

## PARATHYROID ULTRASONOGRAPHY AND FINE-NEEDLE ASPIRATION BIOPSY IN THE DIAGNOSIS OF SECONDARY HYPERPARATHYROIDISM

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### Summary

Parathyroid tumours were sonographically detected in 24 out of 72 uraemic patients with clinical and biochemical findings of secondary hyperparathyroidism. In 12 out of 24 cases ultrasonically guided fine-needle aspiration biopsy of the tumours was performed in order to obtain a cytological specimen. In the eight patients who subsequently had surgical exploration of the neck, diagnostic accuracy of both ultrasonography and biopsy combined was 87 per cent.

### Introduction

The choice of the best treatment of secondary hyperparathyroidism (HPT) in uraemic patients may sometimes be difficult mainly because of discrepancies in clinical symptoms, biochemical signs and bone lesions shown by X-ray [1]. Furthermore, surgery may occasionally be unsuccessful, parathyroid glands (PT) may not be localised if they are not significantly enlarged or when their location is unusual (e.g. mediastinal or intrathyroidal glands) [2]. For all these reasons pre-operative instrumental localisation of the PT may prove helpful both in diagnosis and treatment of secondary HPT [3,4].

In past years scintigraphy [5], thermography [6] and selective arteriography, venography and venous sampling combined [7] have been used in order to localise PT pathology; more recently ultrasonography has been employed with results not inferior to any of the preceding techniques [8]. Sensitivity and specificity of ultrasound are high, ranging from 80 to 95 per cent [9]. According to our experience, we feel that the number of sonographic false negatives (mainly due to intrathyroideal location or uncommon echopattern) and false positives (related to nodular thyroid disease) can be significantly reduced by performing, in selected cases, ultrasonically guided fine-needle aspiration biopsy (FNAB) of suspected parathyroid tumours).

## Material and methods

In a two year period 72 out of 210 chronic uraemic patients on regular haemodialysis for a mean period of 87.4 (42 to 164) months were investigated for questionable clinical and biochemical findings of secondary HPT.

X-ray bone 'score' evaluated as previously described [10] was  $6.4 \pm 3.1$ . Parathyroid hormone serum concentration (iPTH) was estimated by a radio-immunological method (Sorin Biomedica, Saluggia, Italy) with a normal range of 0.5–2ng/ml.

Bone alkaline phosphatase isoenzymes were determined in cellulose acetate [11], with a normal value up to 90U/L.

In a first group of patients the sonographic study was performed using a digital B-scanner (Digisonic, Searle) with a 5 MHz transducer and with the 'water-bath technique'. Before performing aspiration biopsies the localisation of the lesion and its distance from the skin were determined with the B-scanner; during the puncture a real-time sector-scanner (Aloka 115) was used with the ultrasound beam perpendicular to the needle-path, in order to monitor needle penetration.

More recently in a second group of patients sonographic scans were performed with a real-time sector scanner (ATL MK 300 1) with high-resolution multifrequency scanhead (5 MHz short focus – 5 MHz medium focus – 7.5 MHz). FNAB was performed introducing the needle in the lateral adaptor of the scanhead that allows an optimal control of the whole procedure.

With both methods bright needle-tip echoes could be very often seen in the lesions during aspiration (Figure 1). Fine-calibre, 22G needles of the Chiba-type were always used for biopsies, connected to 20ml syringes for aspiration.

Each lesion underwent only one puncture.

Cytological specimens were routinely stained with both Papanicolau and May-Grünwald-Giesma methods.

Eight patients underwent surgical exploration of the neck within 15–20 days of US study and FNAB.

## Results

In 24 out of 72 patients (33%) either one or more (Figure 2) enlarged PT glands were sonographically detected. In most of them sonographic appearance was typical, both for echopattern (round, echopoor, without distal enhancement) and location (posteromedial to the thyroid lobes, in close relation with the minor neurovascular bundle). The dimensions of the lesions ranged from 0.8 to 2.5cm in diameter. In these patients serum iPTH ( $8.4 \pm 2.7$ ng/ml) and bone alkaline phosphatase ( $353.4 \pm 237.3$ U/L) were significantly greater than in the whole dialysis population.

Twelve patients underwent FNAB of one or more of the nodules. Indications for FNAB were: intrathyroideal location of the lesion (two cases), cystic echopattern (one case), coexisting thyroid pathology (nodular goitre) (two cases) and cytological confirmation before surgery (seven cases).

In 10 out of 12 patients parathyroid cells could be demonstrated in the aspirated material, while in the remaining two the material was inadequate.

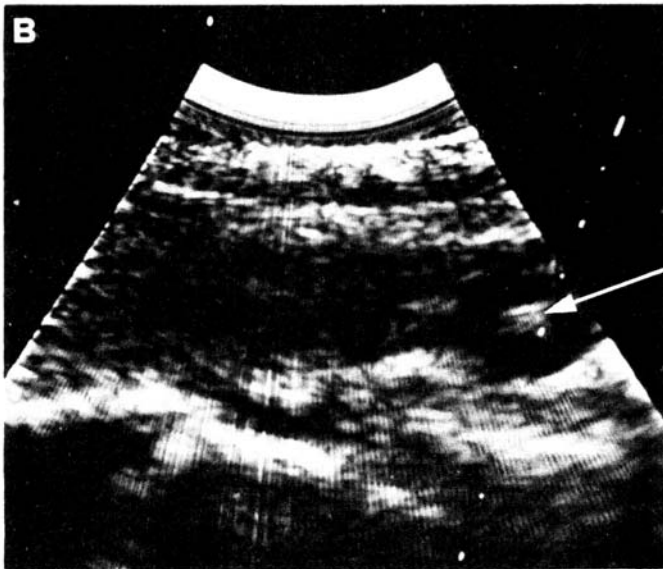


Figure 1. Sagittal scans. A. Echopoor, round lesion (arrows) located at the caudal, posterior edge of the thyroid lobe. Its diameter is 1.5cm. T = thyroid gland. B. During aspiration bright echoes (arrow) within the mass confirm the correct placement of the needle-tip. Typical parathyroid cells were found in the aspirated material

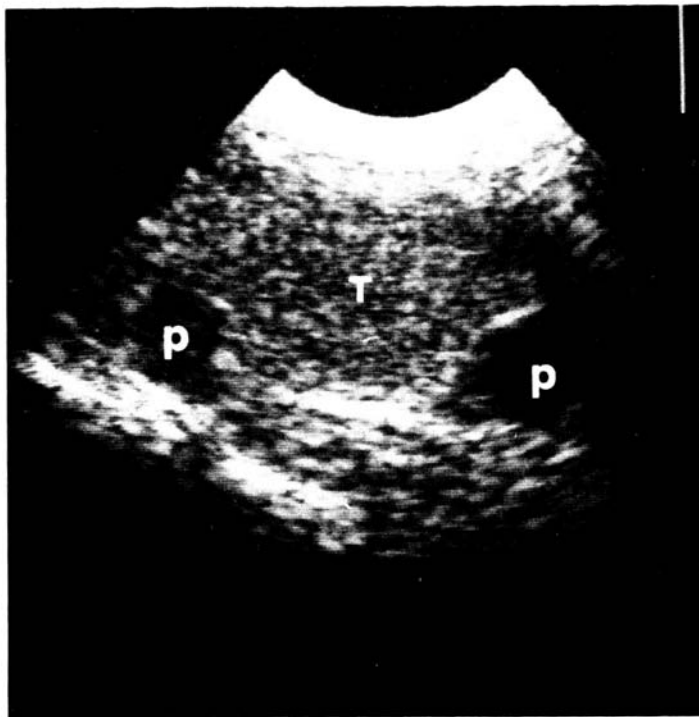


Figure 2. Sagittal scan. Two typical parathyroid tumours (p) posterior to both the upper and lower poles of the thyroid lobe (T)

The results of US and FNAB combined in the eight patients who underwent surgery were: six true positives, one false negative and one true negative. According to these results the sensitivity of both techniques combined was 85 per cent, specificity was 100 per cent and overall accuracy was 87 per cent.

No complications were encountered in our patients; no haematomas were surgically found in or around the punctured tumours.

### Conclusions

In our hands ultrasonography was demonstrated to be a simple, inexpensive, safe and accurate method for the detection of parathyroid tumours. The sensitivity of US is high (87–90%), although it can be limited by small dimensions or ectopic location of parathyroid tumours. Specificity of US is equally high (80–95%), but coexisting thyroid diseases can determine false positive results. In our experience the diagnostic accuracy of US can be significantly increased when it is associated, in selected cases, with ultrasonically guided FNAB. This simple and safe procedure can easily differentiate thyroid from parathyroid pathology and confirm possible intrathyroidal parathyroid tumours). We feel that US can be very helpful in the follow-up of uraemic patients with secondary HPT because

it can monitor parathyroid enlargement during medical treatment. As possibilities of medical treatment are questionable when large parathyroid tumours are detected, US can have an outstanding role in the choice of surgical treatment.

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