RADIOIODINE THERAPY FOR DIFFERENTIATED THYROID CARCINOMA : INHS ASVINI EXPERIENCE

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ABSTRACT

During last 17 years, 175 patients of carcinoma thyroid were treated in this centre. Hundred patients (57%) of papillary carcinoma formed majority. Fifty four patients (31%) were follicular carcinoma and 15 (8.5%) were mixed variety. Two (1.3%) were medullary carcinoma, 3 (1.7%) anaplastic type and 1 (0.5%) hurthle cell carcinoma. After surgery these patients were assessed for radio iodine uptake, residual thyroid tissue and distant metastasis which determined the dose of radioiodine for ablation. Fifty two per cent (91) patients presented as multi nodular goitre, 22.3 per cent (39) as solitary nodule, 13.7 per cent (24) had lymph node metastasis, 5.7 per cent (10) bone metastasis, 2.5 per cent (4) had lung metastasis and 3.8 per cent (7) presented as thyrotoxicosis. Average number of therapy for complete ablation in papillary carcinoma was 1.5, follicular 1.78 and mixed variety 1.5. 72.6 per cent cases (127) needed single dose for ablation, 14.9 per cent (26) needed 2 doses and 5.7 per cent (10) required 3 doses. Only 6.8 per cent (12) cases needed 4 to 8 doses. Average dose of I^{131} administered for ablation was 157 mci in males and 124 mci in females of papillary carcinoma thyroid. Males in follicular variety required 204 mci and females needed only 120 mci. In mixed variety males required 177 mci and females required 62.5 mci for complete ablation. 144 patients (82.3%) were followed up to 5 years and remaining patients from 6 to 17 years. These patients are followed up once in a year or alternate years. Follow-up and medical record keeping for defence personnel is done with meticulous care, therefore followup results are very encouraging.

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KEYWORDS: Differentiated thyroid cancer; Radio iodine therapy; Thyroid ablation.

Introduction

Most differentiated cancers of thyroid are diagnosed when hemithyroidectomy is performed for a solitary cold nodule or multi nodular goitre. Fine Needle Aspiration Cytology (FNAC) contributes to a great extent in preoperative diagnosis of thyroid cancers [1]. These patients are subjected to thyroidectomy after diagnosis of carcinoma (Ca) thyroid. A period of 4 to 6 weeks should elapse to permit serum TSH to rise before assessment of patient is done to decide ablation dose for residual thyroid tissue. Post operative scan at 4 weeks will usually demonstrate some residual tissue in the neck which may be tumor or normal tissue and there is no reliable way to distinguish these two therefore, it is essential to ablate/destroy it. In a series by Ramanna et al only 9 out of 29 cases (31%) were ablated with one 30mci dose (1.11 Gbq) of I^{131} , where as 18 out of 29 patients (62%) were ablated with one dose of 3.70 Gbq (100Mci) [3]. A few clinicians have questioned the mode of treatment of well differentiated thyroid cancer. The efficacy of surgery when combined with radio iodine and thyroxine for the treatment of differentiated carcinoma of thyroid has been well docu-

mented [6]. Despite the extensive experience gained over last 50 years there is still no consensus regarding specific indication for its use and dose of radioiodine to be administered.

Material and Methods

This centre is treating patients of Ca thyroid with radio iodine following surgery. Total of 175 cases have been treated from 1974 to August 1995.

The patients were accepted for treatment after 4 weeks of surgery generally near total thyroidectomy (NTT) is done. During this period they were not given eltroxin replacement. Radio active Iodine uptake (RAIU) studies were performed at 2,4,24,48 and 72 hours intervals and neck scan was done at 24 hours. Average dose of I^{131} given for RAIU was 1.85 Kbc (50 uci). The effective half life (Te) and weight of residual thyroid tissue was calculated from the RAIU and scan findings. The dose of I^{131} to be administered was calculated by the formula.

$$D(b+g) = T_e C (73.8 + E_b + 0.0346 T - g) \text{ rads [8]}$$

Where T_e = Effective isotope half life.

C = Concentration of I^{131} in the tissue (uci/gm).

E_b = Average beta ray energy.

T = gamma ray dose constant per mci.

-g = geometric factor

for a dose of 60,000 rads to thyroid tissue the simplified formula becomes,

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dose in Mbq (mci) = $400 \times \text{gland weight} / \text{Te} \times \text{Max RAIU}$ at 24 hrs

These patients were kept isolated in high activity ward and discharged from wards when radiation doses were reduced to acceptable levels.

The patients were reviewed at 6 months intervals till complete residual thyroid ablation achieved, thereafter patients were reviewed every year for 5 years, than every 2 years. Eltroxin replacement in dose of 0.2 to 0.3 mg per day was given. During each review, eltroxin was withdrawn 4 weeks prior to administration of I^{131} , 111 to 185 Mbq (3 to 5 mci) oral dose and whole body scan taken at 72 to 96 hours later. Patients who showed evidence of metastasis/residual thyroid tissue were given further dose of I^{131} .

Results

The clinical presentation of Ca thyroid patients is given in Table 1. Ninety two patients (52%) presented as multinodular goitre and 39 patients (21.3%) as solitary nodule. Thirty eight patients (21.7%) had evidence of metastatic disease at first presentation. Seven patients (4%) presented as thyrotoxicosis.

TABLE 1
Clinical presentation of cancer thyroid patients

Presentation	No of patients	Percentage
Goitre	130	74.3
Multinodular goitre	91	52.0
Solitary nodule	39	22.3
Metastasis	38	21.7
Lymph nodes	24	13.7
Bones	10	5.7
Lungs	4	2.3
Hyperthyroidism	7	4.0
Total	175	100

The age and sex distribution along with histological classification of Ca thyroid is shown in Table 2. A total of 97 males and 78 females were there. Maximum patients were in the age group of 29-39 years.

Number of fractional doses received by treated patients is as shown in Table 3. In 72.6 per cent (127) patients complete ablation was achieved in single dose only 6.8 per cent patients [12] required more than 3 dose for ablation. Only 1 patient required 7 doses and another patient 8 doses for ablation.

Table 4 shows average dose of radio iodine administered for complete ablation in milli curies (mci) in males and females. It is observed that generally ablation dose required is higher in males than females. Ca in males required maximum average dose of 202 mci and mixed Ca in females required minimal dose of 75 mci. Two cases of Medullary Ca were also treated with I^{131} radio iodine since these patients could not achieve full ablation. One hundred forty four patients required 200 mci or less while 25 patients needed more than 200 mci. Six patients were not administered any dose of radioiodine since there was hardly any concentration of I^{131} on whole body scan.

Follow-up of these patients is shown in Table 5, it is noteworthy that 56 per cent patients have been followed up to 3 years and 40 per cent patients from 4 to 10 years and more. Only 4 per cent [7] patients expired during this period. Three patients of anaplastic carcinoma died due to extensive local infiltration, 1 due to acute

TABLE 2

Histopathological classification of thyroid cancer according to age and sex distribution

Type	Number of cases					
	Males	Average age	Range (years)	Females	Average age	Range (years)
Papillary	60	35.5	21-66	40	34.5	21-60
Follicular	27	33.9	18-61	27	33.5	32-55
Mixed	7	29	22-40	8	33.6	28-37
Anaplastic	1	31		2	39	
Medullary	1	38		1	22	
Hurthle cell	1	58		—	—	—
Grand Total	97	—	—	78	—	—

TABLE 3

Number of fractional doses required for complete ablation

Number of doses	Number of patients	Percentage
1	127	72.2
2	26	14.9
3	10	5.7
4	3	1.7
5	4	2.2
6	3	1.7
7	1	0.57
8	1	0.57

TABLE 4

Average dose of radio iodine I^{131} administered for complete ablation in milli curies (MCI)

Type of carcinoma	Average dose administered (ranges)	
	Male	Female
Papillary	157 (25-1500)	134 (45-613)
Follicular	204 (50-689)	120 (50-600)
Mixed	177 (150-200)	62.5 (25-100)
Hurthle cell	50 (50)	
Medullary	100 (100)*	100 (100)*

*Complete ablation dose not achieved

gastroenteritis and 3 patients had respiratory failure due to tetany and infection. Only 1 patient among 175 has been detected to have acute lymphatic leukemia, who expired.

Discussion

It is well known that incidence of Ca thyroid in multinodular goitre is high compared to solitary nodule as seen in this study also. The figure in this analysis does not represent the true incidence of Ca thyroid since, confirmed cases of Ca thyroid are referred to this centre for further management. Seven cases (4%) who showed signs of thyrotoxicosis were diagnosed as carcinoma thyroid. Association of toxicity and carcinoma thyroid is rare. Basu et al found this incidence as 3.8 per cent. It is felt that even in thyrotoxic nodules

TABLE 5
Period of follow-up in thyroid carcinoma patients

Year of follow-up	Number of patients	Percentage
6 months	33	18.8
1-3 years	65	37.2
4 to 6 years	21	12.0
7 to 10 years	14	8.0
More than 10 years	35	20.0
Expired	7	4.0
Total	175	

FNAC should be performed to rule out occult Ca.

Lymphnode metastasis formed major problem (13.7%) followed by bone metastasis (5.7%) and lung metastasis (2.3%). Radio iodine therapy could eliminate lymphnode metastasis in 18 out of 24 patient (75%). Five bone metastasis out of 10 and 2 lung metastasis out of 4 disappeared. Out of the 2 lung metastasis cases not responding 1 was given a dose of 680 mci and showed partial regression, and the other given a total dose of 1500 mci till he expired, due to respiratory infection, tetany and respiratory failure.

Out of total 100 cases of papillary Ca, 60 were males and 40 females whereas males and females in follicular Ca were 27 each. Seven males and 8 females were found to have mixed thyroid Ca. Maximum patients were in age group of 29-39 years. This is in agreement with many other authors [3,4,5,7].

72.6 per cent patients showed complete ablation in first dose. The success of ablation increases to 87.5 per cent by 2 doses. Ouimby et al and Hurley et al has advocated 100,000 rads to thyroid tissue, but due to built, nutritional status, general health and overall fear of radiation, we restricted the dose to 60,000 rads in our subjects. It is seen from the literature that mostly authors are giving radio iodine dose from 50 to 200 mci without going into tedious calculations [3,4,5,7]. We feel that our patients dose could be safely increased to 75000 rads to achieve better rate of ablation in less number of doses.

Generally ablation dose required in males is higher than females. Two cases of medullary carcinoma were also treated with I^{131} since the residual tumor showed concentration, both these patients did not show complete ablation. One hundred and forty four patients required upto 200 mci and 25 patients needed more than 200 mci, doses of I^{131} . Six patients were not treated with any dose of I^{131} since there was no concentration of I^{131} , all these 6 patients are surviving more than 5 years on replacement doses and are disease free.

Difficulty in treatment may arise at any stage in the form of failure of I^{131} concentration in tumor, invasion of trachea, adjacent muscles or inoperable nodes in the tracheo-oesophageal groove or failure of tumor regression despite adequate concentration of I^{131} in tumor. In former case surgery, in second and third case small dose of 150-200 mci dose if I^{131} repeated at 2 to 3 months intervals are required.

Forty per cent patients have been followed up from 4 to 10 years in which 20 per cent are followed for more than 10 years. 37.2 per cent patients have been followed up from 1 to 3 years. 18.8 per cent cases have been followed up for 6 months. Those patients who have not reported at first 6 months have been excluded from the study. Seven patients who expired in this study form 4 per cent of the subjects. None of these patients expired due to direct cause of differentiated thyroid cancer. Only 1 patient was reported to have developed acute lymphocytic leukemia, the incidence of this disease in general public is also in the same range therefore this cannot be attributed to I^{131} therapy.

A small number of patients have been followed for long period, therefore evaluation of long term therapeutic benefit, and efficacy of radioactive iodine in the management of thyroid Ca has remained a controversial issue. Beierwaltes et al have given analysis of approximately 5000 patients followup for 40 years and have shown that this form of therapy for thyroid cancer is safe and improves the survival rates significantly [5].

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