STRAIN ULTRASOUND ELASTOGRAPHY IN THE DIAGNOSTIC EVALUATION OF THYROID NODULES

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Objectives

Strain elastography (SE) is a relatively new technique that uses ultrasound-based imaging to quantify the extent to which tissues deform with the application of pressure.

The aim of the study was to determine different types of thyroid nodules according to their elasticity and to evaluate the diagnostic accuracy of strain elastography in detection of thyroid cancer.

Materials and Methods

114 thyroid nodules in 84 patients were examined prospectively with conventional B-mode US, color Doppler, strain elastography (SE) and fine needle aspiration biopsy (FNAB). 72 nodules in 50 patients were submitted to surgery and histologically assessed. For final diagnosis we accepted histology in operated cases and cytology for the rest. Study design is presented in Figure 1.
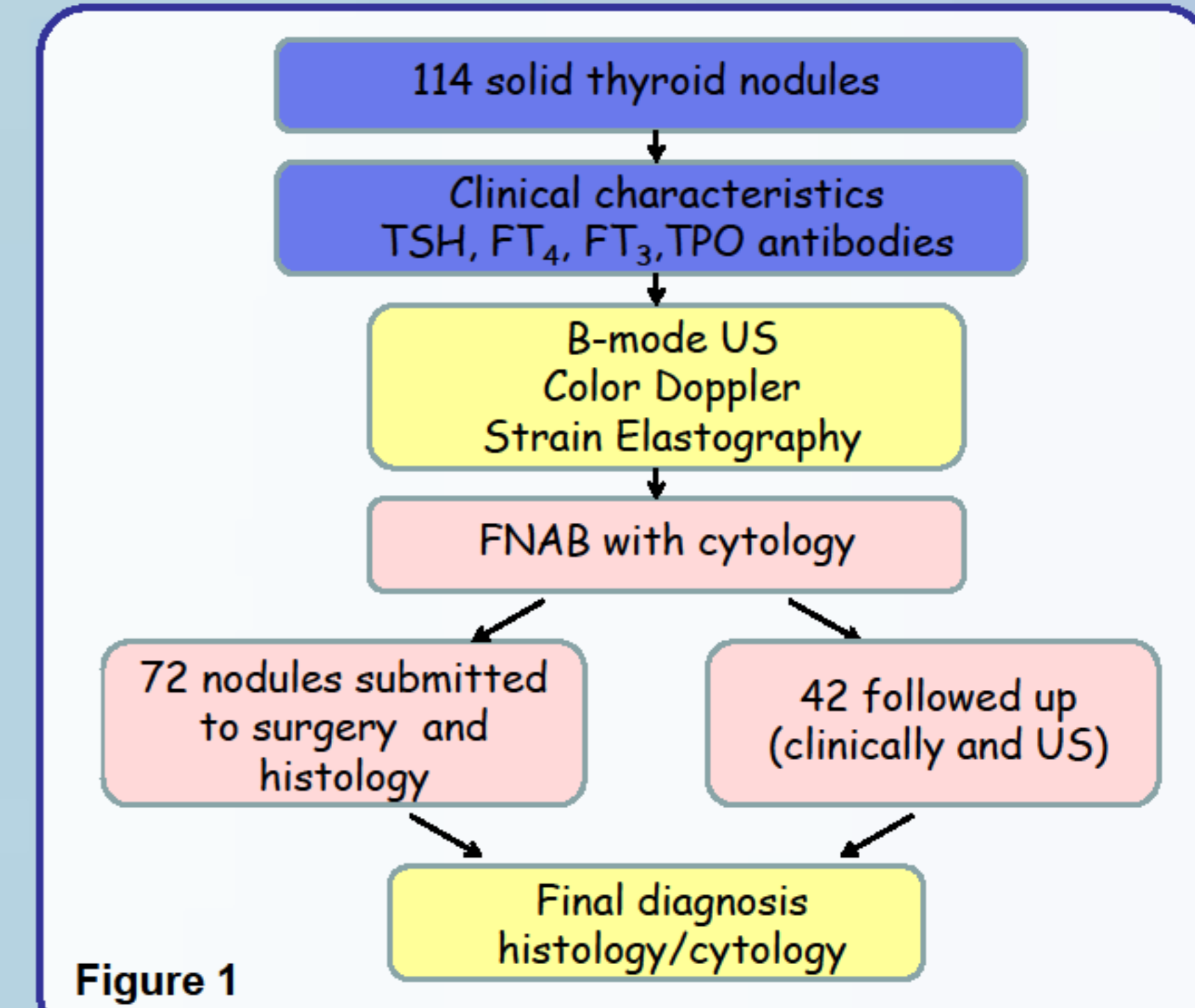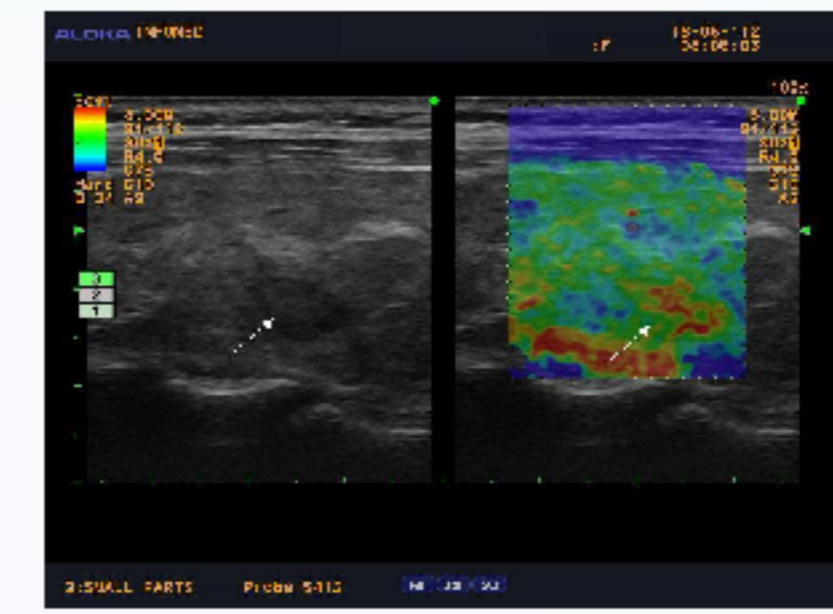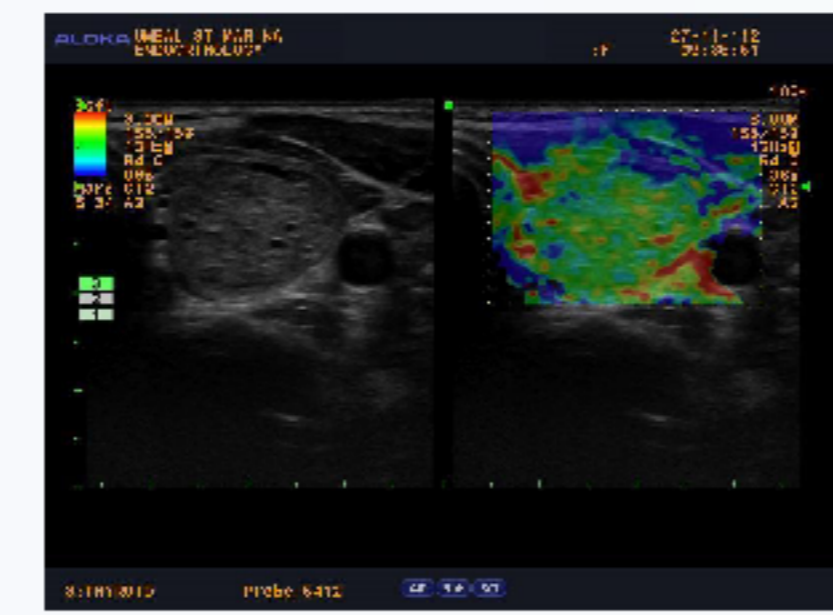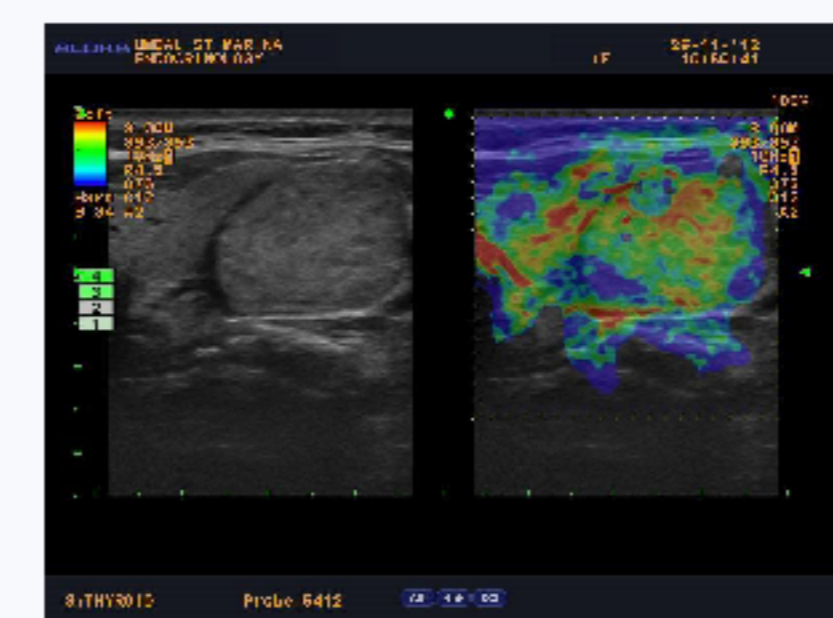

Figure 1

Results

After performing SE, the image was matched to a modified 5 scale scoring system, based on the one of Ueno and Ito. Table 1 summarizes our results. 32,9% of benign and 0% of malignant nodules presented with highly elastic structure - score 1 (p<0,0001). Elasticity in a large area of the nodule (score 2) was present in 34,2% of benign and 5,3% of malignant nodules (p=0,0005). Indeterminate elasticity (score 3) had 26,3% of benign and 18,4% of malignant lesions (p=0,4839). No elasticity (score 4) was determined in 6,6% of benign and in 55,3% of malignant nodules (p<0,0001). Stiffness in nodule and surrounding tissue (score 5) was registered in 21,1% of malignant and none of benign lesions (p<0,0001).

Sensitivity (SN), specificity (SP), positive predictive value (PPV), negative predictive value (NPV) and accuracy were 76,3%; 93,4%; 85,3%; 88,8%; 87,7% for SE; 89,5%; 86,2; 79,1%; 94,4%; 89% for combining B-mode and SE; and 92,1%; 93,4%, 87,5%; 95,9%; 93% for combining B-mode, SE and FNAB, respectively (Table 2).

Elasticity score

Thyroid nodules = 114	Score 1	Score 2	Score 3	Score 4	Score 5
Benign = 76	32,9%	34,2%	26,3%	6,6%	0%
Malignant = 38	0%	5,3%	18,4%	55,3%	21,1%
p-value (Fisher's test)	0,0001	0,0005	0,4839	0,0001	0,0001

Table 1. Elastographic characteristics of thyroid nodules

	SN %	SP %	PPV %	NPP %	Accuracy %
B-mode US (≥ 3 features of malignancy)	68,4	93,4	83,9	85,5	85,1
SE	76,3	93,4	85,3	88,8	87,7
FNAB	90,3	81,1	62,2	96,1	83,5
B-mode + SE	89,5	86,2	79,1	94,4	89,0
B-mode + SE + FNAB	92,1	93,4	87,5	95,9	93

Table 2. Predictive value of B-mode US, SE, FNAB and combinations of methods
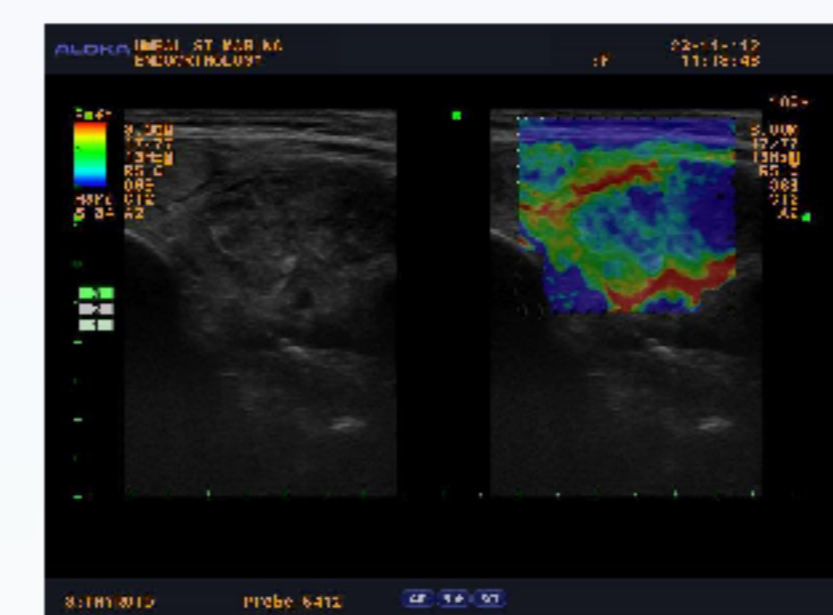

Score 1 Lymphocytic thyroiditis

Score 2 Hyperplastic nodule

Score 3 Follicular adenoma

Score 4 Medullary carcinoma
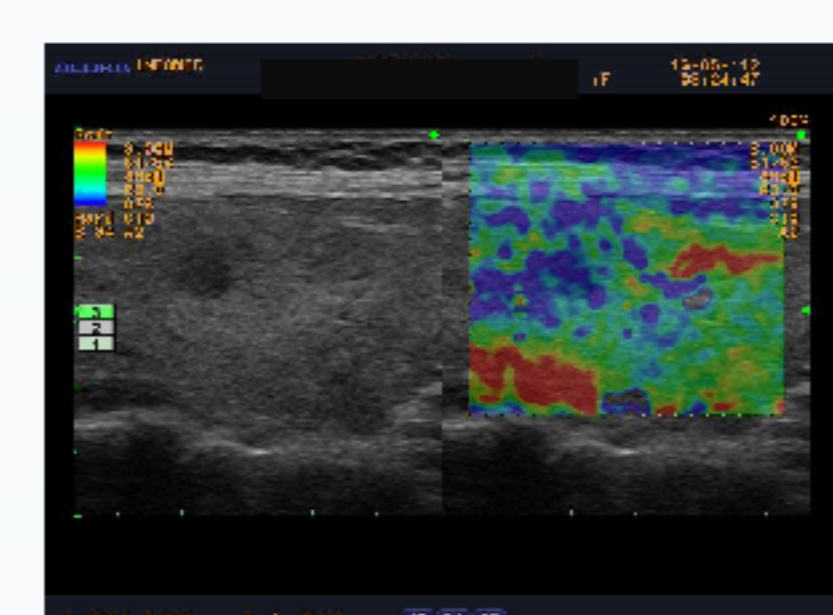
Score 5 Papillary carcinoma

Conclusions

The high specificity und NPP of SE alone or as an adjunct to conventional US suggests that high elasticity (score 1 and 2) is a promising criterion for excluding malignancy and that elastography may limit the indications for FNAB. Combination of three methods has the highest diagnostic accuracy in differentiating malignant from benign nodules and permits the clinician exact selection of patients who would benefit from surgery.

References:

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