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Diagnosis and Therapeutic Management of Parathyroid Cysts

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ABSTRACT

Objectives: The parathyroid cysts (PCs) are rare and their diagnosis and therapeutic management are not clearly established. The aim of the study was to evaluate the characteristics of parathyroid cysts. **Methods and Materials:** Twenty-five patients with PC were included in this retrospective study. The PCs were discovered as follows: cervical mass (n = 18), screening for other pathologies (n = 7). Intracystic parathyroid hormone determination was performed in 6 cases. **Results:** Eight patients presented a hyperparathyroidism. Mean cyst size was 21.1 mm (ext 4 - 70 mm) by 19.8mm (5 - 45 mm). Twenty four cysts were cervical (resection by cervicotomy), and one was mediastinal (resection by sternotomy). In addition to the resection of the PC, 3 adenomas, 1 hyperplasia of the parathyroid glands, 14 benign thyroid diseases and 4 papillary carcinomas were recognized and treated during the cervicotomies. **Conclusion:** The diagnosis of PC is uncommon and must be based primarily on the study of the cyst liquid obtained by percutaneous puncture (intracystic parathyroid hormone measurement). True PCs are non functional.

Keywords: Hyperparathyroidism; Cystic Parathyroid; Intact Parathyroid Hormone

1. Introduction

Parathyroid cysts are rare and represent 1% - 3.3% of parathyroid pathology [1]. They were present in 2.8% of subjects in a set of autopsies [2]. In 1999, 250 cases were described in the literature of which 94 cases were mediastinal. They have a variable presentation with local or hormonal effects. Their treatment is most often surgical (resection by the cervical or thoracic route). However in certain cases, newly developed ultrasound guided fine needle aspiration and sclerosing injections can be used in their management [3,4]. We report a unicentric sample of twenty-five patients managed in the department of General & Endocrine Surgery which allowed us to compare our results and recommendations with those published in the literature.

2. Patients and Methods

This retrospective study reviews the activity of the department of General & Endocrine surgery (University Hospital of Angers) between the 1st of January 1986 and the 31st of September 2011. It consists of 25 patients, 19 females and 6 males with an average age of 51.3 years (range: 22 - 83). The patients presented due to a cervical mass in 18 cases and general health check-ups (osteoporosis, obesity, HTA) in 7 cases.

Functional parathyroid cyst (FPC) is defined as a biochemical primary hyperparathyroidism diagnosed before surgery. In contrast, non functional parathyroid cyst (NFPC) was considered in patients with normal level of PTH and calcemia before surgery.

An ultrasound was performed for all patients. For 11 patients a scintigraphy was performed.

The parameters studied were the anatomical aspect, the clinical characteristics and histological analysis of the lesions.

3. Results

Among 25 patients with cystic parathyroid lesions, 20 (80%) had non functional cystic parathyroid lesions (NFPC) and 5 (20%) had functional parathyroid cyst lesions (FPC).

Among these 25 parathyroid cysts, 3 lesions (2 NFPCs and 1 FPC) were associated with parathyroid adenomas and 1 with parathyroid hyperplasia.

Histological analysis revealed 4 cyst adenomas and all of them were FPC. All of the 20 NFPCs were true cysts parathyroid. The mean age is 51.3 years (22 - 83). The principal localisation is inferior n = 15 (63%) and left n = 14 (58%).

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Twenty-four (96%) cysts were cervical and one cyst was mediastinal. The cysts size on average 27 mm (range = 5 - 70 mm) by 22 mm (5 - 45 mm). Hyperparathyroidism (serum parathyroid hormone greater than 50 ng/ml) was recorded in 8 patients.

Six patients underwent ultrasound guided fine needle aspiration under local anaesthetic to drain their cyst. The intact PTH measurement in the cyst fluid ranged from 53 to 2661 pg/ml parathyroid (normal serum PTH is less than 50). One patient had a first aspiration aimed purely at alleviating their symptoms (without the measurement of intracystic PTH). The cyst recurred and a new aspiration was carried out with the measurement of PTH in the cystic fluid (level of 685 pg/ml).

Eighteen patients had a single parathyroid cyst associated with other cervical pathology originating, in 4 cases, from the other parathyroids (3 adenomas and 1 hyperplasia) and, in 14 cases, from the thyroid (euthyroid on biochemical testing).

In total 5 patients had more than one parathyroid gland excised (1 hyperplasia, 3 adenomas and 1 normal parathyroid) and 14 thyroidectomies were carried out (4 total, 10 subtotal) with associated parathyroidectomy.

The interventions were carried out by cervicotomy in 21, by first focused in 3 cases and sternotomy in 1 case. In the later case the (asymptomatic) patient had initially presented with a bronchogenic cyst.

Corresponding pathologies which were encountered were: 1 case of parathyroid hyperplasia; 3 parathyroid adenomas; 10 cases of benign thyroid disease and 4 papillary carcinomas. All the interventions were uncomplicated without morbidity in particular without recurrence. A summary of our observations is given in **Table 1**.

Table 1. Characteristics and surgical results of patients with parathyroid cyst.

Age (year) /Sex (M/F)	Clinical Presentation	Hyperparathyroidism	Diagnostic Method	Localisation	Max Size (mm)	Treatment	Histology	Serum PTH (1 - 84)*/Intracystic PTH**
51/F	Cervical mass	No	US	L PIII	30	Surgery	NFPC	<10/2660
22/F	Cervical mass/recidive ponction	No	US	L PIII	20	Aspiration, recurrence, surgery	NFPC	N/685
75/M	Multiple sclerosis	Yes	US + Sc	R PIII	23	Surgery	FPC	240/NA
37/F	Goiter	No	US + Sc	R PIV	14	Surgery	NFPC	N/NA
30/F	Goiter	No	US	L PIII	13	Surgery	NFPC	15/72
36/M	Asymptomatic thyroid nodule	No	US + Sc	R PIV	20	Surgery	NFPC	N/NA
81/M	Goiter	Yes	US + Sc	L PIII	8	Surgery (3 glands)	NFPC + Hyperplasia (2 glands)	132/NA
21/M	Goiter	No	US + Sc	L PIII	20	Surgery	NFPC	N/>65
62/F	Osteoporosis	Yes	US + Sc	R PIV	4	Surgery	NFPC + adenoma	<10/NA
46/F	Cervical mass	No	US	R PIV	12	Surgery	NFPC	NA/NA
40/F	Cervical mass	No	US + Sc	L PIII	15	Surgery	NFPC	10/53
80/F	Goiter	No	US + Sc	L PIII	80	Surgery (2 glands)	NFPC + normal	NA/NA
52/F	Cervical mass	No	US	L PIII	3	Surgery	NFPC	NA/NA
27/F	Asymptomatic thyroid nodule	No	US	R PIII	25	Surgery	NFPC	N/210
39/M	Goiter	No	US	NA	6	Surgery	NFPC	NA/NA
80/F	HTA	Yes	US + Sc	L PIII	40	Surgery	FPC	320/NA
83/F	Osteoporosis	Yes	US + Sc	L PIII	NA	Surgery	FPC	110/NA
75/F	Multiple sclerosis	Yes	US + Sc	R PIV	23	Surgery	FPC	240/NA
61/F	Review of obesity	No	US	R PIV (mediastinal)	70	Surgery (sternotomy)	NFPC	NA/NA
40/M	Goiter	Yes	US	L PIV	30	Surgery (2 glands)	FPC + adenoma	>55/NA

Continued

39/F	Goiter	No	US	R PIV	10	Surgery	NFPC	N/NA
49/F	Cervical mass	No	US	L PIII	50	Surgery	NFPC	N/NA
28/F	Goiter	No	US	R PIII	5	Surgery	NFPC	N/NA
68/F	Osteoporosis	Yes	US	L PIV	15	Surgery (2 glands)	NFPC + adenoma	>55/NA
59/F	Asymptomatic thyroid nodule	No	US	L PIII	40	Surgery	NFPC	N/NA

N normal, NA not assessed, L PIII left inferior parathyroid gland, L PIV left superior parathyroid gland, R PIII right inferior parathyroid gland, US ultrasound, Sc scintigraphy. R PIV right superior parathyroid gland, FPC functional parathyroid cyst, NFPC non functional parathyroid cyst. *10 < N < 55 pg/ml. **Intact PTH (normal < 65 pg/ml).

4. Discussion

During the course of the study 538 patients underwent operations for parathyroid pathology and 5663 for thyroid pathology in our department thus there were just over 6000 cervicotomies for cervical, endocrine pathology. Parathyroid cysts account for 4.6% of parathyroid pathologies managed surgically and 0.41% of cervicotomies carried out. Our sample is representative of the literature with a predominence of female subjects (sex ratio = 3.2), patients in the fourth and fifth decade are most commonly affected [5,6].

Generally parathyroid cysts present with a solitary lesion at the laterocervical base [7-9] and preferentially localise to the left [1,9]. Most commonly there is a solitary, uninodular lesion; however Delaunay *et al.* raised the possibility of multiple cysts in 3% of cases [1]. Multinodular cysts have also been described relating to cysts within adenomas [2]. On average the size of cysts varies between 3 and 5 cm [7] with a fluid content between 2 and 75 ml [10]. Mediastinal cysts have been described with a size of up to 12 cm [11]. Many hypotheses have been suggested to explain the development of parathyroid cyst: degeneration or bleeding of the parathyroid gland or an adenoma which forms active cysts in the parathyroid cell wall [7,8] development of embriological residuals [12,13] retention of the secretions of the colloid vesicles or enlargement of microcysts by retention [14] forming inactive cysts with a clear liquid.

The circumstances of discovery are variable. It can be a chance discovery on examination with the suspicion of thyroid pathology (goiter, nodule) or other cervical mass (carotid vessels, adenopathies etc.) or during surgery in the area concerned [2,15] (14 in our observation). Elsewhere examination will note a palpable anterior cervical mass [2,16] or laterocervical base masses [15,17] which is smooth, renitent and mobile presenting like a thyroid nodule. The cervico-mediastinal cysts can give the impression of a plunging goitre [11]. This mass can appear serious if associated with pain (raising suspicion of a haemorrhagic complication). The diagnosis is eventually considered with associated hypercalcemia [18]. You will not find adenopathy in our study.

Typically these cysts, even those discovered in association with cervical mass conditions, are asymptomatic. Rarely there are clinical signs corresponding to a complication: cervical pain [1,3,11,19] and/or thoracic pain [18] or compression symptoms [3,8,11,16,18-20], dyspahgia (one of our observations), dysphonia [5,20] dyspnoea, dry cough or stridor [15,21] deviation and vascular compression [11,18,22]. Systemically the patient will be normal unless the cyst causes significant hyperparathyroidism which itself can be symptomless.

Parathyroid cysts can be functional and secretary, causing hyperparathyroidism in 10% - 15% of cases [3,5,20,23], 20% in our trial. Only 1% - 5% of cases of hyperparathyroidism are caused by parathyroid cysts (in our experience there were five FPCs every 538 cervicotomies for parathyroid pathology, 0.9%) FPCs, most frequently encountered in male patients, are typically degenerative or are bleeds from an adenoma [14,16,21]. Their content is brownish or bloody [1]. The cyst does not have a clear epithelial wall and is lined with parathyroid tissue [1,4,14]. Thus they are pathologically recognisable.

It is not misleading to describe inactive or non-functional cysts as parathyroid. They contain a clear mucous fluid [1,11,13]. Parathyroid tissue is found on histological examination forming islands surrounded by fibrous tissue, this confirms the parathyroid nature of the cyst [1,11,14,20,21].

Associations have been noted with other parathyroid pathologies (hyperplasia (1case), adenoma of another parathyroid gland responsible for hyperparathyroidism [2, 13] 3 of our observations) or can be incidental findings in thyroid disease [24].

One of our observations concerned a mediastinal cyst. Its localisation has been widely reported in the literature where 94 of 250 cysts listed were parathyroid [11] meaning that the incidence of mediastinal glands is between 2.5% - 22% [10,17,19,22]. The cysts (active in 42% of cases [2]) are most often situated anterior to the mediastinum (82%) where they occur as cysts on inferior ectopic glands.

Imaging—in particular ultrasound—only confirms the

cystic nature of the lesion without differentiating between parathyroid cysts and other types of cysts [17,25]. On fine needle aspiration the fluid colour is variable: clear like mineral water (nearly always pathogenic of a parathyroid cyst [5] or milky, bloody etc. (suggestive of a thyroid cyst [5,6]) The presence of parathyroid hormone (PTH) in the aspirate fluid confirms the parathyroid nature of the cyst [2,11,12,25] but does not allow a ruling on the activity level of the cyst because the PTH concentration in the cystic fluid can be greater than the PTH concentration in the blood in either type of cyst (FPCs or NFPCs) [6,25]. Only blood biochemistry can tell the difference between FPCs or NPCs. For some, the concentration of carboxyterminel fragments of PTH in the aspirate fluid is more interesting and a better measure than the whole hormone [2,11,21,26]. The aspirate fluid of parathyroid cyst is acellular and does not contain thyroid hormones.

Fine Needle Aspiration allows the diagnosis between rarer parathyroid cysts and thyroid cysts, which are often falsely suspected, to be made [5,8,17,20,23]. In thyroid cysts the intracystic level of thyroid hormones and thyroglobulin is raised while the level of PTH is zero [8,20,27].

Aside from their diagnostic role, ultrasound guided FNA can treat cysts by drainage but recurrence is always a possibility (one of our observations). In these cases surgery [3,8,20,22,28] repeated fine needle aspiration until the cyst disappears [1,2,23] or intracystic injections to cause sclerosis (tetracycline [27] or ethanol [3,4]) can then be considered. Intracystic injections are accompanied by pain, fever and transient breathlessnesss in 5% of cases [4,6,20]. This technique presents risks of pericystic fibrosis (especially with ethanol injections) which can lead to recurrence of the cyst [3]. It is for this reason that Verges *et al.* advise that whilst carrying out the technique one should speak to the patient and, at the slightest suggestion of dysphonia, should stop the procedure (4 transient dysphonias out of 13 patients in their trial) [29]. It appears that recovery can be established without the need for subsequent sclerosing injections [27,28].

In a study of 37 patients Ippolito *et al.* [25] treated 14 patients by fine needle aspiration (FNA). There were 4 recurrences, all of them treated by surgery. They concluded, FNA is diagnostic due to the characteristic appearance of the fluid and high PTH levels but can also be curative. However recurrences exist and will have to be treated by surgery [25].

In the context of an active parathyroid cyst surgical excision seems the obvious choice [1,2,5,7,13,27] with an extemporaneous histological examination of the surgical specimen. This dissection can be difficult due to the hypervascular character of the cyst and the fact that it can be embedded in the thyroidal parenchyma which can lead to associated resection of the thyroid gland [30]. The three remaining parathyroid glands must also be explored to look for double localisations and associations; however some suggest that it may be sufficient to only explore the unilateral parathyroid gland [30]. Severe hypercalcemia indicates a fine needle aspiration in order to treat the hypercalcemia [1], primary sclerotherapy [29] can permit a secondary surgical removal with the patient in a better metabolic state. The intervention can be guided by the perioperative PTH levels.

5. Conclusion

The indications for surgical or radiological interventions essentially depend on whether or not the cyst is active and on its localisation which determines the possibility of fine needle aspiration. True PCs are non functional. Post therapeutic surveillance of calcium levels is a necessary requirement for the early detection of a recurring cyst or other parathyroidal pathology.

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