BENIGN VS MALIGNANT THYROID NODULES:SONOGRAPHIC EVALUATION

R. Supartmeta[1], P. Pekanan[1],
J. Chatchavala[1], S. Hiranpat[1]

Abstract.

Retrospective review of the ultrasonographic examination of the 119 thyroid nodules was performed. All cases had surgically and pathologically proved. The study included 64 benign and 53 malignant nodules. Definitive findings for benign nodules were purely cystic and predominantly cystic mixded nodules and for malignant nodules were extrathyroidal muscular invastion, vascular encasement and cervical lymphadenopathy. The suggestive findings for malignant nodules were hypoechoic solid pattern and rim calcification. The inconclusive findings were the features of the margin of the nodules, hetero or homogeneity of the tissue, iso and hyperechoic solid nodules.

Key words: Thyroid nodules, Ultrasonography

Introduction

Nodular thyroid disease is a relatively common disorder. In the patient with nodular thyroid disease the clinical challenge is to distinguish the malignant nodules from the benign ones and to identify those patients for whom surgical excision is indicated. The ability of high-resolution sonography to depict small, nonpalpable thyroid nodules is unsurpassed by any other imaging method. Solid nodules as small as 3 mm and cystic nodules as small as 2 mm can be visualized sonograhically. No single sonographic criterion can reliably differentiate all benign thyroid nodules from malignant nodules. We, therefore, reviewed the sonographic thyroid nodules examinations, to evaluate which sonographic characters could help to differentiate benign from malignant nodules.

Materials and Methods

A retrospective study of the thyroid nodules by ultrasonography was performed during the year 1986 to 1992 in Ramathibodi Hospital. Only the nodules that were surgically removed and pathologically examined were included. There were 64 benign nodules and 53 malignant nodules. The sonographic examination of the neck was performed with the patient in a supine position. The patient's neck was hyperextended. High frequency 7.5 MHz transducer was used. The sonographic features of the thyroid nodules, including margination, the presence of the hyperechoic foci or calcification, the echo pattern and extrathyroidal invasion or cervical lymphadenopathy were analyzed.

[1]Department of Radiology, Faculty of Medicine,
Ramathibodi Hospital, Rama 6 Street, Bangkok 10400, Thailand

Results

Table 1. Pathologic diagnosis of 117 thyroid nodules and number of the nodules for each pathology

Pathologic dx		No. (% of total benign or malignant nodules)
BENIGN:	Nodular goiters	43 (67)
	Adenoma	15 (24)
	Cystadenoma	6 (9)
	Total	64 (100)
MALIGNANT:	Papillary carcinoma	31 (58)
	Follicular carcinoma	13 (25)
	Mixed papillary&follicular CA	7 (13)
	Hüerthle cells tumor	1 (2)
	Medullary carcinoma	1 (2)
	Total	53 (100)

Note: Coexistent multinodularity included 4 cases of multinodular goiter, 1 case of triple nodules of cystadenoma, 2 cases of nodular goiter and papillary carcinoma, 2 cases of multicentric mixed papillary and follicular carcinoma, 5 cases of multicentric papillary carcinoma and one case of multicentric follicular carcinoma.

Table 2. Correlation of the margin of the nodules with the numbers of the benign and malignant nodules

Features of the margin	No. (%) of benign N.	No. (%) of malig. N.
Well defined (± Halo sign)	39 (53%)	34 (46%) Total 73
Ill defined	25 (57%)	19 (43%) Total 44
Note: No. of the benign nodules with halo sign was 19 (30%)		
No. of the malignant nodules with halo sign was 17 (32%)		

Table 3. Presence or absence of hyperechoic foci or calcification in the nodules, correlating with benign and malignancy

Calcification in the nodules	No. (%) of Benign N.	No. (%) of malign. N.
Presence	15 (23)	30 (57)
Absence	49 (77)	23 (43)
Note: Rim calcificatioin was found in 2 follicular carcinoma, 1 mixed papillary follicular carcinoma and 1 adenoma		

Table 4. Correlation of echo pattern with the numbers of benign and malignant nodules

Echo pattern	No.(%) of benign N.	No. (%) of malignant nodules	
Pure cystic nodules	3 (100)	0 (0)	T = 3
Mixed pattern cystic predominant	18 (100)	0 (0)	T = 18
	20 (59)	14 (41)	T = 34
Solid pattern solid predominant	23 (37)	39 (63)	T = 62

Table 5. Homogeneity and heterogeneity of the echo in solid pattern nodules with the number of the benign and malignant nodules

	No. (%) of benign N.	No. (%) of malignant N.	
Homogeneity	3 (43)	4 (57)	T=7
Heterogeneity	20 (36)	35 (64)	T=55

Table 6. Echogenicity of the solid pattern, correlating with the benign and malignancy

Echo pattern	No. (%) of benign N.	No. (%) of Malignant N.	
Hypoechoic	5 (23)	17 (77)	T=22
Iso or hyperechoic	18 (45)	22 (54)	T=40

Table 7. Correlation between the extrathyroid invasion and types of malignant nodules

Extension of lesion	Histology of malignant nodules
Cervical lymphadenopathy alone	Papillary Ca (2 cases)
Invasion of Strap muscles alone	Follicular Ca (2 cases)
	Papillary Ca (1 case)
Invasion of Strap muscles and longus colli muscle	Follicular Ca (1 case)
Invasion of Strap m., longus colli m. encasement of carotid a. and cervical lymphadenopathy	Medullary Ca (1 case)

Note: No benign nodules were associated with extrathyroidal involvement

Discussion

Most thyroid nodules are not true neoplasms of the thyroid gland but are due to cycles of hyperplasia and involution of thyroid lobules that result in fusion of localized colloid-filled follicles and are known as colloid or adenomatous nodules (1). The desscriptive terms adenomatous goiter, nontoxic nodular goiter, and colloid nodular goiter are used interchangeably when multiple nodules such as these are present in an otherwise normal patient (1). Epithelial-lined, simple thyroid cysts are rare pathologically (1). The benign follicular adenoma, unlike a colloid nodule, is a true thyroid neoplasm characterized by complete fibrous encapsulation of the nodule. Adenomas are not believed to have malignant potential (1). The overwhelming majority of thyroid nodules are benign (2,3,4). The relatively small benign nodules in our study was due to medical treatment in many benign nodules. Primary thyroid cancer can occur in several histologic forms. Papillary carcinoma (including the so-called mixed papillary and follicular carcinoma) is the most common form of thyroid cancer, accounting for 75-90% of all cases (5,6). Similar incidence was also shown in our series.

The appearance of the outer margin was not a reliable indicator to differentiate between benign and malignant nodules, agreeable by the opinion of Charboneau et al (1).

Calcification can be detected in 13% of all thyoid nodules, and the location and pattern of calcification has predictive value to distinguish benign from malignant lesions (7). Peripheral or egg-shell like calcification is a reliable feature of a benign nodule but occurs in only a small percentage of benign tumors (1). We had several cases of rim calcification in slightly more number in malignant nodules, probably due to the analysis in our series was done only in the operated nodules and had discarded many benign ones which has not been operated upon. When the internal calcifications are fine and punctate throughout the nodule, papillary cancer is a very likely diagnosis but if they are multiple, large and coarse, the benign noduldes are most likely (1). We have

found hyperechoic foci or calcification only twice in the malignant nodules, in comparison with those shown in benign nodules; however, the pattern of the calcification was not analyzed.

A nodule that has a significant cystic component is usually proved to be a benign colloid nodule or an adenomatous nodule that has undergone central degeneration or hemorrhage. Rarely, thyroid cancer, particulary the papillary variety, may exhibit varying amounts of cystic changes and can appear indentical to a benign degenerated adenoma (8,9). We did not found purely cystic nodules or cystic predominant mixed nodules to be malignant nodules, all were benign nodules. The solid nodules with or without homogeneity of the tissue occured in similar incidence in benign and malignant nodules. The hypoechoic solid nodules occured three times more in malignant nodules than the benign ones. If we considered that the benign nodules occured more than malignant nodules, then statistically, probably more benign nodules contains hypoechoic character (1). The iso or hyperechoic nodules were seen slightly more in malignant nodules, the opposite thing was reported by Solbiati et al (7).

The halo sign was seen equally in benign and malignant nodules in our series. It had been found in the other series in 70% of benign nodules (10) and in 15% of thyroid cancer (7,11). Histologically, it is not known whether this halo represents the capsule of the nodule or compressed adjacent thyroid parenchyma. In some cases, color Doppler flow imaging has shown that the halo is caused by vessels located around the periphery of the nodules. More recently, it has been proposed that a thin, complete peripheral halo is more likely to be seen with a benign nodule, whereas a thick, incomplete halo is more suggestive of malignancy (7). Color Doppler flow imaging has been reported to show increased vascularity with autonomously functioning thyroid adenomas as well as with thyroid carcinomas (12,13)

In conclusion; from our data, the only definitive findings of benign nodules is purely cystic and predominantly cystic mixed lesion and for malignant nodules is extrathyroidal invasion and cervical lymphadenopathy. Internal calcification occurred twice more in malignant nodules whereas hypoechoic solid pattern occurred three times more in malignant nodules. Other features were seen in similar incidence in both benign and malignant thyroid nodules.

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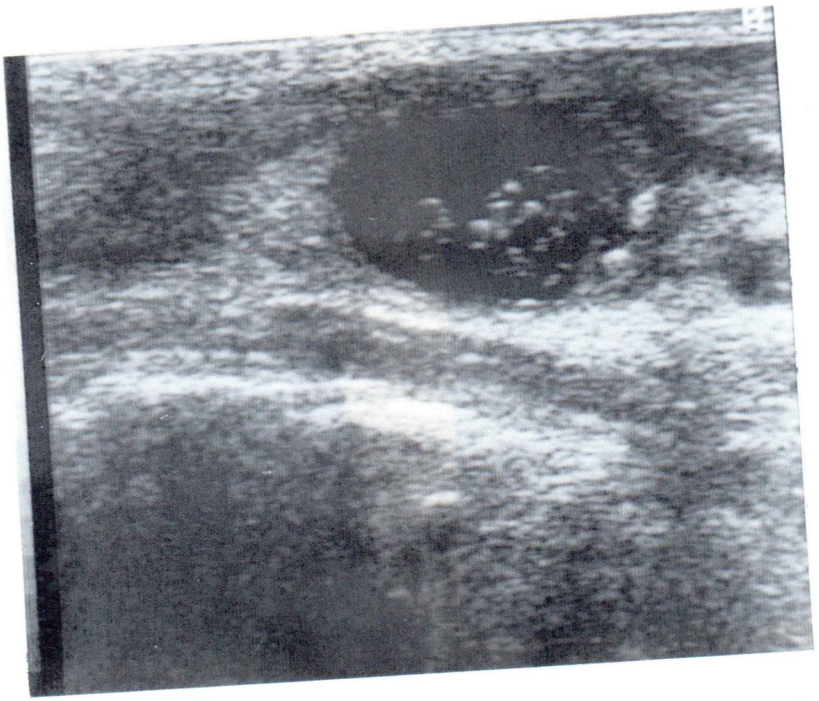


Fig.1 Nodular goiter. Two calcified foci at periphery of the mixed predominant cystic nodule.

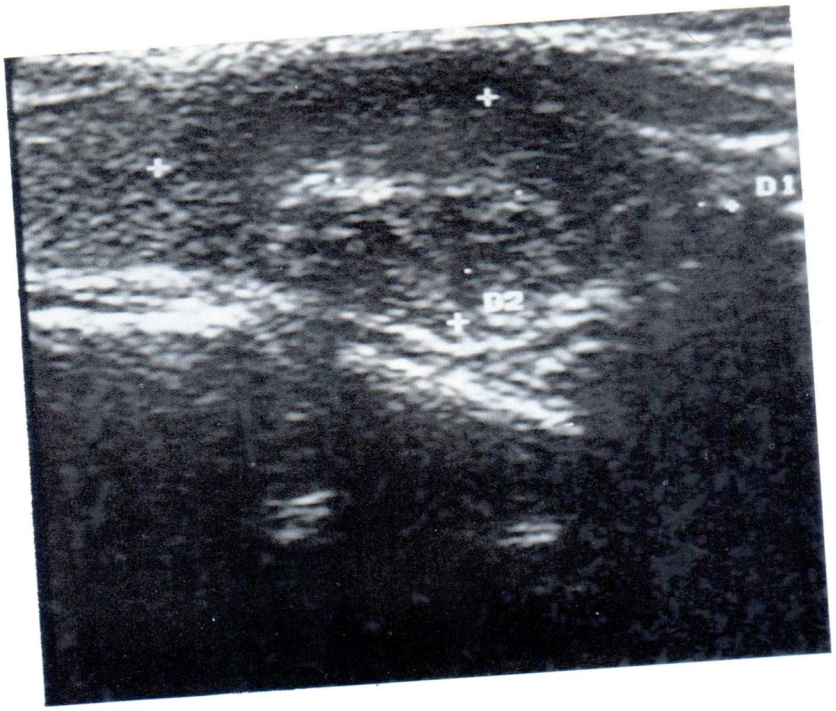


Fig.2 Papillary carcinoma. Calcified or hyperechoic foci in the solid (Hypo + Hyperechoic) nodule

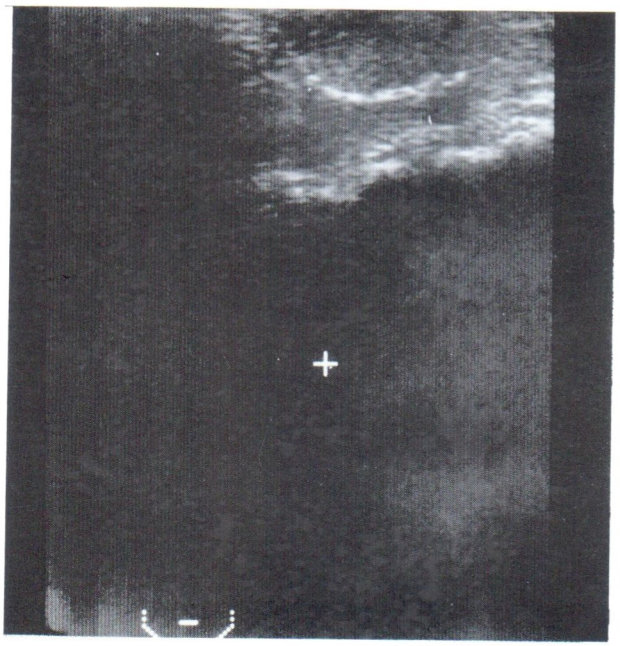
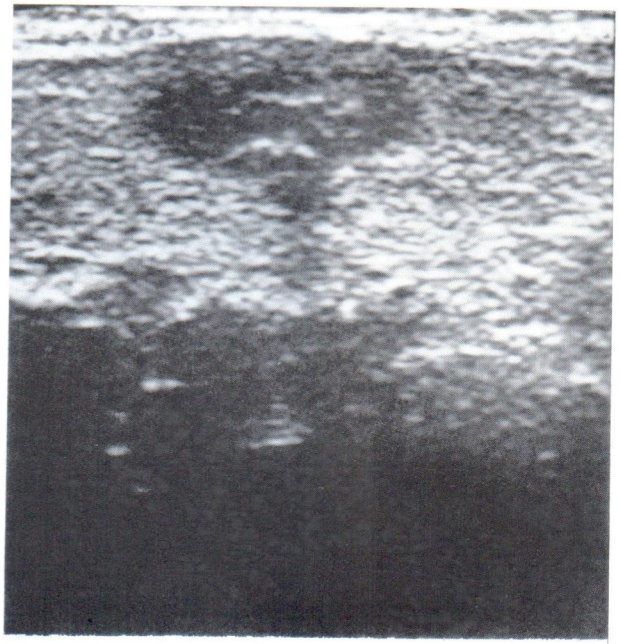


Fig.3 Papillary-folicular carcinoma.
Hypo + hyperechoic nodule with calcified rim.



Follicular carcinoma.
Calcification in low echoic nodule.

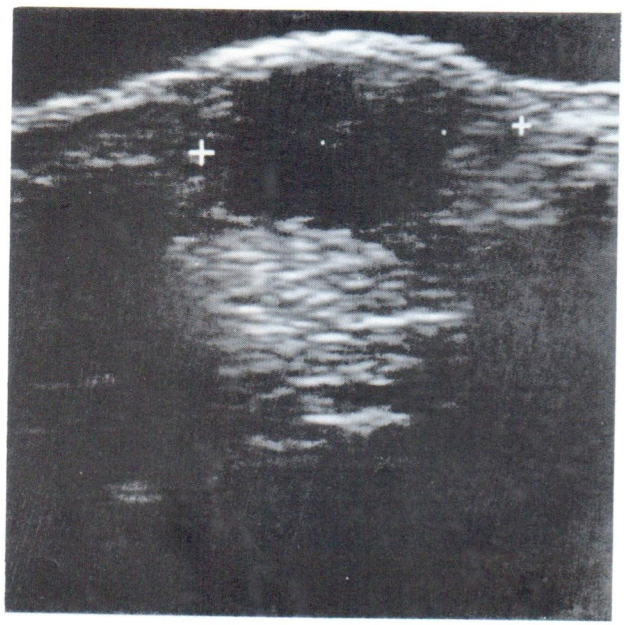


Fig.5 Nodular goiter. Mixed echoic pattern, with cystic predominant nodule.

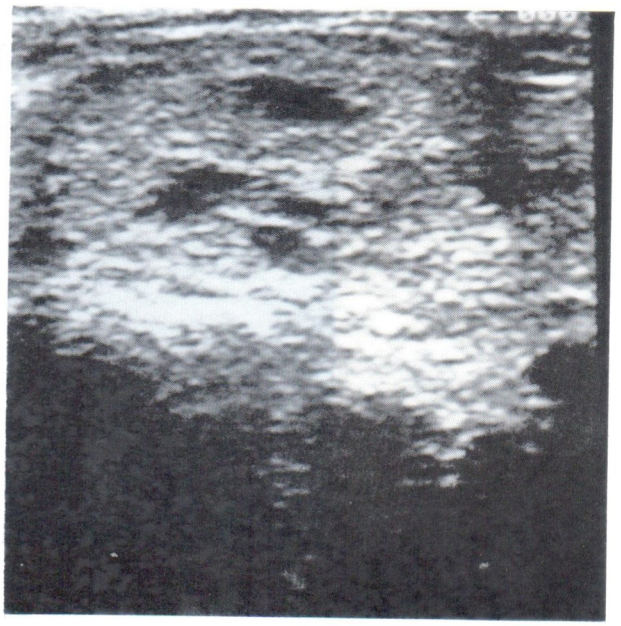


Fig.6 Nodular goiter. Mixed echoic pattern, with solid predominant nodule.

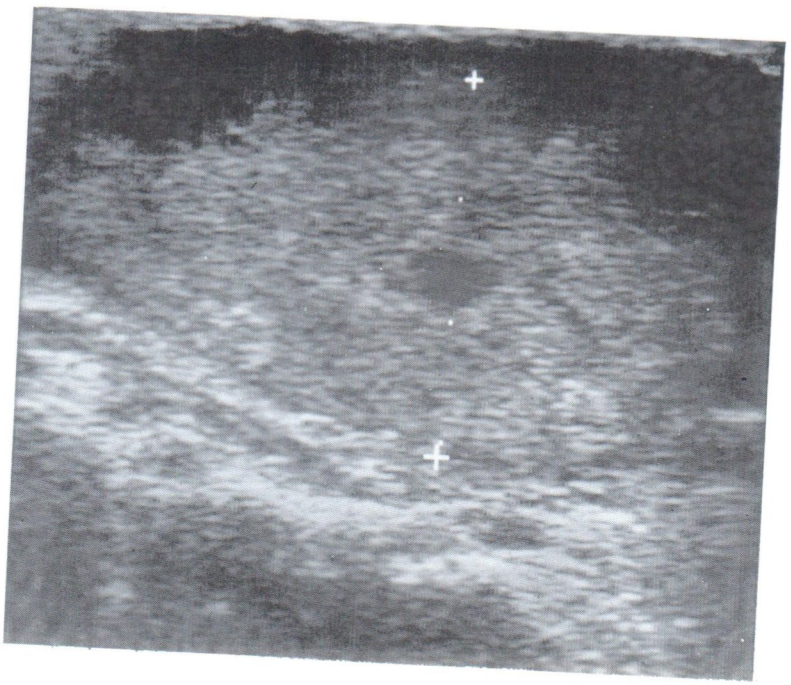


Fig.7 Follicular carcinoma. Mixed echoic pattern, predominantly solid pattern nodule.

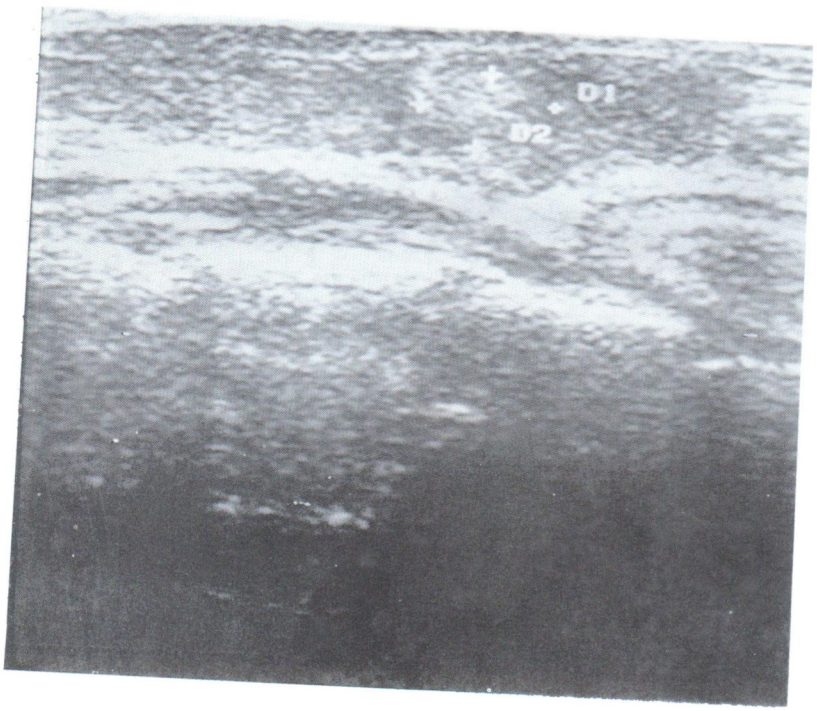


Fig.8 Papillary carcinoma. Hyperechoic solid nodule.

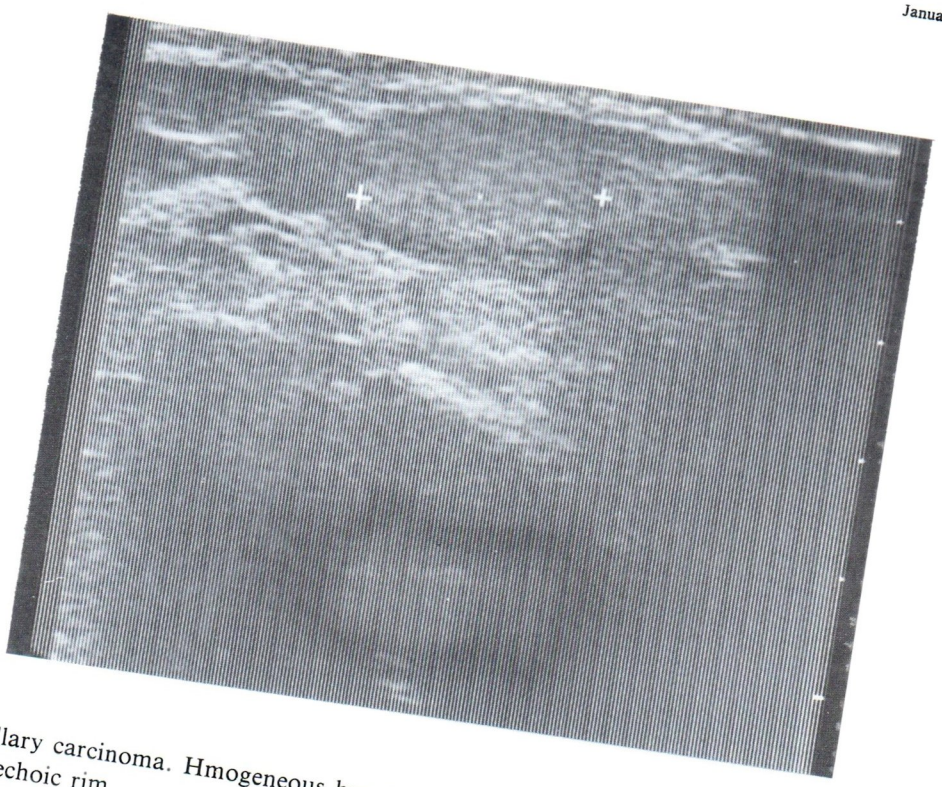


Fig.9 Papillary carcinoma. Hmogeneous hyperechoic nodule with well defined margin and partially hypoechoic rim.

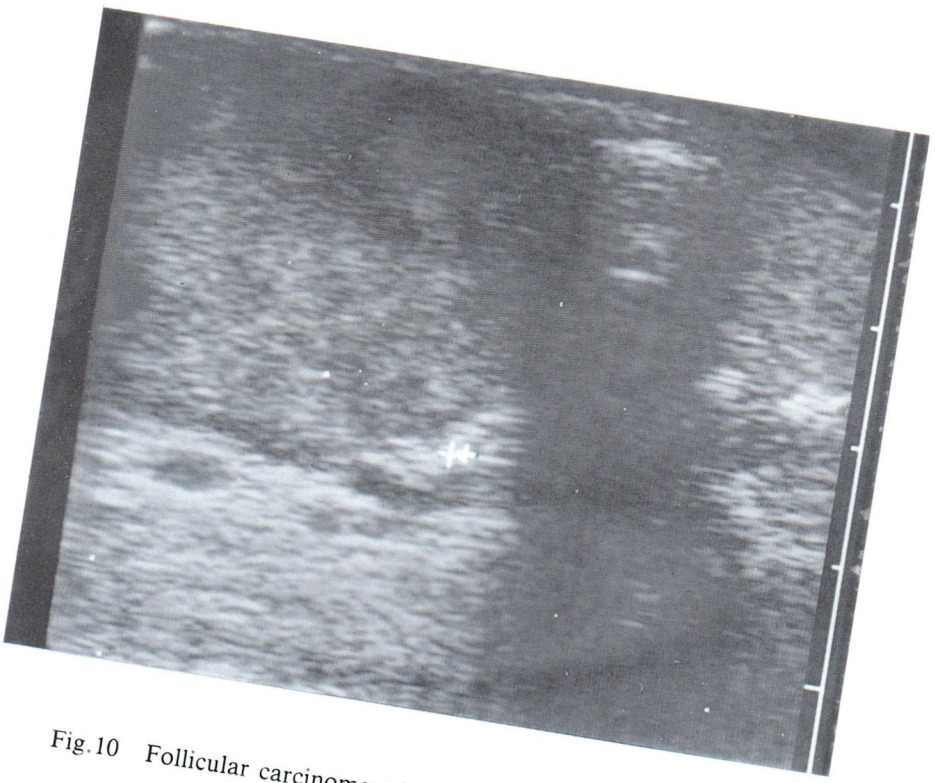


Fig.10 Follicular carcinoma with invasion of the strap muscle.