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Surgical Experience in the Management of 125 Patients with Thyroid Masses in Kashmir

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Abstract

Results of surgical treatment in 125 patients with thyroid masses who attended to a Unit of the Department of ENT, Head and Neck Surgery of Govt. Medical College associated SMHS Hospital Srinagar in the first decade of this century are presented. Age of the patients ranged from 17 to 68 years peaking in the fourth decade of life (Figure 1 and Figure 2). Near 85% of the patients with thyroid masses were female and most of the cases (76%) euthyroid at the time of presentation. Depending upon the expertise of the pathologist, the FNA cytology has a good role in the preoperative diagnosis of thyroid masses especially the malignant types (Figure 3 and Figure 4). The specificity of FNA cytology in detecting malignant thyroid tumors in this study was 100% and the sensitivity was 73.08%. The overall diagnostic accuracy was 83.20%. 45.60% of the thyroid masses proved on excision biopsy to be malignant of which papillary carcinoma continued to be the most common malignant thyroid tumor followed by the medullary, the follicular and the undifferentiated types. Radionuclide scanning gave equivocal results in distinguishing between the benign and the malignant thyroid nodules in this study, but it was useful in evaluating indeterminate cases of FNA cytology. Magnetic resonance imaging of neck was used as an adjunctive imaging modality in assessing the extent of the primary malignant thyroid lesion, its direct extra-thyroidal spread and regional nodal metastases (Figure 5 and Figure 6). Different surgical techniques utilized in dealing with the thyroid masses included partial thyroidectomies and total thyroidectomy with or without modified neck dissection and the results are discussed.

Keywords

Thyroid Masses, Fine Needle Aspiration Cytology, Thyroid Scintiscan, Magnetic Resonance Imaging, Thyroidectomy, Excision Biopsy, Prognosticators

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1. Introduction

The number of patients with thyroid masses attending the tertiary care hospitals in Kashmir for treatment is on rise. Differentiated thyroid cancer seems to afflict more and more of the young women every year [1] [2]. The epidemiology of the thyroid masses was studied in this series of patients and their thyroid status were determined. Technitium-99 pertechnetate scintiscanning patterns of thyroid masses were correlated with the histopathological findings; and also the accuracy of fine needle aspiration cytology in the diagnosis of thyroid masses evaluated. Surgical strategy in dealing with the thyroid masses especially the malignant ones was developed in the study and the prognosticators established.

Figure 1. Papillary carcinoma of thyroid in a female of 37 years.

Figure 2. Multinodular goitre in an elderly female.

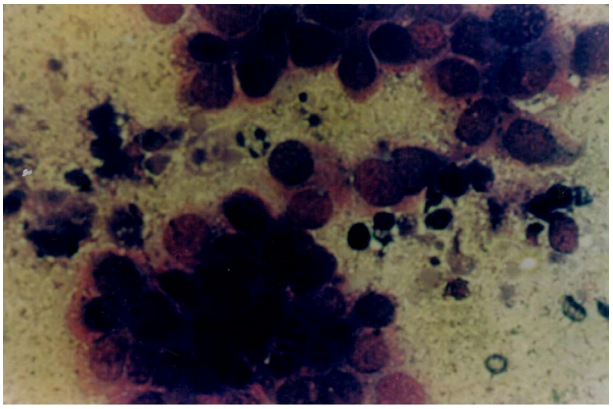

Figure 3. Photomicrograph of an FNA smear of papillary carcinoma of thyroid; Giemsa stain; ×400.

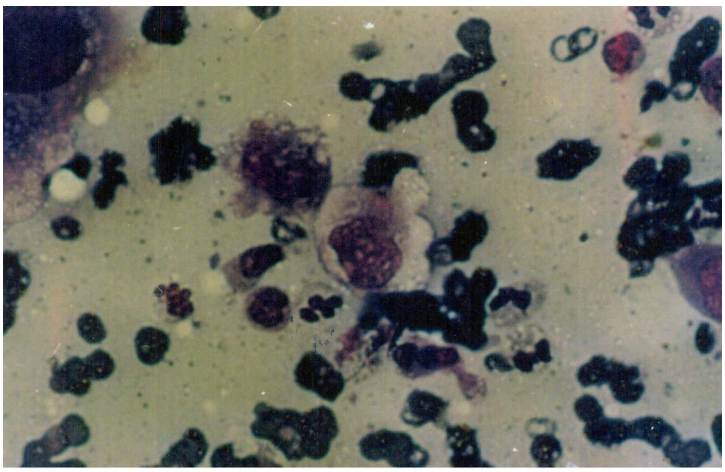

Figure 4. Photomicrograph of an FNA smear of anaplastic carcinoma of thyroid; Giemsa stain; ×400.

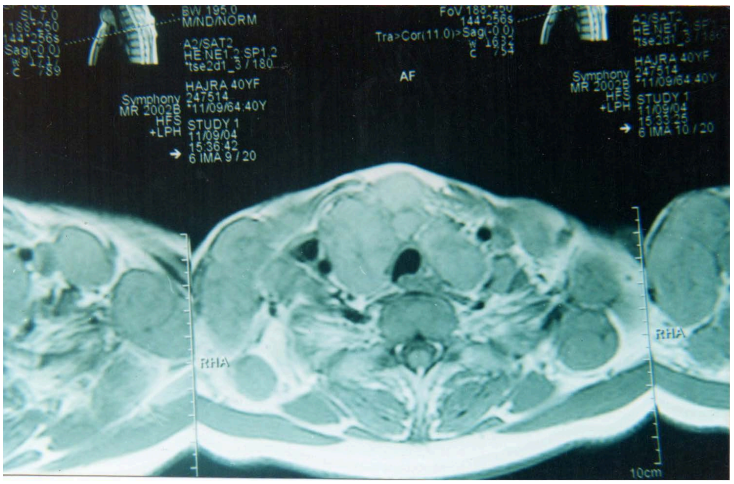

Figure 5. Axial MRI scan of neck showing capsular disruption of thyroid gland by papillary carcinoma, and multiple-level cervical nodal involvement.

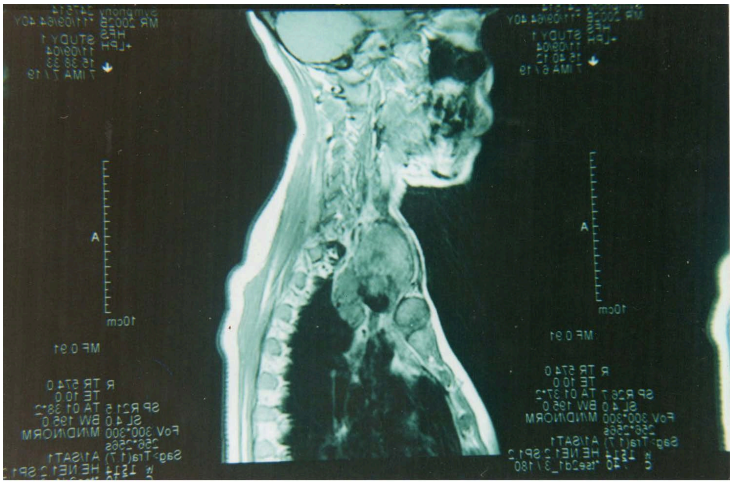

Figure 6. Sagittal MRI scan of neck showing superior mediastinal nodal involvement by papillary carcinoma of thyroid.

2. Material and Methods

The present prospective study is based on 125 patients with thyroid masses who were admitted in a Unit of the Department of ENT, Head & Neck Surgery in the Govt. Medical College associated SMHS Hospital Srinagar from the year 2000 to 2010 and were treated with different types of thyroid surgery. History of the disease was taken and the patients subjected to systemic examination and local examination of neck to know about the size and extent of the thyroid mass, and about the regional and distant metastasis in case of the suspected malignant masses. Fine needle aspiration cytology using Giemsa or haematoxylin stains was done in all of the patients. Bethesda system for reporting thyroid cytopathology was recommended late in the course of this study in the year 2007 [3]. Thyroid scintiscan using technetium-99 radionuclide was possible in only fifty unselected cases and the magnetic resonance imaging of the neck was done in all FNA positive carcinomas and all those false negatives who were subjected to completion thyroidectomy. FNA-documented benign masses of the thyroid in this study were generally managed by partial surgeries whereas the surgical strategy for the carcinomas was formulated on the basis of tumor cytology and the TNM extent (**Table 1**) on which the age and gender factors were imposed only in patients with differentiated thyroid cancer [4]. The revised ATA guidelines for the management of differentiated thyroid cancer were published in 2009 [5] and could not be applied. Solitary non-metastatic papillary carcinomas of thyroid in females under 45 years and with a maximum tumor diameter of less than 3 cm ($pT_1N_oM_o$ and small $pT_2N_oM_o$) were treated with lobectomy, serial measurements of thyroglobulin levels and six-monthly high resolution USG of neck and were followed for any distant metastases. Same treatment policy was applied to males with solitary non-metastatic papillary carcinomas of less than 1 cm ($pT_1N_oM_o$) in maximum diameter. Larger papillary carcinomas in either sex were subjected to total thyroidectomy with or without neck dissection as required to clear the disease. However, irrespective of the tumor size all patients of papillary carcinoma with multifocal disease, extra capsular spread, lymph node metastasis or distant metastasis were treated on similar lines. Near-total thyroidectomy though not recommended was exceptionally done in this study to save patients from severe hypoparathyroidism when it was otherwise a concern. Medullary carcinomas were treated with total thyroidectomy with neck dissection when indicated and serial serum calcitonin measurements, 6 monthly high resolution USG of neck and follow up for distant metastases. Two false negative cases of medullary carcinoma were initially treated with partial procedures. The only patient with undifferentiated carcinoma in this study was treated aggressively. All of the operative specimens were subjected to histopathological examination to confirm the diagnosis; establish the accuracy of fine needle aspiration cytology and thyroid scanning in diagnosing the thyroid disease, and correlating the findings so as to serve as a guide to more effective therapy for thyroid disease including completion thyroidectomy with or without neck dissection. The epidemiological data, findings of various investigations to facilitate diagnosis, and the results of surgery were noted in this study and are presented.

Table 1. TNM classification of thyroid carcinomas.

T:	**Primary Tumor**
T_0:	No evidence of primary tumor
T_1:	Tumor 1 cm or less in greatest dimension, limited to the thyroid
T_2:	Tumor more than 1 cm but not more than 4 cm in greatest dimension, limited to the thyroid.
T_3:	Tumor more than 4 cm in greatest dimension, limited to the thyroid.
T_4:	Tumor of any size extending beyond the thyroid capsule.
N:	**Regional Lymph Nodes**
N_0:	No regional lymph node metastasis
N_1:	Regional lymph node metastasis
N_{1a}:	Metastasis in ipsilateral cervical lymph node/nodes
N_{1b}:	Metastasis in bilateral, middle or contralateral cervical or mediastinal lymph node/nodes
M:	**Distant Metastasis**
M_0:	No distant metastasis
M_1:	Distant metastasis

3. Observations

Age and sex distribution: Age of the patients with thyroid masses ranged from 17 years to 68 years. The mean age of the affected patients was 35 years. The disease peaks in the fourth decade of life (40.80%). Thyroid masses were observed to be affecting females predominantly. Female to male ratio in this study was 5.94:1. **Table 2** depicts the age and sex distribution in 125 patients with thyroid masses.

Clinical Types: Solitary thyroid nodule with or without palpable cervical nodes was the commonest clinical type (92%) encountered followed by diffuse multinodular goitre, diffuse simple thyroid enlargement and palpable cervical lymph node mass with clinically normal thyroid gland in that order. **Table 3** shows clinical types of thyroid masses in 125 patients.

Fine needle aspiration cytology versus histopathological results: Fine needle aspiration cytology in this study showed 100% specificity in diagnosing malignant thyroid tumors (**Figure 7** and **Figure 8**) including 30 primary papillary carcinomas, 3 primary medullary carcinomas, one undifferentiated carcinoma, and one each of the regional secondary papillary and medullary carcinomas with non palpable primary. The diagnostic sensitivity of FNA cytology was 73.08%. Of 23 patients with "follicular neoplasm" reported on FNA there were 10 false negatives including 9 papillary carcinomas (with 4 follicular variants) and one medullary carcinoma; the remaining 13 were benign on HPE. One each of the three "follicular lesions" proved to be papillary carcinoma, follicular adenoma and a colloid goitre (**Figure 9**). Of 56 cases with colloid goitre reported on FNA cytology there were six false negatives of papillary carcinoma and one that of follicular carcinoma; the remaining 49 were true negatives. There were 3 reported cases of follicular adenoma on FNA which proved to be one each of papillary carcinoma, medullary carcinoma and a follicular adenoma. Of 2 patients with Hurthle cell neoplasm on FNA cytology one was papillary carcinoma and the other Hurthle cell adenoma. Histopathology confirmed 2 other FNA reports of Hurthle cell adenoma and Hashimoto's disease. The overall diagnostic accuracy of FNA cytology in this study was 83.20%.

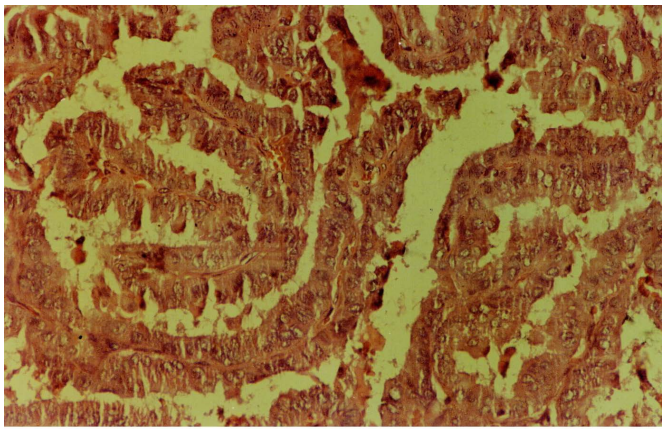

Figure 7. Photomicrograph of papillary carcinoma of thyroid showing papillary fronds and occasional "Orphan Annie eye" nuclei; Haemtoxylin-Eosin stain; ×400.

Table 2. Age and sex distribution in 125 patients with thyroid masses.

Age Group (Years)	No. of Patients	Male (%)	Female (%)
0 - 10	0 (0.00%)	0 (0.00%)	0 (0.00%)
11 - 20	8 (6.40%)	0 (0.00%)	8 (6.40%)
21 - 30	37 (29.60%)	6 (4.80%)	31 (24.80%)
31 - 40	51 (40.80%)	8 (6.40%)	43 (34.40%)
41 - 50	20 (16.00%)	1 (0.80%)	19 (15.20%)
51 - 60	7 (5.60%)	2 (1.60%)	5 (4.00%)
61 - 70	2 (1.60%)	1 (0.80%)	1 (0.80%)
Total	**125 (100%)**	**18 (14.40%)**	**107 (85.60%)**

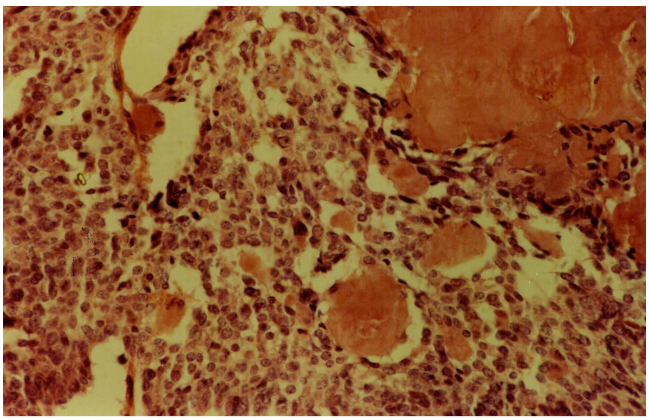

Figure 8. Photomicrograph of medullary carcinoma of thyroid showing solid pattern of growth, spindle cells and abundant deposits of amyloid; Haemtoxylin-Eosin stain; ×400.

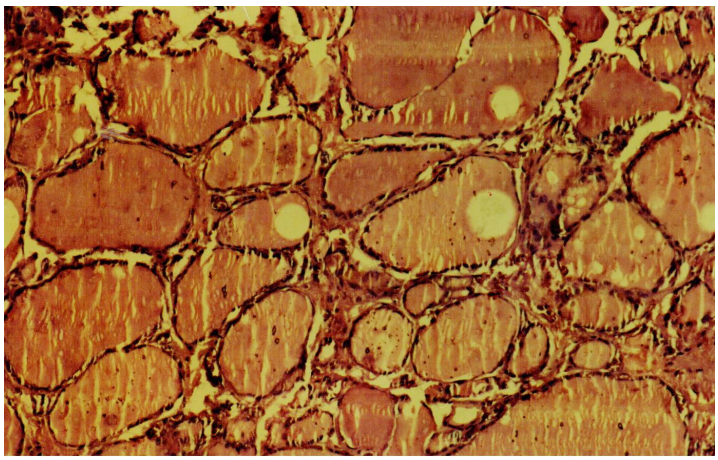

Figure 9. Photomicrograph of colloid goiter showing colloid follicles with flattened epithelium; Haemtoxylin-Eosin stain; ×400.

Table 3. Clinical types of the thyroid masses in 125 patients.

Clinical Type	No. of Patients	Percentage (%)
Solitary nodule with or without palpable neck nodes	115	92.00
Diffuse multinodular goitre	7	5.60
Diffuse simple thyroid enlargement	2	1.60
Palpable nodal mass with clinically normal thyroid	1	0.80
Total	**125**	**100.00%**

Radionuclide Scanning: A comparison between the results of technetium-99 pertechnetate scanning of 50 unselected cases of thyroid masses and their histopathological results was made to determine the role of thyroid scan in distinguishing between the benign and malignant thyroid nodules. **Table 4** summarizes these results.

Thyroid Hormone Status: Of 125 patients with thyroid masses 95 (76%) were euthyroid (normal T_3, T_4, TSH levels), 12 (9.60%) showed T_3 thyrotoxicosis (raised T_3 but normal T_4), 6 (4.80%) showed primary hypothyroidism (lowered T_3, T_4 but raised TSH), 6 (4.80%) showed reduced peripheral response (normal levels of thyroid hormones with clinical hypothyriodism) and 6 (4.80%) had biochemical thyrotoxicosis (high T_3, T_4 in absence of clinical thyrotoxicosis).

Table 4. Comparison of results of pre-operative technetium-99 pertechnetate thyroid scan with HPE in 50 patients with thyroid masses.

Technitium-99 Scan (Pre-op)	Histopathological diagnosis
Solitary cold nodule 33	Papillary carcinoma 10 (30.30%) Colloid goitre 9 (27.27%) Follicular adenoma 7 (1.22%) Medullary carcinoma 3 (9.09%) Hurthle cell adenoma 2 (6.06%) Adenomatous colloid goitre 2 (6.06%)
Enlarged lobe/gland with patches of decreased tracer uptake 7	Papillary carcinoma 3 (42.86%) Colloid goitre 2 (28.56%) Multinodulular goitre 1 (14.29%) Adenomatous colloid goitre 1 (14.29%)
Normal tracer uptake 3	Papillary carcinoma 2 (66.67%) Follicular adenoma 1 (33.33%)
Thyromegaly with a cold nodule 2	Papillary carcinoma 1 (50%) Multinodular goitre 1 (50%)
Increased tracer uptake in neck node with both lobes of thyroid appearing normal in size & shape 2	Papillary carcinoma thyroid metastasis level III node of R1 (50%) Papillary carcinoma thyroid with metastasis in level III node on L1 (50%)
Grossly enlarged left lobe with nodular calcification of both lobes of the thyroid gland 1	Papillary carcinoma of left lobe of thyroid gland 1 (100%)
Autonomous nodule in right lobe with suppressed rest of the gland 1	Papillary carcinoma of the left lobe 1 (100%)
Poorly visualized both lobes of thyroid 1	Papillary carcinoma of thyroid 1 (100%)

Treatment of Thyroid Masses: All of the 125 patients with thyroid masses were subjected to thyroid surgery. Benign masses were mostly treated with partial thyroidectomy techniques whereas the malignant cases were treated in accordance with the stage grouping of the tumor (**Table 5**). Of 31 patients reported on FNA cytology as papillary carcinomas with or without regional nodal metastases 10 (32.26%) were treated with total thyroidectomy alone; 11 (35.48%) were treated with total thyroidectomy and selective neck dissection; 2 (6.45%) with near total thyroidectomy; and 8 (25.80%) with lobectomy. All of the 4 (100%) FNA reported medullary carcinomas and a single case of undifferentiated carcinoma were treated with total thyroidectomy. There were 18 false negative papillary carcinomas, 2 false negative medullary carcinomas and one false negative follicular carcinoma in this study. Of 18 false negative papillary carcinomas 13 were treated with lobectomy as the initial treatment, 3 with enucleation and 2 with subtotal thyroidectomy. Of 2 false negative medullary carcinomas lobectomy was done in both as the initial treatment, and the only case of false negative follicular carcinoma in this study was initially subjected to subtotal thyroidectomy. Completion thyroidectomy as second stage operative procedure was performed in both of the false negative medullary carcinomas and the follicular carcinoma. Completion total thyroidectomy with or without selective neck dissection was also done in eight cases of false negative papillary carcinomas where a highly limited initial operative procedure such as enucleation was contemplated or where there was evidence of operative specimens with positive margins, multifocal or invasive lesion, mixed papillary-follicular histology or lymph node metastases. **Table 6** shows the types of operation done in 57 patients of thyroid carcinomas in the present study.

Follow up and prognosticators: Follow up period of the 57 operated patients with malignant thyroid tumors in this study ranged from 5 to 15 years. Of 49 operated patients of papillary carcinoma 46 (93.88%) survived disease free at 5 years. The other three died because of local failure, regional nodal recurrence and pulmonary metastasis respectively. Serial post operative thyroglobulin levels were persistently above the cut off level (77 ng/ml) in all of the 3 patients who died of the recurrent disease. The only patient of follicular carcinoma was alive at 5 years after surgery. Of 6 patients operated for medullary carcinoma 4 (66.67%) survived 5 years disease free. Disease recurred in neck nodes in the other 2 who were false negatives of FNA cytology at the time of presentation and were subjected initially to partial thyroidectomy followed by completion thyroidectomy and subsequently to modified neck dissection. Serial serum calcitonin levels were high above 10 pg/ml in the latter 2 patients who succumbed to the disease in the 5th post operative year.

Table 5. Staging of the thyroid carcinomas in 36 patients (modified TNM classification).

Type of Thyroid Carcinoma	Stage I		Stage II		Stage III		Stage IV	
	No. of Patients	Percentage %	No. of Patients	Percentage %	No. of Patients	Percentage %	No. of Patients	Percentage %
Papillary	20	64.52	7	22.58	4	12.90	-	-
Medullary	-	-	3	75.00	1	25.00	-	-
Undifferentiated	-	-	-	-	-	-	1	100

Table 6. Operative Procedures performed on 57 patients of thyroid carcinomas.

Type of Carcinoma No. of Patients)	Primary Operative procedure (No. of Patients)	Any Second Stage Operative Procedures (No. of Patients)
A. True Positive Carcinomas:		
a. Papillary carcinoma with or without regional nodal metastasis (31)	➢ Total thyroidectomy with selective neck dissection (11) ➢ Total thyroidectomy alone (10) ➢ Near total thyroidectomy (2) ➢ Lobectomy (8)	Revision surgery for regional nodal recurrence (2)
b. Medullary Carcinoma (4)	➢ Total thyroidectomy (4)	-
c. Undifferentiated carcinoma (1)	➢ Total thyroidectomy (1)	-
B. False Negative Carcinomas:		
a. Papillary carcinoma (18)	➢ Lobectomy (13) ➢ Enucleation (3) ➢ Subtotal thyroidectomy (2)	Completion total thyroidectomy alone or with selective neck dissection (8)
b. Medullary carcinoma (2)	➢ Lobectomy (2)	Completion thyroidectomy with type I modified radical neck dissection for nodal recurrence (2)
c. Follicular Carcinoma (1)	➢ Subtotal thyroidectomy (1)	Completion total thyroidectomy (1)

Complications associated with thyroid surgery: As expected hypothyroidism invariably occurs after total thyroidectomy and may occur after partial thyroidectomy procedures (19.77%) unless supplemented with levothyroxine. The hypothyroid state may proceed to myxoedema. Primary haemorrhage from left inferior thyroid artery was encountered in one patient (0.8%), transient hypocalcaemia occurred in 10.25% of the total thyroidectomy procedures and hypoparathyroidism was encountered in the same percentage of these patients. Of 125 operated patients right recurrent nerve paralysis complicated in one patient (0.8%), right external laryngeal nerve paralysis in one patient (0.8%), stitch abscesses in 5 (4%) and hypertrophic scar in 5 (4%).

4. Discussion

Thyroid masses commonly affect younger females. The mean age of the patients with thyroid masses in this study was 35 years, and near 86% of these patients were female. Female to male ratio was 5.94:1. Mazzafferi [6] in his series on the management of solitary thyroid nodules had female to male ratio of 4:1. The average age of 172 patients with thyroid masses reported by Shapiro *et al*. [7] was 36 years. 92% of the thyroid masses presented clinically as solitary nodules affecting predominantly the right lobe of the gland. Messaris [8] reported in his series of 568 patients of thyroid masses the right lobe involvement in near 57% of cases. Fine needle aspiration (FNA) cytology showed 100% specificity in diagnosing malignant thyroid tumours. The diagnostic sensitivity of FNA cytology in the present series of patients was 73.08% and the diagnostic accuracy was 83.20%. Being complementary to the false negative rate the low sensitivity was worrisome because in other words 21 malignant lesions in the series of 125 patients were simply missed—most of them (57%) from the FNA reported "follicular neoplasm" or "atypia of undetermined significance (follicular lesion)". In diagnosing thyroid masses with FNA cytology Afroze *et al*. [9] reported sensitivity of 61.9%, specificity of 99.3% and diagnostic accuracy of 94.5%; Kessler *et al*. [10] reported 79% sensitivity, 98.5% specificity and 87% diagnostic accuracy; and

Gupta *et al*. [11] reported 80% sensitivity, 86.6% specificity and 84% accuracy. Cibas and Ali report about the Bethesda system for thyroid cytopathology. This system recommends six diagnostic categories for thyroid masses which include the unsatisfactory, benign, "follicular lesion" or atypia of undetermined significance (AUS), "follicular neoplasm", suspicious for malignancy and malignant. According to these authors 35% of the "follicular neoplasms" prove not to be neoplasms but hyperplastic proliferation of follicular cells, and 15% to 30% prove to be malignant. The majority of "follicular neoplasm" cases turn out to be follicular adenomas or adenomatous nodules, both of which are more common than follicular carcinomas. Some of the "follicular neoplasms" are follicular variants of papillary carcinoma. For a definitive diagnostic procedure most of the patients with "follicular neoplasm" are managed by lobectomy. The "follicular lesion" or atypia of undetermined significance (AUS) result is obtained in 3% to 6% of thyroid FN aspirations. The recommended management is clinical correlation and repeated FNA at an appropriate interval. In most cases, a repeated FNA results in a more definitive interpretation. Only about 20% nodules are reported again as AUS. In some cases, however, the surgeon chooses not to repeat FNA but observe the nodule clinically or, alternatively to operate the patient because of concerning clinical and/or sonographic features. In the suspicious for malignancy category follicular variant of the papillary carcinoma of thyroid (PTC) can be difficult to distinguish from benign follicular nodule. Nodules reported to be "suspicious for malignancy" are resected by lobectomy or total thyroidectomy. 60% to 75% of these prove to be papillary carcinoma and the rest are follicular adenomas. Immunohistochemical analysis and flow cytometry in borderline cases is usually more helpful with medullary carcinoma and lymphoma than with PTC. The false negatives of the "benign" reports in the present series were 14.29%. The false negative rate of the benign FNA reports in the review studies quoted by Cibas and Ali was low (0% - 3%), but patients were nevertheless followed up with repeated assessments by palpation or ultra sound at 6 months to 18 months interval. If the nodule showed significant growth or suspicious sonographic changes, a repeated FNA was considered. Gharib *et al.* [12] comments that while FNA cytology is highly accurate in the diagnosis of nodular thyroid disease there can be difficulty in distinguishing some benign cellular adenomas from their malignant counter parts. Amrikachi *et al.* [13] reviewed 6226 fine needle aspiration biopsies from 1982 to 1998 and concludes that the major diagnostic problems are caused by diagnosis of malignancy based on one or two atypical cytological features or overlapping cytological features of follicular neoplasm with those of follicular variant of papillary carcinoma. Mehenna R. *et al.* [14] report about the impact of large nodule size and follicular varient of papillary carcinoma on false negatives in thyroid cytology.

A comparison between the radionuclide scanning of thyroid masses and the histopathological results of their operative specimens showed that thyroid scan is not quite specific in distinguishing between the benign and malignant masses in all of the scintiscan patterns including especially the solitary cold nodules which form the majority (92%) of these patterns. The diagnostic yield of malignant lesions in cold nodules in the present study was still better (39%) than reported by Ashcraft *et al.* [15] who in their review of 22 series of patients found 84% of the nodules were cold, 10% were warm and 5.5% were hot; and malignant disease was found in only 16% of the cold nodules. According to Mazzaferri radionuclide scanning of thyroid is not quite specific in diagnosing malignant tumors of thyroid but is useful for evaluating the undeterminate lesions of the FNA cytology which if 'cold' should be subjected to surgery or otherwise followed up.

Most of the patients (76%) with thyroid masses were euthyroid and only 4.80% showed primary hypothyroidism with raised TSH. Raised TSH as a factor for initiation or anaplastic transformation of relatively innocuous papillary carcinomas could neither by substantiated nor forfeited through this study. Brooks [16] comments that under the influence of pituitary thyroid stimulating hormone, a less malignant form of thyroid carcinoma (papillary) can become anaplastic over a long period. Ibanez *et al.* [17] gives similar suggestions. In the 54 patient series of Silverberg *et al.* [18] 6 originally papillary or follicular carcinomas later demonstrated anaplastic features, and 5 of these had earlier been treated with some form of radiation (external beam or ^{131}I) to the thyroid.

A modified TNM classification on which the age and the gender factors were imposed was utilized in staging the differentiated thyroid cancer. TNM classification irrespective of the age and gender of the patient was utilized for staging the medullary carcinoma; and the undifferentiated carcinoma of any size was treated as stage IV disease. Of 31 patients with papillary carcinoma 64.52% were in stage I disease, 22.58% were in stage II disease, 12.90% in stage III disease and none in stage IV disease. Of 4 patients with medullary carcinoma on FNA 75% were in stage II disease and 25% in stage III disease. The only patient with undifferentiated carcinoma was managed as stage IV disease. Risk factors such as age, distant metastasis, extent of the primary and its size (AMES) in the management of differentiated thyroid carcinoma were reported in detail by Cady and Rossi [19].

Benign thyroid masses in the present study were generally managed by conservative thyroidectomy procedures and the complications encountered were minimal. Greene [20] comments that all cold nodules should be removed because 20% of these will be found to be unequivocally malignant. The debate for selecting conservative thyroidectomy procedures or radical thyroidectomy operations in the treatment of differentiated carcinoma continues. Cady & Rossi observed that 90% of the patients with differentiated thyroid cancer are low risk and there was no statistically significant difference between the death rate of those treated with unilateral operations (1.6%) and those treated with bilateral operations (1.8%). However, in high risk patients of the differentiated thyroid carcinomas Hay quoted by above authors noted improved survival with bilateral operations in contrast to the unilateral operations. Besides, according to these authors serious morbidity including hypoparathyroidism in 32% of the operated patients' results from total thyroidectomy. Hundahl *et al.* [21] reviewed of 53,856 cases of thyroid carcinoma from 1985 to 1995 in which total thyroidectomy with or without lymph node dissection represented the dominant method of surgical treatment to patients with papillary and follicular carcinoma. At 5 years, variation in surgical treatment (*i.e.* lobectomy v.s more extensive surgery) failed to translate into compelling differences in survival for any subgroup of the differentiated carcinoma but longer follow up was required to evaluate this. Recent long term survival rate from high volume centres support a less aggressive management for papillary thyroid microcarcinoma (PTMC) than those advocated by existing guidelines [21] [23]. In a questionaire distributed to Canadian otolaryngologists-head and neck surgeons and endocrinologists to determine the current management of papillary thyroid microcarcinoma [24] 47% of the respondents recommended hemithyroidectomy and 43% recommended total thyroidectomy for a newly diagnosed PTMC in low risk patients; observation was the preferred method for managing PTMC detected incidentally after hemi-thyroidectomy (76%). Respondents chose more aggressive treatment for male patients compared to female patients. WU *et al.* [25] found that after hemi-thyroidectomy for PTMC, if there were no complicating factors, 70% of the respondent OHN surgeons and endocrinologists recommended no further surgery, while 30% believed that completion thyroidectomy was necessary. The prognosis for PTMC remains excellent with disease specific mortality well under 1% [26]. Younger age appealed to influence prognosis favourably for all thyroid carcinomas. Contrary to the above studies Russel *et al.* [27] after examining eighty thyroid glands containing primary carcinomas observed that the thyroid carcinoma spreads from primary site to all parts of the gland through the intragrandular lymphatics. The lymph vessels in the capsule than collect and carry malignant cells to the pericapsular lymph nodes from which they pass into the cervical lymph nodes. As proved by the whole organ sub-serial sections, 87.5% of the 80 tumors extended into the isthmus, the opposite lobe, the pericapsular lymph nodes of the opposite lobe or 2 or all 3 of these structures. They suggest that for complete eradication of carcinoma of the thyroid gland, total thyroidectomy, including the excision of pericapsular lymph nodes is the treatment of choice. For removal of the proved metastasis in the regional lymph nodes radical neck dissection is indicated. Clark [28] in his study on the treatment of differentiated thyroid cancer suggests that total thyoidectomy is the treatment of choice because residual cancer would persist in the remaining thyroid tissue is at least 61% of patients if only lobectomy had been performed. Blood supply to the parathyroid glands can be preserved by ligating the branches of the inferior thyroid artery on the thyroid capsule rather than by ligating the main vessel proximally. By dissecting the vessels and parathyroid glands from the thyroid gland, the blood supply to the parathyroid glands is preserved. Stael *et al.* [29] recommended total thyroidectomy with therapeutic selective neck dissection when indicated to be safe and well tolerated approach in children with thyroid carcinomas. Medullary and the undifferentiated carcinomas in the present study were treated with total thyroidectomy and neck dissection for nodal disease. Flemming *et al.* [30] while summarizing the results of their study on the surgical strategy for the treatment of medullary carcinoma in Houston, Texas comments that the majority of patients with invasive medullary carcinoma of thyroid have metastasis to regional lymph nodes at the time of diagnosis as evidenced by the frequent finding of persistently elevated calcitonin levels after thyroidectomy and high rates of recurrence in the cervical lymph nodes. Their data provide the rationale for surgeons to perform more extensive nodal clearance at the time of initial thyroidectomy and to consider re-operative cervical lympadenectomy in patients with persistently elevated calcitonin levels after thyroidectomy. Bouvet *et al.* [31] also report about the surgical strategy for the treatment of medullary thyroid carcinoma. Completion thyroidectomy as a second stage operative procedure in the present study was done in most of the false negative carcinomas.

Serial postoperative thyroglobulin levels were above the cut off level (77 ng/ml) in all the 3 patients of papillary carcinoma who died of recurrent disease. Serial serum calcitonin levels were high above 10 pg/ml in 2 patients of medullary carcinoma who succumbed to disease in the fifth post operative year. Tubiana *et al.* [31] stu-

died the long term results and prognostic factors in patients with differentiated thyroid carcinoma. A multivariate analysis of the prognostic factors was carried out on a series of 546 differentiated thyroid cancers followed for 8 to 40 years. For survival, the highest risk factor was associated with age; tumors diagnosed in patients younger than 45 years had the highest relapse free survival and total survival rates and slower growth rate. The second independent prognostic factor was histology. There was no difference between papillary and follicular well-differentiated tumours, but follicular moderately-differentiated had lower total survival and relapse free survival. The third factor was sex. Tumors tended to disseminate more in male than in female patients. The presence of palpable lymph nodes also had a significant independent impact on both total survival and relapse-free survival. Elevated levels of circulating thyroglobulin were observed in 12% of the patients who had been in complete remission for longer than 20 years. Lima N *et al.* [32] and Polachek *et al.* [33] laid emphasis on the prognostic value of serial thyroglobulin determinations after total thyroidectomy for differentiated thyroid cancer. Complications encountered after thyroid surgery in the present study were minimal. In the series of Mazzeferri *et al*. [34] the main complications of thyroid surgery were permanent hypoparathyroidism in 5% of the patients and permanent recurrent laryngeal nerve paralysis in 2%, almost always following total thyroidectomy for large and invasive tumours. Of 49 operated patients of papillary carcinoma in our study 93.88% survived disease-free at 5 years. Of 6 patients operated for medullary carcinoma 66.67% survived disease-free for 5 years. Bouvet *et al.* [35] describe in detail the surgical strategy, results of treatment and the prognosticators in medullary carcinoma of thyroid. The single case of undifferentiated carcinoma in this study died 2½ years after surgery because of local recurrence and airway obstruction. Results of the role of prognosticators in thyroid carcinoma in the present study are similar to those reported by Geissinger [36] and Gilliland *et al*. [37].

5. Conclusions

In this prospective study on 125 patients with thyroid masses treated surgically and followed up from 5 years to 15 years, following conclusions are drawn:

- Thyroid masses are more common in younger females. Peak age group affected by the thyroid masses in this study was the fourth decade of life (40.80%) and the mean age of the patients was 35 years. Female to male ratio was 5.94:1.
- 92% of the patients presented with a solitary nodule affecting the right lobe more often than the left.
- FNA cytology is highly specific in diagnosing thyroid malignancies (100%). The sensitivity of the FNA cytology in this study is 73.08% which is indicative of a significant false negativity. The overall diagnostic accuracy was 83.20%.
- Technetium-99 pertechnetate scintiscanning has adjunctive role in the diagnosis of thyroid masses but is not quite specific in diagnosing malignant tumors of thyroid. The chances of a cold nodule to be a papillarycarcinoma, colloid goitre or follicular adenoma are nearly equal. Thyroid scan may even be normal in patients having thyroid carcinoma. It is useful, however, in evaluating indeterminate cases of FNA cytology. MRI of the neck is rewarding in detecting the nodal involvement in thyroid B malignancy as well as assessing the extent of the primary and its direct extrathyroidal spread. Most of the patients (76%) with thyroid masses are euthyoird at the time of presentation.
- In the present study, 45.60% of the thyroid masses proved on excision biopsy to be malignant of which papillary carcinoma was the commonest followed by the medullary, the follicular and the undifferentiated carcinomas in that order.
- The risk factor considered in classifying the differentiated carcinomas in this study were the age, gender, tumor histology, tumor size, direct extrathyroidal spread, nodal involvement and distant metastasis. Most of the papillary carcinomas presented in stage I disease (64.52%) and stage II disease (22.58%). Only 12.90% of these presented in stage III disease. The only patient of undifferentiated carcinoma in this study was treated as stage IV disease.
- The surgical strategy in dealing with the differentiated thyroid cancer continues to be debatable between utilizing partial procedures on the one hand and radical thyroid techniques on the other. An exhaustive review of literature revealed evidence weighing more in favor of total thyroidectomy than partial thyroidectomy procedures for differentiated thyroid cancer.
- Benign thyroid masses were generally death with effectively by partial thyroidectomy procedures and the complications encountered were minimal. Completion thyroidectomy with or without neck dissection was opted for most of the patients which were reported initially benign on FNA but proved invasive malignant

tumors later after histopathological examination of the operative specimens.

- Medullary carcinomas were treated with total thyroidectomy, and neck dissection when indicated; and the only patient of undifferentiated carcinoma in this study was also treated with total thyroidectomy.
- Hypothyroidism is an expected consequence of the total thyroidectomy procedure. The other complications encountered after thyroid surgery in the present study included primary hemorrhage from the left inferior thyroid artery in one patient, unilateral external and recurrent nerve paralysis in one patient each, transient respiratory obstruction in the immediate post operative period in one, stitch abscess in 5 patients and scar hypertrophy in 5 patients.
- 5 years survival rate though admittedly insufficient to assess the results of treatment in differentiated thyroid cancer, however, most of the recurrences (69%) are reported to occur in first 5 years only. 95.79% of the patients with differentiated thyroid carcinomas followed up for 5 years in this study survived disease-free for that long period. 5 years survival rate for the medullary carcinoma cases was 66.67% and the only patient with undifferentiated carcinoma in this study survived barely 2½ years post treatment.
- Serial post operative thyroglobulin levels in the differentiated thyroid carcinomas and serial calcitonin levels in the operated medullary carcinomas are reliable prognosticators.

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