

OUTCOME OF RADIOIODINE ABLATION IN THE MANAGEMENT OF DIFFERENTIATED CARCINOMA THYROID

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Abstract:

Objectives: To evaluate the outcome of the differentiated carcinoma thyroid after radioiodine ablation, to find out the survival rate of the differentiated carcinoma thyroid and to increase consciousness and compliance among the patients.

Study design : Retrospective study.

Methods : The study was carried out from January 1986 to April 1994 at the Institute of Nuclear Medicine & Ultrasound, Bangabandhu Sheikh Mujib Medical University, Dhaka which randomly selected a total of 125 patients irrespective of age & sex with thyroid cancer undergone total thyroidectomy and referred to the Institute

Results : Among 125 cases in this study age prevalence was 10-70 years and maximum age group involved was 21-30 years (28%) followed by the age group 31-40 years (27.20%); female: male ratio was 3:2 approximately; female of reproductive age were more affected by carcinoma thyroid than male- among the 31-40 age group, female: male was 2.5:1 but for the older age group male: female was approximately 1:1, even sometimes male were more affected; regarding distribution of cell type of carcinoma thyroid Papillary carcinoma was 68% and Follicular carcinoma was 32% - 3 cases (1 of papillary, 2 of follicular) developed anaplastic carcinoma; maximum age incidence of papillary carcinoma was 21-30 years (32%) followed by the age group 31-40 years (25%) during when incidence of follicular carcinoma was less- on the contrary, follicular carcinoma incidence was more the papillary carcinoma in older age viz during the age group 51-60 years its incidence was 25% whereas papillary carcinoma incidence was only 10%, regarding radioiodine ablation 62 patients (49.6%) got only the first dose whereas only one (0.8%) received also the 10th dose, maximum recurrence occurs after 6 months of receiving the 1st dose. 15 years survival is more in Papillary carcinoma (22%) than in Follicular carcinoma, 15⁺ Years survival is maximum for 31-40 years age group (29.41%) followed by 21-30 years (17.14%), 15⁺ Years survival is more in female (20.83%) than in male (13.20%), Efficacy of the 1st ablation dose to prevent recurrence metastasis is 43% approximately; most efficient ablation dose is 100-150 mCi. but for metastatic cases, it is 150-200mCi. 21% patients seem to be noncompliant. Neck-node metastasis is common in papillary carcinoma whereas bone metastasis is common in follicular carcinoma, recurrence in thyroid bed is more common in papillary carcinoma whereas recurrent bone and neck-node metastasis is more common in follicular carcinoma than in papillary carcinoma.

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Introduction:

Thyroid swelling is the most common, diabetes mellitus being the second¹, endocrine disorder in Bangladesh, an endemic zone for goiter². The national prevalence rate of goiter had

increased over the past decades up 47%³ which is now only 17%⁴. Thyroid clinic, BSMMU, Dhaka reported 32.67% goiter being nodular goiter⁵. Thyroid malignancy is a common juvenile malignancy in Bangladesh although

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no age is immune for thyroid malignancy and female are more affected. The challenge to the clinician is to select patients whose gland harbour thyroid cancer from the large group of patients with thyroid nodules. Carcinoma Thyroid usually presents as either solitary nodule or dominant nodule in multinodular goiter, may or may not be with palpable neck-node^{6,7}. 10-20% Adenomas turn to malignancy, 10-15% cold nodules turn to malignancy, 15-20% cold cystic nodules turn to malignancy, 10-15% cystic nodules turn to malignancy, 6-10% MNG turn to malignancy, about 5% warm nodules turn to malignancy – hot nodules never turn to malignancy. Thyroid hormone assay, FNAC, USG, Thyroid scan are the diagnostic tools for carcinoma thyroid- USG capable of differentiating solid from cystic lesion but cannot distinguish malignant from benign one; isotope scan can demonstrate the functioning capacity of the nodule but not the histopathological character; simple, less expensive, easily available FNAC can provide cytodiagnosis of the thyroid malignancy excepting the follicular ones but histopathological examination is the most accurate way to diagnosis the malignancy. However, lymphnode metastasis is common for carcinoma thyroid rather than the distant metastasis. Since thyroidectomy alone can not cover the total treatment regime for carcinoma thyroid, so postoperative radioiodine ablation is commonly practised as an essential part in the management of differentiated carcinoma thyroid. Regular follow-up after ablation should increase the survival rate as well as quality of life but a good number of patients is noncompliant due to many socioeconomical grounds, so vigilant counseling at different phases of the treatment is a mandatory to achieve the best result of the radioiodine ablation in the management of the differentiated carcinoma thyroid.

Methods:

Methods of study: Patients of differentiated carcinoma thyroid were diagnosed confirmedly by histopathological examination and were sent to the nuclear medicine centre/Institute for receiving radioiodine ablation. Methods used in this study included clinical presentation, patient selection, pretreatment investigation, treatment and follow up. First ablation dose, dose(s) for recurrent/ persistent cases, total

dose, propensity of recurrence, survival rate, review of dropped out patients were the priority issues.

Results:

Table-I

Sex distribution of the patients of ca-thyroid (n=125)

| Cell type of Carcinoma | Total No. of the patients | | Number of Patients of each cell type |
|------------------------|---------------------------|-------|--------------------------------------|
| | Female | Male | |
| Papillary | 44 | 41 | 85 |
| Follicular | 28 | 12 | 40 |
| Total Patients = | 72 | 53 | 125 |
| % of Female & male | 57.60 | 42.40 | |

Table-II

Age distribution of the patients of ca-thyroid (n=125)

| Age group (years) | No. of the patients |
|-------------------|---------------------|
| 10-20 | 15(12%) |
| 21-30 | 35(28%) |
| 31-40 | 34(27.20%) |
| 41-50 | 17(13.60%) |
| 51-60 | 20(16%) |
| 61-70 | 4(3.20%) |
| Total Patients = | 125 |

Table-III

Distribution of the cell type of ca-thyroid (n=125)

| Cell type of carcinoma | Number of Patients of each cell type | % Of each Cell type |
|------------------------|--------------------------------------|---------------------|
| Papillary | 85 | 68% |
| Follicular | 40 | 32% |
| Total Patients= | 125 | |

Table-IV

Correlation Between Age Group & Sex Preponderance (n=125)

| Age group (Years) | No. of the patients | |
|-------------------|---------------------|------|
| | Female | Male |
| 10-20 | 8 | 7 |
| 21-30 | 21 | 14 |
| 31-40 | 24 | 10 |
| 41-50 | 8 | 9 |
| 51-60 | 8 | 12 |
| 60-70 | 3 | 1 |
| Total Patients= | 72 | 53 |

Table-V*Age incidence of the types of ca-thyroid*

| Age group (Years) | No. of the patients | |
|----------------------|-----------------------------|------------------------------|
| | Papillary carcinoma (85) | Follicular carcinoma (40) |
| 10-20 | 12(14.11%) | 3(7.5%) |
| 21-30 | 27(31.76%) | 10(25%) |
| 31-40 | 21(24.70%) | 11(27.4%) |
| 41-50 | 13(15.29%) | 4(10%) |
| 51-60 | 9(10.58%) | 10(25%) |
| 61-70 | 3(3.52%) | 2(5%) |
| Total Patients= | | |

Table-VI*Schedule of the ablation dose (s) received by the patients (n=125)*

| Number of Dose(s) | Number of the Patients |
|----------------------------|------------------------|
| 1 st Dose only | 62(49.6%) |
| 2 nd Dose also | 38(30.4%) |
| 3 rd Dose also | 16(12.8%) |
| 4 th Dose also | 02(1.6%) |
| 5 th Dose also | 01(0.8%) |
| 6 th Dose also | 02(1.6%) |
| 7 th Dose also | 02(1.6%) |
| 8 th Dose also | 01(0.8%) |
| 10 th Dose also | 01(0.8%) |
| Total Patients= | 125(100%) |

Table-VII*Schedule of interval of recurrence (n=125)*

| Interval between 1 st & 2 nd doses | Number of the patients |
|---|---------------------------|
| Before 6 Months | 05 |
| After 6 Months | 14 |
| After 9 Months | 07 |
| After 1 year | 10 |
| After 1.5 years | 02 |
| After 2 years | 03 |
| After 3 years | 08 |
| After 4 years | 03 |
| After 5 years | 04 |
| After 6 years | 03 |
| After 7 years | 01 |
| After 9 years | 01 |
| After 10 years | 01 |
| After 15 years | 01 |
| Total patients= | 63 |

Table-VIII*Schedule of survival rates of the patients of carcinoma thyroid (n=125)*

| Duration of survival | Number of the patients | | |
|-------------------------|-----------------------------|------------------------------|------------------------|
| | Papillary carcinoma (85) | Follicular carcinoma (40) | No. of the patients |
| 5 years | 67 (88.83%) | 29 (72.50%) | 96(76.8%) |
| 10 years | 51 (59.99%) | 20 (50%) | 71(56.8%) |
| 15 years | 33 (38.88%) | 10(25%) | 43(34.4%) |
| 15 ⁺ years | 14(16.47%) | 08 (20%) | 22(17.6%) |

Table-IX*Correlation between age group & survival rate (n=125)*

| Age group (Years) | No. of the total Patients | Survival | | | | |
|-------------------|------------------------------|----------|-------|--------|--------|---------------------|
| | | <5 yrs | 5 yrs | 10 yrs | 15 yrs | 15 ⁺ yrs |
| 10-20 | 15 | 4 | 2 | 3 | 3 | 3 |
| 21-30 | 35 | 8 | 6 | 7 | 8 | 6 |
| 31-40 | 34 | 5 | 5 | 7 | 7 | 10 |
| 41-50 | 17 | 5 | 4 | 2 | 3 | 3 |
| 51-60 | 20 | 5 | 7 | 8 | - | - |
| 61-70 | 4 | 2 | 1 | 1 | - | - |
| | 125 | 29 | 25 | 28 | 21 | 22 |

Table-X

Correlation between survival rate & sex group (n=125)

| Survival Duration (years) | No. of the patients | |
|---------------------------|-----------------------|---------------------|
| | Female (Total No.=72) | Male (Total No.=53) |
| <5 | 14 | 15 |
| 5 | 17 | 8 |
| 10 | 14 | 14 |
| 15 | 12 | 9 |
| 15+ | 15 | 7 |

Table-XI

Schedule of the first ablation dose for the patients of ca-thyroid (n=125)

| Dose in mCi | No. of the patients received |
|------------------|------------------------------|
| 45-75 | 38 |
| 76-100 | 43 |
| 101-125 | 12 |
| 126-150 | 24 |
| 151-200 | 07 |
| 201-250 | 01 |
| Total Patients = | 125 |

Table-XII

Correlation of the first ablation dose with propensity of recurrence (n=125)

| 1 ST Dose in mCi | No. of patients received | No. of patients received successive dose (s) | No. of patients upgraded, didn't receive successive dose |
|-----------------------------|--------------------------|--|--|
| 45-75 | 38 | 20(52.63%) | 18 |
| 76-100 | 43 | 21 (48.83%) | 22 |
| 101-125 | 12 | 04(33.33%) | 08 |
| 126-150 | 24 | 12(50%) | 12 |
| 151-200 | 07 | 05(71%) | 02 |
| 201-250 | 01 | 01(100%) | Nil |
| Total Patients= | 125 | 63 | 62 |

Table-XIII

Review of the dropped out patients of ca-thyroid under follow up

| Duration of follow up (in years) | Still under follow up | No. of the patients | | | Total |
|----------------------------------|-----------------------|---------------------|---------------------|---------------|-------|
| | | Recorded Death | Cause not known | Not turned up | |
| At the end of 5 years (n=125) | 96 | Recorded Death =10 | Cause not known =19 | =19 | 29 |
| At the end of 10 years (n=96) | 71 | Recorded Death =22 | Cause not known =13 | =13 | 35 |
| At the end of 15 years (n=71) | 43 | Recorded Death =13 | Cause not known =15 | =15 | 28 |

Table-XIV

Prevalence of neck-node & bone metastasis in carcinoma thyroid (n=125)

| Cell type of carcinoma | Total Patients of each Cell type | Both Neck-node & Bone Metastasis | Only Neck-node metastasis | Only Bone metastasis |
|------------------------|----------------------------------|----------------------------------|---------------------------|----------------------|
| Papillary carcinoma | 85 | Nil | 45 (49.41%) | Nil |
| Fillicular Carcinoma | 40 | 03 (7.5%) | 12 (30.00%) | 05 (12.5%) |
| Total= | 125 | 03 | 54 | 05 |

Table-XV

Post ablation recurrent/ metastatic evaluation of the patients of carcinoma thyroid (n=125)

| Cell type of carcinoma | Total Patients of Cell type | Thyroid bed, Bone & Neck-node involved | Thyroid bed & Bone involved | Thyroid bed & Neck-node involved | Only Thyroid bed involved | Only Bone involved | Only Neck-node involved | Thyro id/ Neck Mass | Increased Serum Thyro-globulin level |
|------------------------|-----------------------------|--|-----------------------------|----------------------------------|---------------------------|--------------------|-------------------------|---------------------|--------------------------------------|
| Papillary carcinoma | 85 | 02(2.305%) | 01(1.17%) | 08(9.40%) | 32(38%) | Nil | 01(1.17%) | 10(11.76%) | 24(28.20%) |
| Follicular carcinoma | 40 | Nil | 02(5%) | 05(12.5%) | 11 (27.5%) | 02(5%) | 02(5%) | 02(12.5%) | 08(20%) |
| Total= | 125 | 2 | 3 | 13 | 43 | 2 | 3 | 15 | 32 |

Discussion:

7% of world population has goiter⁸. Annual incidence of thyroid malignancy- a common juvenile malignancy in Bangladesh although no age is immune for thyroid malignancy is 3.7 per 1,00,000 of the population but mortality rate being only 2-3%⁶. Nodular goiter is more prevalent than diffuse goiter⁹. Thyroid nodule specially cold, cystic, cold and cystic and solitary one, has a higher propensity of being malignant¹⁰. In a young patient (including children) in whom lymph-node enlargement is often the associated presenting feature, a papillary carcinoma (60%) is the usual cause; in middle age a follicular carcinoma (20%) is likely and in old age an anaplastic carcinoma (15%)¹¹. Overall male & female sex ratio for thyroid malignancy is 3:1⁶ with female preponderance for papillary carcinoma (2.4:1)⁹ and no sex preponderance for follicular carcinoma. Young male with solitary nodule is a high risk factor for being malignancy and papillary carcinoma is usually the only childhood thyroid malignancy. Follicular carcinoma is most common in 6th decade of life but being seldom under the age of 30 years and it gets very few lymph node metastasis (about 10%, about 4% for purely follicular one) rather than bone and lung metastasis is common (about 20-30%)¹²; on the contrary, nodal metastasis is common in papillary carcinoma (about 40%)^{6, 13}

However, few cases of differentiated thyroid cancer, specially papillary thyroid cancer, are diagnosed preoperatively but most of the malignant cases, specially follicular carcinoma, are diagnosed by postoperative histopathological examination. Thyroid hormone assay, USG of the thyroid bed with other neck swelling if any, Thyroid scan¹⁴, FNAC¹⁵ are well enough to diagnose the differentiated carcinoma thyroid which is confirmed by preoperative frozen section (it also begets 1-2% false positive)¹⁶ or postoperative histopathological examination. 70% of seemingly solitary nodules become dominant nodule of MNG in USG⁶ which delineate simple or complex anatomicopathological structure of the nodule as well as of the gland. In general, 30-50% of seemingly

solitary nodules prove to be adenoma by FNAC, of which only 10-20% are proved to be malignant and rest of the solitary nodules become cystic or colloid in nature^{6 17}; 3-20% being purely or partially cystic- mixed solid and cystic lesions and also the recurrent nodules allegedly have a higher frequency of malignancy whereas for the purely cystic one, the rate is only 3%^{18 19}. However, FNAC is less reliable in cystic than in solid lesions⁹. About 80% of discrete swellings are cold in thyroid scan but only 15% prove to be malignant whereas cold cystic nodules get 15-20% chance for malignancy and the cystic ones get 10-15% chance¹⁹. On the contrary, hot nodules never turn to malignancy, and only 2-6% warm nodules turn to malignancy; 6-10% MNG turn to malignancy, usually follicular carcinoma⁹.

Total thyroidectomy followed by suppression of TSH as well as radioiodine ablation is the mainstream of the treatment of differentiated carcinoma thyroid. In Nuclear medicine centre/Institute, Serum T₃, T₄, TSH estimation, Thyroid scan/ Ultrasonogram of thyroid gland are practiced before selection of patient since if residual thyroid tissue is >3 gm, the patient is advised for completion thyroidectomy²⁰. So, now-a-days for a suspected nodular goiter, total thyroidectomy is performed, if malignancy could not be excluded by frozen section, and histopathological examination is done to confirm the malignancy; and the patients of differentiated carcinoma thyroid are sent for radioiodine ablation. In nuclear medicine centre/ institute, thorough clinical history, physical examination, USG, radioactive iodine uptake, bone scan, large dose whole body scan are routinely performed to assess the status of metastasis, amount of thyroid remnant & status of radio-iodine uptake of thyroid tissue to estimate the ablation dose²¹. Usually 50-250 mci dose is given for ablation in our country²⁰ – for nonmetastatic case, 75-100 mci; for nodal metastatic case, 100-150 mci; for distant metastatic case; 150-200 mci usually²¹. Postablation scan is done & the patient is discharged on thyroxin with the advice to visit after six weeks. One the successive follow up, clinical history, physical examination, T₃, T₄,

TSH estimation is routinely done and large dose whole body scan (off thyroxine) and serum thyroglobulin level, anti thyroglobulin antibody assay is done to seek for metastasis. For the recurrent/metastatic patients, ablation dose(s) is/are given with higher mci dose usually¹⁹.

Regular follow-up after radioiodine ablation for which heartiest counseling is a must is mandatory to observe the quality of life, to find out any metastasis or recurrence and to estimate the survival rate. The study performed revealed 43% patients being noncompliant which implies that counseling with the patients and attendants preoperatively, postoperatively and while availing the radioiodine ablation is the most essential part in the management of differentiated carcinoma thyroid. The present study highlights as well as emphasizes the counseling with patient and his/her attendants regarding importance of postoperative radioiodine ablation, result of ablation, importance of obeying advices, importance of regular follow up to ensure increased survival rate and quality of life.

Conclusion:

Goiter is common in Bangladesh and nodular goiter is not uncommon which harbours the malignancy. Postoperative radioiodine ablation is an essential part in the management of differentiated carcinoma thyroid in which approximately 50% patients respond well enough to the 1st ablation dose but regular follow up is essential. Unfortunately 43% patients are found to be noncompliant which implies that counseling with the patients and attendants preoperatively, postoperatively and after first ablation is a very important factor in this management of the differentiated carcinoma thyroid. Finally, if carcinoma thyroid is diagnosed earlier, total thyroidectomy is done timely & post-thyroidectomy radio-iodine ablation is received compliantly, the 15 years even more survival is common and feasible; the patient can die a normal death.

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