Evaluation of Dominant Thyroid Masses

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Controversy exists concerning the management of solitary thyroid nodules because of conflicting information concerning the high clinical incidence of thyroid nodules, the varying incidence of cancer reported in those surgically excised and the infrequency of death from thyroid cancer. During the past several years, a plan for evaluating patients with dominant thyroid masses has evolved. The objective is to avoid unnecessary operations by identifying patients with a high risk of cancer. The criteria which are used are the age and sex of the patient, the duration of the mass, ^{125}I or ^{99m}Tc scans, ^{75}Selenomethionine scans, B-mode ultrasonography and the response of the mass to suppressive therapy. This is a report of the findings in 222 patients who have been studied employing this approach. Thirty per cent of the patients were operated upon. Forty per cent had neoplasms (well differentiated cancer—28.8%, adenoma—12.1%), 47.0%—nodular goiter, 6.1% cysts, and 6.1% chronic thyroiditis. The incidence of cancer in the 222 patients was 8.6% and adenoma 3.6%. Patients at greatest risk of having cancer are those with solid nonfunctioning nodules which fail to regress with suppressive therapy. This study indicates that the approach described above is effective in selecting for surgical excision those individuals at greatest risk of having thyroid cancer.

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THE MANAGEMENT of thyroid nodules is controversial. This is because of conflicting information concerning the incidence of thyroid cancer in surgical specimens, at autopsy and the infrequency of death from this disease.[12,24,26] It is a common clinical problem because of the high clinical incidence of nodular goiter from which thyroid cancer needs to be differentiated.

Thyroid cancer was regarded as a curiosity of little clinical significance until attention was called to its high incidence in patients operated upon for nontoxic nodular goiter by Cole *et al.* in 1945.[8] Subsequent reports from many parts of the world have indicated the incidence of thyroid cancer in patients with thyromegaly to be highly variable. It has been reported in from 5 to 38% in surgical specimens.[12,15,18,21,25] Demographic factors do not completely explain these discrepant figures.[16] Differing criteria for selection of patients for operation is a more important factor.

There is fairly good concensus concerning the management of a patient with a thyroid nodule which is probably carcinoma. More challenging is the evaluation and appropriate treatment of the patient with an asymptomatic solitary nodule or dominant mass in the thyroid which probably is not cancer. The extremes of management vary from suppressive therapy of all nodules to their surgical removal. Since physical findings of benign and malignant thyroid disorders are not distinctive, a variety of criteria have emerged which are used in an effort to distinguish between them. One of the earlier and more useful methods is to determine the functional status of a nodule or dominant mass as measured by its ability to concentrate radioiodide. There are, however, distinct limitations of the ability of scans to appraise accurately the intrinsic radionuclide content of a thyroid nodule. Therefore, scans have been considered by some to be of little discriminating value.[19,22] Other methods which have been developed to differentiate between benign and malignant nodules include scanning with ^{75}Selenomethionine,[27] B-mode ultrasonography,[1,23] thermography,[7] needle biopsy,[10,11,29] a trial of suppressive therapy,[3,12,17] and serum human thyroglobulin levels.[28]

During the past several years we have developed a decision matrix, for evaluating patients with a dominant thyroid mass. The objective was to provide an alternative to excision of all thyroid nodules. This study was designed to determine the effectiveness of this approach in selecting patients for operation with the highest risk of thyroid cancer.

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TABLE 1. *Sex and Age of 222 Patients With Solitary Nodules (Dominant Masses) in the Thyroid Gland With a Clinical Diagnosis (No Operation) and a Pathological Diagnosis (Based on an Open Operation)*

			Sex				Age			
			Female		Male		<41		>40	
	#	%	#	%	#	%	#	%	#	%
Clinical Diagnosis										
Cyst	8	5.1	8	100.0	0	00.0	4	50.0	4	50.0
Thyroiditis	8	5.1	7	87.5	1	12.5	5	62.5	3	37.5
Nodular Goiter	140	89.7	122	87.1	18	12.9	69	49.3	71	50.7
Total	156	100.0	137	87.8	19	12.2	78	50.0	78	50.0
Pathological Diagnosis										
Cyst	4	6.1	3	75.0	1	25.0	2	50.0	2	50.0
Thyroiditis	4	6.1	4	100.0	0	00.0	1	25.0	3	75.0
Nodular Goiter	31	47.0	27	87.1	4	12.9	12	38.7	19	61.3
Adenoma	8	12.1	8	100.0	0	00.0	8	100.0	0	00.0
Cancer	19	28.8	14	73.7	5	26.3	8	42.1	11	57.9
Total	66	100.0	56	84.8	10	15.2	31	47.0	35	53.0

Materials and Methods

Admission of patients to the study was based upon a request for a thyroid scan to evaluate an asymmetrical enlargement of the thyroid gland. Two hundred and twenty-two patients seen from January 1, 1971 through March 1, 1975 provided the material for the study. On the basis of the clinical findings, all lesions were categorized as solitary nodules (dominant masses), multinodular or diffuse goiters. All the thyroid scans were carried out using ^{125}I or ^{99m}Tc and interpreted by one of us (ES). Scans were made with a 3″ × 2″ NaI (TL) detector (Picker Magnascanner). For ^{99m}Tc thyroid studies the procedure was to use a scan speed of 60 cm/min for a thyroid count rate in the range of 20,000 to 50,000 cpm and a scan speed of 120 cm/min for a thyroid count rate of 50,000 to 100,000 cpm. ^{125}I thyroid scans typically had a count rate over the thyroid on the order of 2,000 cpm and a scan speed of 30 cm/min was used. In all cases the step size was 0.15 cm and a low energy collimator with 73 holes, 3″ focal depth was used.

Most patients with hyperfunctioning nodules were excluded from further evaluation. Patients with thyroiditis were also excluded except for those who were operated upon because of a high index of suspicion of cancer. Patients who proved to have a multinodular goiter were also excluded unless there was a dominant mass or nodule. Non, hypo, or normally functioning nodules were further appraised by B-mode ultrasonography. A Unirad Sonograph I diagnostic recorder with a 2.25 mega hertz transducer was used. The results were recorded on Polaroid film from an oscilloscope screen. Solid and cystic masses were differentiated. The latter were categorized as being either pure or mixed with a solid component. Pure cystic lesions were managed by aspiration with histological examination of the aspirate. These patients were followed unless there was a residual mass or immediate recurrence of the cyst. Hypo or normally functioning solid lesions, presumed to be a manifestation of a nodular goiter because of some uptake of radionuclide,[13] were managed by suppressive therapy for a minimum of 6 months. This therapy consisted of: A) 75 to 100 mcg of triiodothyronine daily with monitoring of TSH suppression by the fall in the serum thyroxine to hypothyroid levels, or B) 0.2.–0.3 mg of thyroxine with monitoring by measuring serum TSH levels. Individuals having complete regression of their nodules were followed. When there was no or incomplete regression surgical excision was advised.

Nonfunctioning solid lesions were further evaluated by $^{75}Selenomethionine$ scanning. When there was selective concentration surgical excision of the lesion was advised. When there was no selective concentration of this isotope suppressive therapy was commenced as outlined above. Needle biopsy was done in selected patients to confirm the clinical diagnosis of thyroiditis or in patients with a dominant nodule in whom a trial of suppressive therapy was considered inadvisable because of age or other factors indicating poor risk or limited life expectancy.

The differences between groups of patients were examined for statistical significance using Student t test and Chi Square method. Only those differences which were found to be significant are indicated.

In Table 1 are recorded diagnoses, sex and age of the 222 patients providing the clinical material for this investigation. The basis for inclusion in the study was the presence of a dominant mass detected on physical examination of the thyroid gland. The clinical diagnoses were made on the basis of the history, physical findings, radionuclide scans, ultrasonography and the response to suppressive therapy. The clinical diagnosis group of patients with thyroiditis includes 4 in whom the diagnosis was confirmed by needle biopsy. The pathologic diagnoses

TABLE 2. *Interpretation of ^{125}I-^{99m}Tc Scans of 222 Patients With Solitary Nodules (Dominant Masses) in the Thyroid Gland With a Clinical Diagnosis (No Operation) and a Pathological Diagnosis (Operation)*

		No Function		Hypo-function		Normal		Hyper-function		Other	
	#	#	%	#	%	#	%	#	%	#	%
Clinical Diagnosis											
Cyst	8	5	62.5	3	37.5	0	00.0	0	00.0	0	00.0
Thyroiditis	8	1	12.5	1	12.5	0	00.0	0	00.0	6	75.0
Nodular Goiter	140	11	7.9	39	27.9	26	18.6	21	15.0	43	30.7
Total	156	17	10.9	43	27.6	26	16.6	21	13.5	49	31.4
Pathological Diagnosis											
Cyst	4	0	00.0	2	50.0	2	50.0	0	00.0	0	00.0
Thyroiditis	4	1	25.0	1	25.0	0	00.0	2	50.0	0	00.0
Nodular Goiter	31	2	6.5	13	41.9	1	3.2	5	16.1	10	32.3
Adenoma	8	4	50.0	3	37.5	0	00.0	1	12.5	0	00.0
Cancer	19	9	47.4	7	36.8	1	5.3	1	5.3	1	5.3
Total	66	16	24.2	26	39.4	4	6.1	9	13.6	11	16.7

were based upon histologic study of thyroid tissue removed at the time of an *open* operation. The pertinent findings are: 1) 29.7% of the patients were operated upon to identify or exclude thyroid cancer. 2) 18.1% of patients with nodular goiter (clinical plus pathological diagnosis) were operated upon. 3) 28.8% of patients undergoing thyroidectomy for diagnosis had carcinoma and 12.0% had adenomas. All of the cancers proved to be well differentiated. 4) Cysts, thyroiditis, nodular goiter and carcinoma of the thyroid occurred 7.5 times as often in women as in men. The relatively high incidence of cysts and adenomas in women is of interest but not of statistical significance. 5) Nodular goiter and carcinoma were more common above 41 years of age. However, this association to ageing was not striking or statistically significant. Of interest is the observation that all patients with adenomas were younger than 41 years at the time of operation.

The data obtained by radionuclide scanning with ^{125}I or ^{99m}Tc are recorded in Table 2. The pertinent findings are: 1) A nonfunctioning mass occurred in 48.1% of the patients with neoplastic lesions (adenoma or carcinoma) in contrast to 6.5% of the patients with pathologically confirmed nodular goiter ($P < 0.005$). 2) A hypofunctioning mass was observed in 42% of the patients with pathologically confirmed nodular goiter and 37.0% of patients with neoplastic lesions (cancer or adenoma). 3) A hyperfunctioning mass was present in 13.5% of the 222 patients. Nine of these 30 patients were operated upon because of the size of the mass or because of asssociated hyperthyroidism.

Table 3 records information concerning the duration of the thyroid masses prior to diagnosis based upon history and/or physical examination. Twenty-five per cent of the patients with adenoma and 42.1% of the patients with cancer had a history of less than one month. The most significant finding is that patients with clinical and pathological diagnoses of nodular goiter had a relatively long history.

Table 4 records the results of the ^{75}Selenomethionine scans which were done in 94 patients. Of the patients with adenomas and cancer 47.6% had selective uptake of this radionuclide in the mass compared with 14.3% of patients with nodular goiter upon whom an operation

TABLE 3. *Duration of Solitary Nodule (Dominant Mass) in 222 Patients With Solitary Nodules (Dominant Masses) in the Thyroid Gland With a Clinical Diagnosis (No Operation) and a Pathological Diagnosis (Operation)*

		1 Month		2–3 Months		4–12 Months		1 Year	
	#	#	%	#	%	#	%	#	%
Clinical Diagnosis									
Cyst	8	4	50.0	2	25.0	1	12.5	1	12.5
Thyroiditis	8	4	50.0	2	25.0	1	12.5	1	12.5
Nodular Goiter	140	78	55.7	11	7.9	14	10.0	37	26.4
Total	156	86	55.1	15	9.6	16	10.3	39	25.0
Pathological Diagnosis									
Cyst	4	1	25.0	2	50.0	1	25.0	0	00.0
Thyroiditis	4	0	00.0	2	50.0	1	25.0	1	25.0
Nodular Goiter	31	9	29.0	1	3.2	4	12.9	17	54.8
Adenoma	8	6	75.0	0	00.0	0	00.0	2	25.0
Cancer	19	8	42.1	6	31.6	3	15.8	2	10.5
Total	66	24	36.4	11	16.7	9	13.6	22	33.3

TABLE 4. *^{75}Selenomethionine Scans in 94 Patients With Solitary Nodules (Dominant Masses) in the Thyroiud Gland With a Clinical Diagnosis (No Operation) and a Pathological Diagnosis (Operation)*

	Selective uptake	Diffuse uptake		No selective uptake		
	#	#	%	#	%	#	%
Clinical Diagnosis							
Cyst	2	0	00.0	0	00.0	2	100.0
Thyroiditis	1	1	100.0	0	00.0	0	00.0
Nodular Goiter	44	10	22.7	1	2.3	33	75.0
Total	47	11	23.4	1	2.1	35	74.5
Pathological Diagnosis							
Cyst	3	0	00.0	2	66.7	1	33.3
Thyroiditis	2	0	00.0	2	100.0	0	00.0
Nodular Goiter	21	3	14.3	0	00.0	18	85.7
Adenoma	4	2	50.0	0	00.0	2	50.0
Cancer	17	8	47.1	1	5.9	8	47.1
Total	47	13	27.7	5	10.6	29	61.7

was performed ($P < 0.05$). A localized uptake in 22.7% of the patients with clinically diagnosed nodular goiter suggested that other findings (history, physical, ^{125}I, ^{99m}Tc and ultrasonography) placed these patients in a low risk group.

Table 5 records the results of ultrasonography performed in 62 patients. Seven of the 8 patients with a diagnosis of a cyst had an echo-free mass. Findings consistent with a cyst were observed in one patient with an adenoma and in one patient with cancer. The latter patient had a cyst and a separate *occult* solid carcinoma. All 35 patients with a diagnosis of nodular goiter had a solid lesion as indicated by the ultrasonograms.

Table 6 compares the size of the dominant mass on physical examination with the findings on thyroid scan. In about one-third of the masses regarded as solitary on physical examination, the scans indicated a diffuse uptake of radionuclide. The physical findings indicated a larger lesion in adenomas whereas scan findings, a larger lesion in carcinomas.

Table 7 depicts the results of thyroid suppression in 65 patients (49 with a clinical and 16 with a pathologic diagnosis). This approach was most useful in identifying patients with nodular goiter and thyroiditis. Nine patients (presumed nodular goiter) had complete regression. This represents 20.9% of patients with a clinical diagnosis of nodular goiter and 17.6% of all patients with a diagnosis of nodular goiter. Three patients who did not respond to suppressive therapy proved to have adenoma and two patients had carcinoma. Neither of the latter patients had evidence of metastatic disease.

Discussion

Thirty years have passed since Cole's classic paper documenting the relatively high incidence of thyroid cancer in euthyroid patients with solitary or dominant masses in their thyroid gland. During this period there has been an increase in the clinical and autopsy incidence of this neoplasm.[5] When special techniques are used to evaluate the thyroid gland at necropsy an incidence of 5.7% has been reported.[24] Most of these cancers had little clinical significance and few were responsible for the death of the patient. The literature indicates an overall increasing incidence of thyroid cancer and an increasing incidence of cancer in patients operated upon for nodular goiter. This probably reflects better patient selection achieved by using a variety of criteria, both specified and unspecified.

Initially the solitary nodule constituted the primary indication for operation yielding an incidence of cancer in 4 to 25% of patients.[3,8,12,17] Currently the factors most commonly used to discriminate benign from malignant lesions include the age and sex of the patient, functional activity of the nodule, studies with B-mode ultrasonography and the results of suppressive therapy. These criteria have been used singly or in combination. With the ability to differentiate cysts, hyperfunctioning nodules, thyroiditis and TSH dependent nodular goiter, the number of operations for non-neoplastic lesions has declined with a higher yield of cancer.[3,17] Few authors, however, have improved on the results of Cole *et al.* who without the present methods of evaluation found an incidence of cancer in 11% of patients with multinodular goiter and 24% with solitary nodules.[8]

Radioiodide scanning for evaluation of patients with a nodular goiter was first reported by Dobyns in 1949.[14] He and Cope reported a higher incidence of cancer in patients with a low radioiodide content in a thyroid mass.[9] Others have reported similar findings.[20] The limitations of the scanning techniques in determining the intrinsic content of radioisotope in a nodule are well documented.[6] It is particularly difficult to appraise small nodules located deep in thyroid parenchyma. This is well illustrated in

TABLE 5. *Ultrasonograms of 62 Patients With Solitary Nodules (Dominant Masses) in the Thyroid Gland With a Clinical Diagnosis (No Operation) and a Pathological Diagnosis (Operation)*

		Cyst		Solid	
	#	#	%	#	%
Clinical Diagnosis					
Cyst	7	7	100.0	0	00.0
Thyroiditis	1	0	00.0	1	100.0
Nodular Goiter	24	0	00.0	24	100.0
Total	32	7	21.9	25	78.1
Pathological Diagnosis					
Cyst	1	0	00.0	1	100.0
Thyroiditis	1	0	00.0	1	100.0
Nodular Goiter	11	0	00.0	11	100.0
Adenoma	6	1	16.7	5	83.3
Cancer	11	1*	9.1	10	90.9
Total	30	2	6.7	28	93.3

TABLE 6. *Size of Solitary Nodule (Dominant Mass) as Determined by Physical Examination and ^{125}I or ^{99m}Tc Scans in Patients With Solitary Nodules (Dominant Masses) in the Thyroid Gland With a Clinical Diagnosis (No Operation) and a Pathological Diagnosis (Operation)*

	<2 Cm.				>2 Cm.			
	Exam		Scan		Exam		Scan	
	#	%	#	%	#	%	#	%
Clinical Diagnosis								
Cyst	4	57.1	4	80.0	3	42.9	1	20.0
Thyroiditis	2	66.7	1	100.0	1	33.3	0	00.0
Nodular Goiter	62	67.4	34	50.0	30	32.6	34	50.0
Total	68	66.7	39	52.7	34	33.3	35	47.3
Pathological Diagnosis								
Cyst	0	00.0	1	33.3	4	100.0	2	66.7
Thyroiditis	2	100.0	1	50.0	0	00.0	1	50.0
Nodular Goiter	9	39.1	17	68.0	14	60.9	8	32.0
Adenoma	3	37.5	4	50.0	5	62.5	4	50.0
Cancer	7	46.7	7	38.9	8	53.3	11	61.1
Total	21	40.4	30	52.6	31	59.6	27	47.4

the findings of Kendall and Condon who observed a 20.9% incidence of thyroid cancer in 91 patients.[19] The incidence of hypofunction was 80% in benign and 85% in malignant nodules. Scans were considered to be of no discriminating value. These investigators, however, did not differentiate between non and hypofunctioning masses or relate function to mass size. Nelson and Gorman indicate that radioisotope scanning is not helpful in evaluating cancer which is not palpable or masses less than 2 cm in diameter.[22] Oblique scanning techniques have recently been introduced to overcome the problem of the small nodule located within normal thyroid parenchyma.[2]

Our findings suggest that it is important to differentiate between nonfunctioning and hypofunctioning lesions. Dominant masses with no uptake of ^{125}I or ^{99m}Tc had about a 50% chance of being adenoma or carcinoma. When there was hypofunction the probability of adenoma or carcinoma was about the same as that of nodular goiter. In contrast, when the scan was interpreted as normal, hyperactive or other, the probability of either adenoma or carcinoma was greatly reduced.

In this study three historical factors were evaluated: duration of mass, sex and age of patient. Duration of the dominant mass and sex of the patient appeared to have some usefulness in discriminating between a benign and malignant lesion. Patients with adenoma and carcinoma had a shorter history of a mass than those with nodular goiter. The incidence of cancer in dominant masses in males (17.2%) was higher than comparable masses in females (7.2%). In view of the increasing incidence of nodular goiter with age the equal distribution of cancer and nodular goiter above and below 40 years of age was somewhat surprising. This may be a reflection of the average age at diagnosis of well differentiated thyroid cancer (45.7 years)[4] and the unconscious exclusion of older patients with nodular goiter from this type of evaluation. The higher incidence of nodular goiter in older people suggests that after 40 years of age there should be additional findings before such patients are considered at risk from thyroid cancer.[3]

Ultrasonography has been a reliable method to detect cysts in the thyroid gland. Aspiration, combined with

TABLE 7. *Response to Suppressive Therapy in 65 Patients With Solitary Nodules (Dominant Masses) in the Thyroid Gland with a Clinical Diagnosis (No Operation) and a Pathological Diagnosis (Operation)*

		None		Partial		Complete		Progression	
	#	#	%	#	%	#	%	#	%
Clinical Diagnosis									
Cyst	0	0	00.0	0	00.0	0	00.0	0	00.0
Thyroiditis	6	4	66.7	2	33.3	0	00.0	0	00.0
Nodular Goiter	43	23	53.5	9	20.9	9	20.9	2	4.7
Total	49	27	55.1	11	22.5	9	18.4	2	4.1
Pathological Diagnosis									
Cyst	1	1	100.0	0	00.0	0	00.0	0	00.0
Thyroiditis	2	2	100.0	0	00.0	0	00.0	0	00.0
Nodular Goiter	8	6	75.0	0	00.0	0	00.0	2	25.0
Adenoma	3	3	100.0	0	00.0	0	00.0	0	00.0
Cancer	2	2	100.0	0	00.0	0	00.0	0	00.0
Total	16	14	87.5	0	00.0	0	00.0	2	12.5

histologic study of the fluid content, eliminates the need for an operation in most of these patients. In the development of refinements in the method of B-mode ultrasonography cystic areas as small as 1–2 mm may be detected. The accuracy of this approach is estimated to be greater than 90%.[23] The incidence of cysts in patients with a "solitary thyroid nodule" has been reported to be from 7 to 25%.[1,2,23] Data are still being accumulated with this new noninvasive technique. It is too early to give precise figures as to the incidence of cancer in cystic lesions. In view of the observation that most cysts represent degenerative changes in nodular goiters the incidence of cancer is probably quite low. However, some well differentiated carcinomas may have a cystic component and may present as a "mixed" cyst.[1]

Our findings indicate that when there is an increased uptake of ^{75}Selenomethionine in a dominant nodule there is about a 50% incidence of either adenoma or carcinoma. The increased uptake noted with chronic thyroiditis is usually diffuse in contrast to the localized uptake in neoplasms. Our overall experience indicates approximately ⅓ of patients with neoplasms will have a false negative scan.

Hill called attention to the value of suppressive therapy as a discriminating factor in differentiating benign from malignant thyroid lesions.[17] He observed a 4% incidence of thyroid cancer (683 patients; 1950–1960) when most patients with thyroid nodules were operated upon. During 1960–63 suppressive therapy was used to help select patients for operation. During this time the incidence of thyroid cancer in 159 patients was 12.6%. Since 1964 suppressive therapy has been used as a routine except in patients under 16, over 65 with a new nodule, who were symptomatic, had prior irradiation or obvious metastases. In 167 patients using these criteria the incidence of cancer was 36.5%. Unfortunately, Hill did not specify the number of patients on suppressive therapy who had regression of their thyroid masses or the incidence of regression in cold or hypofunctioning masses. In our studies some degree of regression occurred in approximately ⅓ of patients with nodular goiter on suppressive therapy. No regression occurred in patients with an operative finding of adenoma or carcinoma.

Brooks used a number of criteria to improve the selectivity of patients undergoing operation for thyroid cancer.[3] He reported a cancer incidence of 9% in 502 patients operated upon between 1940 and 1962. Of patients without cancer, 60% had nodular goiter, 26% adenoma and 5% thyroiditis. He restricted operations to: A) males of all ages not responding to suppressive therapy; B) females below the age of 40 with cold nodules not responding to suppressive therapy; and C) females over 40 if there was an increase in nodule size on suppressive therapy, or in whom a needle biopsy was positive in a large or clinically suspicious nodule. Using such criteria, there was an increase in the overall yield of thyroid cancer to 19% in 202 patients so managed. The remaining patients had a 42% incidence of nodular goiter, 38% incidence of adenoma and 1% incidence of thyroiditis. Brooks points out that less than 1% of patients had regression of their nodules on suppressive therapy. Thus, other criteria for selection of patients for operation must have been used.

The variability in the recorded incidence of cancer in solitary or dominant thyroid masses and in nontoxic nodular goiters continues to be substantial. It is evident that in absence of histologic proof there is no one criterion, that is of unequivocal predictive value in establishing the diagnosis. There is evidence that the application of the methods described in this report can produce a more accurate clinical diagnosis and thus eliminate a certain number of unnecessary operations in patients with benign thyroid disorders. Thyroiditis, cysts and hyperfunctioning nodules can usually be excluded by clinical findings supplemented by laboratory studies. Clinically adenoma has the same characteristics as well differentiated cancer. Differentiation between these two entities can only be made by histologic study. Basically the problem is to distinguish between nodular goiter and benign and malignant thyroid tumors. Thirty per cent of the 222 patients with dominant masses included in this study ultimately were operated upon. This is a relatively low operation rate in patients with dominant thyroid masses. Of the patients operated upon, 40% had either a benign or malignant neoplasm with well differentiated cancer being present in 29%. In over two-thirds of these patients the diagnosis was made on clinical data and was not substantiated by histologic findings. Were pathological findings available, some of these patients might fall into other categories.

Conclusions

The most discriminating criteria for the differentiation of thyroid cancer from benign lesions were: 1) *Sex*: 17.2% of all males in the study and 50% of those operated upon proved to have thyroid cancer. This was true of only 7.3% of all females and 25% of those operated upon. 2) *Functional status via ^{125}I or ^{99m}Tc scan*: Nonfunction was present in 47.4% of patient with cancer compared with 7.6% of patients with adenomatous goiter. Hypofunction was not helpful in discriminating between cancer and adenomatous goiter; however, the incidence of cancer with hypofunction was about 10 fold that in patients with scans interpreted as showing normal, other or hyperfunction. 3) *^{75}Selenomethionine scan*: 47.0% of patients with cancer proved to have a selective concentration of this radionuclide compared with 20.0% of patients with adeno-

matous goiter. 4) *Ultrasonography* was useful in differentiating solid from cystic lesions. 5) *Regression on suppressive therapy* was useful in identifying TSH dependent nodular goiter.

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Discussion

Dr. Ernest A. Gould (Washington, D.C.): Our interest in the problem has worked out much the same way, except that we are not as rigid in our criteria. We get somewhat edgy about our internists and endocrinologists procrastinating with these people with unilateral masses.

All too often, we feel that even though the mass is unilateral, the internist waits a little too long on the patient who has the solid tumor. If the surgeon had seen the patient earlier, he probably would have made a quicker decision to bring the patient to the operating room. We find that even where there is complete regression of the dominant unilateral lobe, with a remaining solitary nodule, 30% of them will turn out to be multinodular goiter. On the other hand, there is a 5% incidence of malignant tumors in this group.

With all of our sophisticated methods today, the solitary unilateral nodule deserves surgical attention; and although we may reduce some of the incidence of surgery in this unique group, surgical therapy is the treatment of choice.

Dr. Joseph A. Buckwalter: (Closing discussion) Because of the limited time for his presentation, Dr. Thomas was unable to discuss in depth our method of disposition of patients with thyroid nodules. He presented the guidelines which we use which are modified as indicated by the findings unique to each patient.

We have seen no patients with regression on suppressive therapy who ultimately were found to have cancer.

In support of the use of suppressive therapy, it should be noted that all patients with cancer in our study had the well differentiated variety. Almost always the clinical characteristics of poorly differentiated carcinoma are sufficiently typical to permit a correct diagnosis prior to biopsy or operation. Because of the indolent, long course of patients with well differentiated carcinoma, a more conservative approach is justified.

(Slide) Another clinical feature studied was the time that the mass had been present prior to examination. Patients with adenoma and carcinoma had a known mass or nodule in their thyroid for a shorter period of time than those with nodular goiter.

During the four years, three months of the study, we saw a total of 60 patients with carcinoma of the thyroid. Thus, the study included one-third of the patients seen with well differentiated thyroid.