NECK SWELLING	12 (80%)	11 (73.3%)	23	0.186	0.66
HOARSENESS OF VOICE	3 (20%)	4 (26.7%)	7	0.18	0.6
TOTAL	15	15	30		

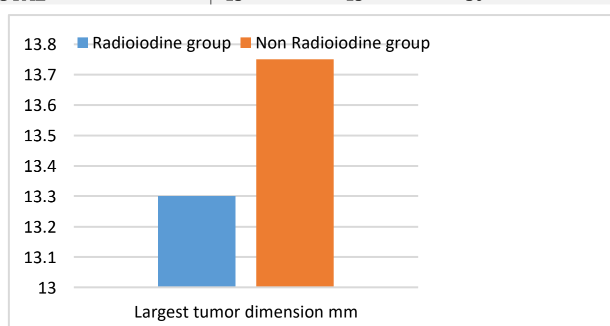

Fig 2. Largest tumor dimension data of studied cases.

There were insignificant difference between both groups as regard Largest tumor dimension mm .

This table reveals that there were significant variance among both groups as regard Post TSH. There were significant variance in each group groups among Pre TSH & Post TSH.

Table 3. TSH level pre and Post among studied cases.

	RADIOIODINE GROUP	NON RADIOIODINE GROUP	TEST	P VALUE
PRE TSH (MIU/L)			1.11	0.84
MEAN± SD	2.6±0.6	2.7±0.57		
POST TSH (MIU/L) AT 4 M			4	0.01*
MEAN± SD	1.7±0.4	1.89±0.4		
P1 IN EACH GROUP	0.01*	0.02*		
POST TSH (MIU/L) AT 4 M				
MEAN± SD	1.5±0.25	1.8±0.3	1.2	0.208
P2 IN EACH GROUP	0.001*	0.01*		
POST TSH (MIU/L) AT 8 M			1.77	0.047
MEAN± SD	0.9±0.15	1.1±0.2		
P3 IN EACH GROUP	0.0001*	0.001*		
POST TSH (MIU/L) AT 12 M			4	0.01*
MEAN± SD	0.65±0.1	0.75±0.2		
P4 IN EACH GROUP	<0.0001*	<0.0001*		

This table reveals that There were high significant variance among both groups as regard Thyroglobulin at 12 months.There were high significant variance among 4 months, 8 months and 12 months as regard Thyroglobulin in Radioiodine group.

Table 4. Thyroglobulin among studied cases.

	RADIOIODINE GROUP	NON RADIOIODINE GROUP	TEST	P VALUE
THYROGLOBULIN AT 4 MONTHS			0.24	0.62
≤1 NG/ML	3 (20%)	2 (13.3%)		
>1 NG/ML	12 (13%)	13 (86.6%)		
THYROGLOBULIN AT 8 MONTHS			2.4	0.12
≤1 NG/ML	7 (46.7%)	3 (20%)		
>1 NG/ML	8 (53.3%)	12 (13%)		
THYROGLOBULIN AT 12 MONTHS			8.57	0.003*
≤1 NG/ML	12 (80%)	4 (26.7%)		
>1 NG/ML	3 (20%)	11 (73.3%)		
P IN EACH GROUP	<0.0001	0.22		

Table (5): Response to Treatment at 4-8 Months and 1 Year of studied cases.

There were insignificant difference between both groups as regard Response to Treatment at 4,8 Months and 1 Year.

	RADIOIODINE GROUP	NON RADIOIODINE GROUP	TEST	P VALUE
EVALUATION AT 4 MONTH				
EXCELLENT	11 (73.3%)	10 (66.7%)	0.15	0.69
STRUCTURALLY INCOMPLETE: ABNORMAL IMAGING	1 (6.67%)	0	1.03	0.31
BIOCHEMICALLY INCOMPLETE	1 (6.67%)	1 (6.67%)	-	-
INDETERMINATE	2 (13.3%)	4 (26.7%)	0.8	0.36
EVALUATION AT 8 MONTH				
EXCELLENT	10 (60%)	10 (60.0%)	-	-
STRUCTURALLY INCOMPLETE: ABNORMAL IMAGING	1 (6.67%)	2 (13.3%)	1.15	0.28
BIOCHEMICALLY INCOMPLETE	2 (13.3%)	1 (6.67%)	1.2	0.20
INDETERMINATE	2 (13.3%)	2 (13.3%)	-	-
EVALUATION AT 1 YEAR				
EXCELLENT	9 (60%)	8 (53.3%)	0.13	0.71
STRUCTURALLY INCOMPLETE: ABNORMAL IMAGING	3 (20%)	1 (6.67%)	1.15	0.28
BIOCHEMICALLY INCOMPLETE	2 (13.3%)	3 (20%)	0.24	0.62
INDETERMINATE	1 (6.67%)	3 (20%)	1.15	0.28

4. Discussion

The initial tumour's histology is the most crucial prognostic factor for thyroid cancer. Papillary and follicular thyroid cancers are thyroid tumours originating from follicular cells and account for ninety per cent of all thyroid cancers. The prognosis of papillary thyroid carcinoma is generally favourable, with a death rate of between one and two per cent during 20 years. [7]

The main results were as follows:

In our study, the demographic data of the studied cases in the Radioiodine group showed that the mean age was 53.2±5.1, 40% were male, and 60% were Female. In the radioiodine group, the mean age was 52.9±5.5, 33.3% were men, and 66.7% were Women. There was no significant variance among both groups regarding Age and Sex.

Our investigation corroborated the findings of Grani et al., who sought to ascertain the impact of policy changes on the utilization of RAI and the immediate results of individuals. The research consisted of two cohorts. In cohort 1, 51.7% of the 116 patients underwent RAI. In cohort 2, RAI was done promptly in only 6.4% of the 156 patients and an additional three patients after the initial follow-up data. The study found no statistically significant disparity in age and gender across the groups under investigation ($p>0.05$). The prevalence of Females, n (%), was 84 (72.4) in the first group while it was 119 (76.3) in the second group. Age at diagnosis, the median (range) was 47 (12-80) years in the first group, while it was 52 (13-77) in the second group.[8]

Regarding presenting symptoms of studied cases, There was no significant variance among both groups regarding presenting symptoms.

Our results showed that the average largest tumour dimension in the Radioiodine group was 8.3±3.5. In the radioiodine group, the average largest tumour dimension was 8.75±3.85. There was no significant variance among both groups concerning the largest tumour dimension.

Our study correlated with Lukovic et al., who aimed to assess the incidence and results of RAI use in this population.[9]

In contrast with our study, Grani et al. reported a larger tumour size as there was a statistically significant variance among the examined groups. It was 10 (1-45) mm in the RAI group and 7 (1-60) mm in the no RAI group.[8]

As regards TSH levels pre and Post-among studied cases, we found that in the Radioiodine group, the mean pre-TSH (mIU/L) was 2.6±0.6, the mean post-TSH (mIU/L) at 12 M was 0.65±0.1. In Non Radioiodine group, the mean Pre TSH (mIU/L) was 2.7±0.57, and the mean Post TSH (mIU/L) at 12 was 0.75±0.2. There was a significant variance among both groups concerning Post TSH, and there was a significant difference in each group group between Pre TSH and Post TSH.

Consistent with our research, Janovsky et al. demonstrated a remarkable outcome in patients with low-risk differentiated thyroid cancer who did not get radioiodine remnant ablation following total thyroidectomy. The research found that the average Tg level was 0.42 ng/ml. Following six months post-surgery, the average thyroid bed uptake following rhTSH administration was 1.82%, and the levels of Tg varied from 0.10 to 22.30 ng/ml (with an average of 2.89 ng/ml). The individuals were monitored for any indication of recurrence, as negative results from neck US and stable or declining Tg levels. The Tg trend remained consistent or declined throughout the continuous monitoring, regardless of whether the baseline Tg level was repressed or stimulated.[10]

Concerning response to Treatment at 4,8 Months and 1 Year of studied cases, we found that at 4 months in the Radioiodine group, 73.3% had Excellent Response, 6.67% had structurally incomplete, 6.67% had Biochemically incomplete, 13.3% had Indeterminate. In the non-radioiodine group, 66.7% had excellent response, 0.0% had structurally incomplete, 6.67% had biochemically incomplete, and 26.7% had indeterminate. Regarding Evaluation at eight months in the radioiodine group, 60% had Excellent Response, 6.67%had Structurally incomplete,13,3% had Biochemically complete, and 13.3% had indeterminate. In the non-radioiodine group, 60%had Excellent Response; 13.3% had Structurally incomplete, 6.67% had Biochemically incomplete, and 13.3% had indeterminate. Regarding Evaluation at one year in the Radioiodine group, 60.0% had Excellent Response, 20.0% had structurally incomplete, 13.3% had Biochemically incomplete, and 6.67% had Indeterminate. In the non-radioiodine group, 53.3% had excellent response, 6.67% had structurally incomplete, 20.0% had biochemically incomplete, and 20.0% had indeterminate. There was no significant variance among both groups concerning response to Treatment at 4,8 Months and 1 Year.

Our study agrees with Yang et al., who aimed to assess the clinical utility of routine neck US in ATA low-risk PTC cases with no structural evidence of disease after their initial thyroid surgery. The study reported no significant variance regarding response to therapy among cases who received initial RAI and cases who did not receive initial RAI ($p>0.05$).

Our results showed no suspected malignancy in both Radioiodine and no Radioiodine group groups.[11]

Our study disagrees with Lukovic et al., who reported that the patients with DM (lung n=2, bone n=4, lung + bone n=1) had the first Treatment consisting of complete thyroidectomy followed by postoperative RAI. Only three (42.8%) of the seven patients had metastatic disease exhibiting RAI uptake. Additionally, two patients demonstrated localized dedifferentiation in their original pathology.[9]

4. Conclusion

The study concluded that there was no significant difference between adding radioiodine ablation(low dose) to hormonal replacement therapy after follow-up at 4, 8, and 12 months.

This suggests that non-radioiodine therapy has the same effect as radioiodine therapy after total thyroidectomy in cases with low papillary thyroid cancer.

Disclosure

The authors have no financial interest to declare in relation to the content of this article.

Authorship

All authors have a substantial contribution to the article

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