Parathyroid incidentaloma detected during thyroid sonography – prevalence and significance beyond images

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Abstract

Introduction: Parathyroid incidentaloma (PTI) designates a nodule discovered incidentally during thyroid sonography, and whose location and aspect suggests an abnormal parathyroid. Our aim was to assess the prevalence of PTI, their functional characteristics and to identify the factors correlated with their presence. Patients and methods: We recorded all patients detected with PTI between January 2009 and December 2011, in our department. Serum calcium, parathyroid hormone (PTH), thyroid stimulating hormone (TSH), free thyroine (FT4) and anti thyroid peroxidase antibodies (anti-TPO Ab) were measured. Results: From a total of 2662 thyroid ultrasounds, 32 patients were identified with PTI (prevalence 1.2%). The diagnosis of a functional parathyroid adenoma was confirmed in 12 patients (37.5%). There was no significant difference in size, location, echogenicity or vascular pattern between the functioning adenomas and the other PTI. The only parameter correlated with the non functioning lesion was the multinodular pattern of the thyroid (multinodular goiter or macronodular autoimmune thyroiditis). Conclusions: Although rare, the ultrasound identification of an image suggestive for a pathological parathyroid gland requires the evaluation of the functioning character of the lesion, more than one third PTI being hyperfunctional. The concomitance of a nodular goiter decreases the probability of a primary hyperparathyroidism.

Keywords: Parathyroid, incidentaloma, primary hyperparathyroidism, nodular goiter, ultrasonography

Introduction

Parathyroid incidentalomas (PTI) represent a less known and studied condition as compared to incidentaloma of other endocrine glands (adrenal, thyroid, pituitary). The first case described in literature dates from 1967 [1]. Initially the term was used in cases of intraoperative discovery of one or several enlarged parathyroids, in the absence of hyperparathyroidism evidences. Later, the term was also attributed to the images discovered incidentally during thyroid ultrasound, raising the suspicion of a pathological parathyroid, confirmed or not by puncture biopsy, histology, parathyroid hormone (PTH) level, and thyroglobulin, or confirmed as hypersecreting adenomas by serum calcium and PTH dosage [1-3].

The reported intraoperative incidence is between 0.2 and 7.6% [2-9] while the ultrasound incidence is under 1% [2,3,10]. In a series of postmortem examination of patients without known hyperparathyroidism or thyroid disease, Akerstom et al. demonstrated a much higher incidence, i.e. 9.4% (of which 7% hyperplasia and 2.4% adenoma) [11], suggesting that a great proportion of these lesions remain clinically silent.

The most common sonographic aspect is of an oval nodular mass, adjacent to the thyroid parenchyma, apparently extracapsular, well delimited, homogeneous, hypoechoic. Besides this aspect, other forms are possible: irregular margins, non-homogeneous, hyperechoic, or with transonic areas [2,12]. However, not all the im-
ages described are real parathyroid lesions. Multinodular goiter or peri-thyroid lymph nodes, often present in lymphocytic chronic thyroiditis, may be factors for misinterpretation [2,3,10,12]. In case of ultrasound evidence of a PTI, confirmation of the lesion is based on the serum calcium and PTH dosage, puncture biopsy and analysis of the biopitic sample by histology, PTH dosage and thyroglobulin [3].

Most incidentalomas evidenced by ultrasound are parathyroid adenomas, much more rarely parathyroid hyperplasia [2-4], although biopitic tests indicate a reversed situation. Confirmed PTI, with normal serum calcium and PTH levels, are considered to be the early stages for primary hyperparathyroidism development, for this reason some authors recommending the surgical excision [2,4,13].

The aim of this study was to evaluate the prevalence of PTI detected during thyroid ultrasound examination in our department, and to identify the factors possible positively correlated to this condition.

Material and method

We carried out a prospective longitudinal study which included all the patients suspected of parathyroid lesions based on thyroid ultrasound examinations performed from January 2009 to December 2011 in Endocrinology Department. Ethical committee approval was obtained and patients signed an informed consent. We excluded the patients with known primary hyperparathyroidism. Pathological parathyroids suspected were defined as nodular masses, most frequently hypoechoic, apparently situated outside the thyroid capsule (fig 1), vascularized or not by a vascular pedicle (feeding artery). The following were investigated: location of the lesion, size, structure, echogenicity, vascularization, and the ultrasound aspect of the thyroid gland. In the case of patients suspected of a pathological parathyroid we determined: serum calcium, PTH, TSH, FT4, anti-TPO antibodies.

Data were analyzed using the Excel spreadsheet and EpiInfo. The student t test for 2 samples and the $\chi^2$ test were used for statistical analysis and data comparison. The statistical threshold was considered at $p<0.05$.

Results

During the period January 2009 – December 2011, 2662 thyroid ultrasound examinations were performed. Suspicious parathyroids were evidenced in 32 patients showing a prevalence of 1.2%. The patients were 31 women and one man, with age range between 14 and 78 years (mean 47.96±14.38 years). The suspected lesions size ranged between 7 and 30 mm (mean 13.73±5.49). Seventeen masses were located at the level of the right thyroid lobe (5 upper, 12 lower), and 15 at the level of the left thyroid lobe (5 upper, 10 lower).

Regarding the structure and echogenicity, 29 nodules (91%) were hypoechoic (27 being homogeneous), 2 isoechoic (2), and one transonic.

In 17 patients (53%), the nodules were vascularized by a “feeding artery”, a pattern very suggestive of a pathological parathyroid (fig 2).

Analyzing the functional aspect of PTI by serum PTH and calcium dosage, 12 cases (37.5%) were confirmed as primary hyperparathyroidism (group A), while in the rest of the patients the levels were normal (group B). The morphological and functional features of the lesions were compared for the two groups, and the results are presented in table I.

Fig 1. Ultrasonography – axial and sagital scans of the right thyroid lobe; superior parathyroid incidentaloma. LTD – right thyroid lobe, PTI – parathyroid incidentaloma, ACC – carotid artery, VJI – internal jugular vein, NT – thyroid nodule.

Fig 2. Ultrasonography – sagital scan of the right thyroid lobe; inferior parathyroid incidentaloma (black arrow) and the “feeding artery” pattern (white arrow). LTD – right thyroid lobe, PTI – parathyroid incidentaloma.
In the group with primary hyperparathyroidism, the mean calcium and PTH levels were 10.31±0.75 mg/dl, and 141.9±68.44 pg/ml respectively; all the masses described were hypoechoic (10 homogeneous, 2 non-homogeneous), 8 of 12 (66%) having a vascular pattern of a feeding artery (RR=7.83).

In the group with normal parathyroid function, the mean calcium and PTH levels were 9.36±0.77 mg/dl, and 45.17±13.31 pg/ml respectively; TPOAb were positive in 4 patients (20%), 5 (25%) had thyroid dysfunction (hypothyroidism), 5 (25%) had a US aspect of autoimmune thyroiditis, and 9 (45%) an aspect of nodular goiter. In 90% (9 of 10) of the patients with nodular goiter, the PTI was not associated with hyperparathyroidism (fig 3).

No statistically significant difference was found between the patients with primary hyperparathyroidism and those with normal parathyroid function regarding age, gender, size and echogenicity of the lesions, or the location. Nor did the vascularization differ between the two groups (p>0.05). Regarding the aspect of the thyroid, the only significant difference between the two groups was the presence of nodular goiter (p= 0.03/0.05), The difference was significant even we took into account the cases of autoimmune nodular thyroiditis (p= 0.05).

### Discussions

The prevalence of the incidentalomas in our study was 1.2%, similar to reports in literature [2,3,10]; the frequency of hyperfunctional incidentalomas was 37.5%, higher that 13.6%, reported by Farasoldati [2], and 12.5% reported by Kwak [3]. Though low, the prevalence of primary hyperparathyroidism diagnosed in cases with PTI, emphasizes the necessity of careful ultrasound examina-

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**Table I. Functional and sonographic aspects of PTI**

<table>
<thead>
<tr>
<th></th>
<th>Group A (12)</th>
<th>Group B (20)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum PTH levels (pg/ml)</td>
<td>141.9±68.44</td>
<td>45.17±13.31</td>
<td>p&lt; 0.05</td>
</tr>
<tr>
<td></td>
<td>67.4-287.5</td>
<td>27.3-80</td>
<td></td>
</tr>
<tr>
<td>Serum calcium levels (mg/dl)</td>
<td>10.31±0.75</td>
<td>9.36±0.77</td>
<td>0.63</td>
</tr>
<tr>
<td></td>
<td>8.85-11.1</td>
<td>8-10.59</td>
<td></td>
</tr>
<tr>
<td>Dimensions (mm)</td>
<td>15.24±5.63</td>
<td>12.82±5.34</td>
<td>0.23</td>
</tr>
<tr>
<td></td>
<td>10-30 mm</td>
<td>7-28.8 mm</td>
<td></td>
</tr>
<tr>
<td>Location</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Upper right lobe</td>
<td>1</td>
<td>4</td>
<td>0.37</td>
</tr>
<tr>
<td>Lower right lobe</td>
<td>4</td>
<td>8</td>
<td>0.7</td>
</tr>
<tr>
<td>Upper left lobe</td>
<td>2</td>
<td>3</td>
<td>0.89</td>
</tr>
<tr>
<td>Lower left lobe</td>
<td>5</td>
<td>5</td>
<td>0.32</td>
</tr>
<tr>
<td>Feeding artery pattern</td>
<td>8</td>
<td>9</td>
<td>0.23</td>
</tr>
<tr>
<td>Thyroid pattern</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Diffuse autoimmune thyroiditis</td>
<td>6</td>
<td>5</td>
<td>0.14</td>
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<tr>
<td>Nodular autoimmune thyroiditis</td>
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<td>3</td>
<td>0.89</td>
</tr>
<tr>
<td>Nodular goiter</td>
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<td>9</td>
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</tr>
<tr>
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<td>1</td>
<td>0.43</td>
</tr>
<tr>
<td>Normal</td>
<td>5</td>
<td>5</td>
<td>0.32</td>
</tr>
</tbody>
</table>

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Fig 3. Ultrasonography – longitudinal scan of the left thyroid lobe; multiple parathyroid incidentaloma, associated with nodular goiter, proved (by surgery and pathological exam) to be lymph nodes. LTS – left thyroid lobe, NT – thyroid nodule, PTI – parathyroid incidentaloma.
tion of the areas susceptible of containing a pathological parathyroid mass. The higher percentage of hyperfunctional formations in our study, as compared to other studies in literature, was probably due to an easier access of the patients to thyroid ultrasound examination compared to other diagnostic tests (PTH dosage), as well as to the selection of the patients, namely in an endocrinology unit, whereas the other studies were performed in radiology departments.

Regarding the etiology of PTI without hyperparathyroidism, Kwak et al [3] found that 21.4% (24 of 112) of the suspected lesions were parathyroid, based on puncture biopsy samples and PTH dosage; in 14 of the 24 patients the hypersecreting status was also confirmed. Non-parathyroid lesions were thyroid tissue or lymph nodes [3]. In a similar study, Farasoldati et al [2] showed that 24% (9 of 38) of the suspected lesions were of parathyroid origin, 5 of the 9 patients presenting increased serum PTH and calcium levels. The unconfirmed lesions (92) were of thyroid origin (58%) and lymph nodes (11%). These studies indicate that about 10% of incidentalomas are “non-secreting” parathyroid adenomas, with a potential functional evolution that cannot be ruled out.

We could not demonstrate a relation between certain ultrasound features of PTI and their hypersecreting character. Literature mentions that non-functional parathyroid incidentalomas, considered to be a precursor stage of primary hyperparathyroidism [7,14], are encountered in younger patients, while the hyperfunctional PTI in older patients [14]. In our study, the mean ages of the two groups were comparable. A positive correlation between the size of the incidentaloma and serum PTH was also evidenced, namely larger incidentalomas are more probably hypersecreting [2]. In our study we obtained no significant statistical difference between the two groups regarding the size of suspicious lesions. The normal vascularization of the parathyroid glands is of “feeding artery” type, an aspect also maintained in the case of adenoma or hyperplasia, which helps identify pathological parathyroids [15,16]. In our study this aspect was found in both groups, with a slight difference in favor of the secreting masses, (66.67% versus 45%), not statistically significant. Regarding the location of the lesions, similar to literature [10], the great majority of PTI were situated on the lower thyroid poles, though this location had no predictive value for the primary hyperparathyroidism.

Investigating the aspects of the thyroid gland correlated to PTI, Ozemir et al. have shown that the clinical or sonographic evidence of chronic thyroiditis is the major factor related to the misinterpretation of a hypoechoic image as being a pathological parathyroid, most of them being probably lymph nodes, rather common in patients with chronic thyroiditis [10]. In our study this aspect was found in pseudo-macronodular thyroiditis forms, which indicates that rather a pseudo nodule located on the posterior surface or on the lower pole of the thyroid lobe was misinterpreted as a pathological parathyroid.

We found that the multinodular goiter was the only aspect correlated significantly with non functioning PTI. Similarly, Barbros et al demonstrated that concomitant thyroid nodules were the most frequent cause of confusion with pathological parathyroids, these results being in close positive correlation with the posterior location of thyroid nodules and their number, and negatively correlated with the weight of the thyroid adenoma [12].

As concerns the therapy, in the case of hyperfunctioning incidentalomas the indication is for surgical treatment. The majority of authors recommend the excision of incidentalomas found during thyroid operations (2,4,13,17,18). Kirkby-Bott et al disagree with this treatment, except for the cases in which primary hyperparathyroidism has been documented prior to the operation, arguing that a large proportion of PTI are due to chronic vitamin D deficit. This deficit may trigger pathophysiological sequences responsible for inducing secondary hyperparathyroidism and the appearance of multiple PTI [5]. In the case of clinically non-functional incidentalomas, the yearly follow-up by ultrasound and hormonal test is a good decision, taking into account the potential evolution toward hypersecretion. There are no prospective studies to indicate what percentage of the formations became hypersecreting in time.

The limits of the study consist in the absence of histopathological diagnosis for most of the PTI; only 8 patients with primary hyperparathyroidism were operated (and confirmed by pathological exam). The other patients will be followed yearly, and the therapeutic decisions will be made depending on the morphological and functional evolution of the lesion.

Conclusions

Though rare, the ultrasonographic evidence of an image suggesting a pathological parathyroid imposes the assessment of the secreting status of the mass through serum calcium and PTH dosage, as more than one third has been proved to be secreting. The association of the multinodular aspect of the thyroid gland lowers the probability of a primary hyperparathyroidism, without ruling it out though.

For the confirmed forms of primary hyperparathyroidism, surgical cure is mandatory, with the exception of the silent, slowly evolving forms that do not have re-
percussions on the bones and viscera, in elderly patients, with other associated diseases.

For the PTI without hyperparathyroidism, a yearly follow-up of the serum calcium and PTH levels may be useful, because an evolution towards hypersecretion cannot be ruled out.

Conflict of interest: none

References