Parathyroid cysts
A review of 359 patients reported in the international literature

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Abstract
Background: Parathyroid cysts are lesions that represent 1–5% of neck masses. They are subdivided into two categories: functioning and non-functioning.

The aim of the present review is to give a detailed account of all reported cases of parathyroid cysts in the literature and to analyze statistically the available data.

Methods: A bibliographic research was performed from 1905 until 2016. A database with the patients’ characteristics was made and analyzed statistically.

Results: A total of 218 articles were found, reporting 359 cases of cysts. Mean age of patients was 49.24 y/o and the male/female ratio was 1:1.85. The most common locations were left thyroid lobe (113/358 patients, 31.6%), and superior mediastinum (69/358 patients, 19.3%), while the most common symptoms were neck mass (148/355 patients, 41.7%), compressive symptoms (73/355 patients, 20.6%) and hyperparathyroidism (62/355 patients, 17.5%). Non-functioning cysts were more frequent (220/357 patients, 61.6%). Regarding dimensions, mean diameter was 4.88 cm. Ultrasound and FNA are used for their diagnosis, while cystic fluid analysis may help the differential diagnosis. Recurrences were mentioned in 27/97 patients (27.8%) with available data. No deaths due to parathyroid cysts were mentioned in the literature.

Conclusion: Parathyroid cysts should be taken into consideration in case of parathyroid dysfunction or asymptomatic neck mass. The surgeon’s careful manipulations on the cyst are crucial for a definitive treatment.

Abbreviations: AE1/2 = cytokeratin, CAM 5.3 = cell adhesion molecule 5.3, CT = computed tomography, FNA = fine needle aspiration, LCA = leukocyte common antigen, MRI = magnetic resonance imaging, PC = parathyroid cyst, PTH = parathormone, SMA = smooth muscle actin.

Keywords: parathyroid cyst, parathyroid glands

1. Introduction
Parathyroid cysts (PCs) are relatively rare lesions, which represent less than 0.5% of parathyroid glands’ pathologies and account for 1% to 5% of neck masses.[1-6] The first description of a PC was made by Sandström in 1880,[7] whereas the first report of surgical excision of a PC was made by Goris in 1905.[8] PCs can be subdivided into 2 main categories, depending on their hormonal activity: functioning and non-functioning ones. In the majority of cases, they are asymptomatic and are incidentally found, although there are also reports of clinically symptomatic lesions. Common sites that PCs are detected are the anterior neck and the mediastinum.

The aim of the present systematic review is to give a detailed account of all reported cases of PC in the literature and to analyze the available data, in order to completely characterize the entity from epidemiological, medical, and surgical aspects.

2. Methods
A bibliographic research was performed using PubMed, Scopus, Embase, Cochrane Library, and CINAHL. The search term employed was “parathyroid cyst.” In total, 356 articles were found, from which cystic adenomas were excluded. Since 1905, when the first description of PC was made, until 2016, 269 articles were found, from which 51 articles were not included, as 23 of them were published before 1970 and they were not available even in the journal that had been published and the rest 28 articles were impossible to find (after detailed research in medical databases, emails to the correspondence author, cross-references by other available articles) (Fig. 1). As result, 218 articles were included in our database. Among these, we spotted 359 well-documented cases of PC. One-hundred sixty-three articles were English, 24 were Japanese, 11 were French, 9 were Spanish, 2 were German, 4 were Italian, 2 were Portuguese, 1 was Finnish, and 1 was Czech and 1 was Icelandic. These articles were carefully studied and a database with the patients’ characteristics was made. The database included gender, age, location of the PC, symptoms, clinical presentation, dimensions of the cyst,
diagnostic methods, histopathological findings of the cyst and the containing fluid, treatment, duration of hospitalization, and follow-up. The cases that fulfilled at least 8 of these 10 criteria have been included in the statistical analysis. Table 1 displays the number of cases presenting the criteria. An ethical approval is not required because this study is a review of the existing international literature.

In order to express results, descriptive statistics were used appropriately. Means, medians, and standard deviations were used for continuous variables.\(^9\) The normal distribution of quantitative data has been checked using the Kolmogorov–Smirnov test. Nonparametric tests (Mann–Whitney U test) have been applied for the non-normal distribution data. Spearman rho test has been applied for the correlation between continuous variables. Kruskall–Wallis test and Chi-square test have been applied for the data correlated. Excel 2007 (Microsoft Office Excel 2007, Jones, Chicago) and SPSS 22.0 (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.) were employed to statistically analyze the data.

### 3. Results

Characteristics of PCs were determined concerning gender, age, localization of the PC, symptoms, clinical presentation, dimensions, diagnostic methods, histopathological findings and the containing fluid, treatment, duration of hospitalization, and follow up.

#### 3.1. Gender

Concerning gender, 35% of the patients were male (123 patients), while 65% were female (228 patients). The ratio between men and women was 1:1.85, suggesting a female predominance in the reported PC population.

#### 3.2. Age

Mean age of the population was 49.24 years, ranging from 8 to 88 years. It is concluded that PCs most frequently appeared in age ranges from 30 to 60 years.

We correlated the age distribution among male and female population and we found that there is no statistically significant difference between men and women. (Male Mean Rank: 187.14, Female Mean Rank: 169.27, \(U = 12,487.5, P = .115\)).

#### 3.3. Clinical manifestations

Furthermore, PCs can present with a wide variety of symptoms, ranging from asymptomatic neck masses to the different clinical manifestations of hyperparathyroidism. Our statistical analysis has shown that the most frequent symptom is neck mass (148/355 patients, 41.7%), while PCs presented as thyroid nodule in 25 of 355 patients (7%). Ten patients had a medical history of nephrolithiasis (2.8%), while 6 of 355 patients had thyroid dysfunction in general (1.7%). Parathyroid dysfunction was presented in 62 of 355 patients (17.5%), compressive symptoms in 73 of 355 patients (20.6%), and asthenia, weight loss, fatigue, and depression in 15 of 355 patients (4.2%). Another clinical presentation of PCs was neck pain in 6 of 355 patients (1.7%), while 8 of 355 patients (2.3%) were admitted to an emergency department with mental confusion and deterioration due to undiagnosed hyperparathyroidism. Last but not least, obesity was the main symptom in 2 of 355 patients (0.6%). Figure 2 summarizes all the above symptoms.

### Table 1

| Criteria                                    | Number of cases [%] (n = 359) |
|---------------------------------------------|--------------------------------|
| Age                                         | 351 [97.8]                     |
| Sex                                         | 351 [97.8]                     |
| Symptoms                                    | 355 [98.9]                     |
| Location                                    | 358 [99.7]                     |
| Clinical presentation                       | 357 [99.4]                     |
| Dimensions                                  | 267 [74.5]                     |
| Diagnostic methods                          | 357 [99.4]                     |
| Histopathology and immunohistochemistry     | 199 [55.43]                    |
| Cystic fluid                                | 220 [61.28]                    |
| Treatment                                   | 333 [92.79]                    |
| Postoperative values                        | 348 [96.9]                     |
| Hospitalization                             | 30 [8.35]                      |
| Follow-up                                   | 97 [27]                        |
| Recurrence                                  | 98 [27.2]                      |

Figure 1. Flow diagram according to PRISMA Statement 2009.

Figure 2. Frequencies of symptoms’ categories.
3.4. Localization

As far as the localization of the PCs is concerned, they can be found from the angle of the mandible until the mediastinum, as shown in Fig. 3. In our population, the most common site was the left thyroid lobe (113/358 patients, 31.6%), while superior mediastinum was the second one (69/358 patients, 19.3%). PC appeared in the right thyroid lobe in 68 of 358 patients (19%) and a cervical localization was found in 46 of 358 patients (12.8%). Cervicomediastinal PCs were found in 18 of 358 patients (5%), while in 16 of 358 patients (4.5%) PC was located in the anterior mediastinum. PCs were found in the middle compartment of mediastinum in 13 of 358 patients (3.6%) and in both thyroid lobes in 10 of 358 patients (2.8%). Posterior mediastinum (4/358 patients, 1.1%) and the angle of the mandible (1/358 patients, 0.3%) represent rarer locations of PCs.

The correlation between age and location using Kruskall–Wallis test showed that there is a different distribution of age among several location of PCs, with anterior and posterior mediastinum coming first, then the thyroid lobes and last the angle of the mandible, as shown in Fig. 4 (P < .001).

3.5. Clinical presentation

Furthermore, there are 2 main categories of PCs: the functioning and the nonfunctioning ones. Nonfunctioning PCs were found to be more frequent, as they represent 61.6% of the total amount of patients (220/357 patients).

The correlation between clinical presentation of PCs and gender has shown that there is statistically significant difference between male and female, as nonfunctioning PCs have a female predilection (nonfunctioning: Male = 26.5%, Female = 73.5%, P < .001). The percentages for the functioning PCs were Male = 48.5% and Female = 51.5% (P < .001), suggesting a slight predominance for female population. These results are presented in Fig. 5.

We also correlated age between categories of clinical presentation and came to the conclusion that there was a difference between functioning and nonfunctioning cysts, suggesting a predominance of functioning ones in older patients (U = 8002, P < .001). Figure 6 demonstrates these results.
Concerning treatment, 95.4% of patients with functioning cysts underwent surgical excision and 4.6% FNA, whereas 71.6% of patients with nonfunctioning cyst underwent surgical excision, 21.9% FNA and 6.5% sclerotherapy ($P < .001$), as shown in Fig. 7.

3.6. Size

For the dimensions of PCs, there were data for 267 of 359 patients (74.3%). Mean diameter of the cyst was $4.81 \pm 2.88$ cm, ranging from 0.5 to 15 cm, as shown in Fig. 8.

We correlated dimensions and clinical presentation of PCs and found that there is no statistically significant difference of the diameter between 2 different categories of clinical presentation ($U = 7617.5$, $P = .187$).

Concerning gender, we concluded that male had bigger cysts than female (male mean rank = 156.55, female mean rank = 121.14, $U = 6058$, $P < .001$). This is demonstrated in Fig. 9.

As far as location is concerned, bigger cysts were located in the middle compartment of mediastinum, followed by the other compartments of mediastinum and then the thyroid lobes ($P < .001$), as shown in Fig. 10.

The correlation made between age and dimensions showed that there is difference between age distribution among dimensions of the PC ($P = .005$).

3.7. Diagnostic methods

As far as diagnostic methods are concerned, the most useful tool has proved to be ultrasound, followed by FNA, as shown in Fig. 11. Other imaging techniques applied were computed tomography (CT) scan and plain radiograph, while surgical exploration is still of great importance for the diagnosis of PCs. Last but not least, magnetic resonance imaging (MRI) and Tc99m scintigraphy can be helpful tools for the differential diagnosis of PCs. In the laboratory tests, 131 of 135 patients (97%) were found to have elevated PTH in cystic fluid, a fact that characterizes PCs.
3.8. Histopathological features

For the histopathology and immunohistochemistry of PCs, the majority of them consist of parathyroid tissue (190/192 patients, 98.9%), while thyroid tissue (9 patients) and thymic tissue (8 patients) can be presented. There were cases that presented fibrosis (43 patients) and bleeding into the cyst (23 patients).

There was not enough information about the immunohistochemical factors of PCs. AE1/2, CAM 5.3, Factor VIII, Calcitonin, LCA, and SMA were stained for 1 patient each. Pancytokeratin was positive for 2 patients, while thyroglobin was positive for 4 patients.

As far as cystic fluid analysis is concerned, there were data for 220 of 359 patients (61.28%), from whom 170 patients (77.3%) had watery/clear fluid, 15 patients (6.8%) had chocolate/brown fluid, 22 patients (10%) had hemorrhagic fluid, and 13 patients (5.9%) had turbid fluid. Concerning clinical presentation, 79.4% of nonfunctioning cysts had watery/clear cystic fluid and 40% chocolate/brown one, whereas 20.6% of functioning cysts had watery/clear cystic fluid and 60% chocolate/brown one (P < .001), as shown in Fig. 12.

3.9. Treatment

For the treatment applied, surgical excision has been chosen in 269 of 333 patients (80.8%), whereas FNA has been done in 50 of 333 patients (15%). Sclerotherapy has been chosen in 14 patients (4.2%).

The correlation made between treatment applied and recurrence rate has shown that there is no statistically significant difference between surgical excision and FNA as far as recurrence rate (P = .590).

3.10. Hospitalization and follow-up

The mean duration of hospitalization has been found to be 4.76 days, ranging from 1 day to 20 days, but we had data only for 30 of 359 patients (8.35%), so the results are not so reliable. The duration of hospitalization of patients who did not undergo thoracotomy should be only 1 day.

With data for 97 of 359 patients (27%), the mean follow-up period was 17.34 months, ranging from 0 months to 204 months. The cyst recurred in 27 of 97 patients (27.83%).

4. Discussion

PCs are uncommon clinical entities, which arise in the neck and the mediastinum. They were first described by Sandström in 1880,[7] while Goris[8] (1905) reported their first surgical resection.[10] DeQuervain[11] published the first case of a mediastinal PC in 1925, whereas the first functioning PC was described by Greene et al[12] in 1952.[13] Noble and Borg[14] in 1936 was the first who resected surgically a functioning mediastinal PC.[15] Crile and Perryman (1953)[16] were the first to publish a case of the correct preoperative diagnosis of a PC using FNA.[17]

PCs seem to have a female predilection with a male: female ratio 1:3.5 and 1:2.5.[17–22] PCs more frequently appear in fourth and sixth decades.[19,21–24] PCs can be subdivided into 2 main categories: functioning and nonfunctioning, regarding their hormone producing activity.[25–28] Functioning cysts count for 20% of PCs, as they were found in 0.3% to 3% of parathyroid
glands removed due to hyperparathyroidism.\[209\] Functioning PCs seem to be found predominantly in male patients (1.6:1), while nonfunctioning ones have a predilection for female.\[101,103,17,27,29-32\] Regarding our study, functioning PCs have a similar distribution between male and female, while nonfunctioning ones of female are 2 times more frequent in females.

Jarnigan and Clark\[133\] mentioned that the incidence of mediastinal PCs ranges from 2.5% to 22%, while the incidence of sternotomy in such cases ranges from 1.4% to 14%. According to our findings, mediastinal PCs’ percentage is much higher and up to 33.5%.

It is important for us to notice that larger parathyroid glands and parathyroid glands of older patients tent to be located in the mediastinum (cervicomediastinal and lower). Both gravity and consistence of the surrounding tissues (less collagen in older people) probably lead to a displacement of the glands to lower positions.

Regarding location of PCs, it extends from the angle of the mandible to the mediastinum.\[26,34,36\] The majority of PCs arise from the inferior parathyroid gland.\[15,37\] In the literature, there are several reports of both neck and mediastinal PCs, yet with a higher incidence of these in the neck.\[15,38-44\] Safran et al\[31\] referred to the incidence of neck PCs, which is 85% to 95% and mostly left-sided.\[42,6,60\] Furthermore, it is worth mentioning that there is a paucity of intrathyroidal and intrathymic cases of PCs.\[157,161\] We found that the larger cysts are pushed lower into the neck, ending up into the mediastinum.

PCs display a great variety of symptoms. The heterogeneous clinical presentation is attributed to the fact that PCs appear in different locations and are of variable functionality. The majority of cases are asymptomatic, presenting with an incidentally found neck mass,\[11,23,32,77-94\] Alvi et al\[18\] and Coates et al\[95\] reported that larger cysts can cause compressive symptoms and mediastinal ones can cause recurrent laryngeal nerve palsy. Compressive symptoms such as dysphagia, odynophagia, dyspnea, asthma, stridor, hoarseness, vein thrombosis, cough, vomiting, choking sensation are caused by displacement of the adjacent structures.\[5,15,16,19,26,38,58,95-113\] Furthermore, there are references of vocal cord paralysis due to compression of PCs.\[20,114-117]

On the contrary, PCs may present with hyperparathyroidism, hypercalcemia and hypophosphatemia, nephrolithiasis, constipation, mental disturbances, depression, weight loss or obesity and fatigue, bone changes, osteomalacia, or there are only incidental laboratory findings.\[142,25,23,29,35,69,77,113,118-141\] In the majority of these cases, the cause of this parathyroid dysfunction is an adenoma, which coexisted with the PC or degenerated into a cyst.\[2,92,131,201\] Fallon et al\[145\] reported 1 case of parathyroid gland hyperplasia instead of adenomas. Several cases of acute symptoms, caused by hypercalcemic crisis or compression of adjacent structures, which are life-threatening conditions, have been reported in the literature.\[146-153\] Furthermore, hemorrhage into the PC has been reported and Manouras et al mentioned a case of bleeding into the cyst that caused acute hypercalcemic crisis.\[15,102,129,143,149,154,155\] Taniguchi et al\[156\] reported a case of a cervical hematoma caused by a PC. Glyn et al\[157\] published a case of multiple PCs. Cases of coexistence of PCs with other conditions such as pheochromocytoma and MEN-1 syndrome have been reported.\[158,159\]

Our study supported the assumption that the most common clinical manifestation of PCs is an asymptomatic neck mass, while compressive symptoms are the second most frequent clinical presentation.

PCs occur rarely in children. According to the present review, only 4 cases have been reported, accounting for 1% of PCs.\[2,98,160,161\]

The differential diagnosis of a PC includes a wide range of neck and mediastinal masses. PCs should be considered in the differential diagnosis of neck masses.\[160\]

Therefore, in the differential diagnosis of PCs, one must consider thyroid goiter, thyroid cyst, thymic cyst, thyroid adenoma, and parathyroid carcinoma.\[2,6,10,50,75,125,132,162-173\] Furthermore, thyroglossal duct cyst and branchial clef cyst should be taken into consideration as neck masses that usually mimic PCs. Multiple studies support the assumption that test of the cystic fluid aspirated by FNA is the best method to distinguish PCs. PCs contain clear-watery fluid. Moreover, PCs contain high concentrations of PTH.\[118,170,174-178\]

As far as the mediastinal PCs is concerned, they should be distinguished from vascular lesions, teratomas, lipomas, adenopathy, neuromas, thymomas, bronchogenic cysts, lymphangiomas, cystic hygromas, cysts and tumors of esophagus, trachea, nerves, lymphatics, and thyroid and parathyroid glands.\[24,35,37,38,56,165,170,179\] Imaging examinations and especially CT scan can differentiate vascular, solid, and cystic structures.\[47,179\] Aortography was used in a case of PC in order to be differentiated by vascular abnormalities.\[192\] Spitz\[180\] suggested that mediastinal malignancies and metastases should be considered in the differential diagnosis, especially in the elderly.

The diagnosis of PCs is far more characterized as a postoperative rather than preoperative one.\[77,91,98,118,182\] However, references in the literature reveal that there are several cases of PCs, which have been diagnosed preoperatively.\[116,24,27,65,170,183,184\] Hauet et al\[165\] suggested that the final diagnosis of PCs is based on biopsy. Korukluglu et al\[69\] mentioned that a preoperative localization of the PC using scintigraphy or ultrasound would help in order that the bilateral neck surgical exploration is avoided.

On physical examination, PCs appear to be palpable firm, smooth, solitary, nontender lesions located in the neck or superior mediastinum.\[163\]

The main imaging techniques that are used for the diagnosis of PCs are plain radiograph, CT scan, MRI, techniium radionuclide scintigraphy (Tc-scintigraphy) and ultrasound. Plain radiographs are usually used when the cyst is located in the mediastinum or lower neck.\[55,183\] CT and MRI scan has nonspecific findings, but they can easily reveal homogenous areas of cystic nature and are useful tools for the diagnosis, especially when there is a symptomatology of vocal cord paralysis or if the cyst is mediastinal.\[45,47,54,55,171,131,148,151,166,167,186-188\] The neck ultrasound examination is of great importance for the evaluation of PCs, as it reveals the cystic nature of the mass and its dimensions, is easily done and can be combined with FNA aspiration fluid.\[15,21,44,50,69,131,143,148,151,168,171,183-187,189-194\]

Microscopically, PCs are lined by ciliated or columnar epithelium and are thin-walled white cysts.\[1,15,22,117,139,162,191,196\] Furthermore, other tissues such as thymic, bone, lymphoid, muscular, adipose, salivary, and mesenchymal can be found in the cyst wall.\[172,131,147,196\] This pathology refers mainly to nonfunctioning cysts, whereas functioning ones lack this epithelium and are characterized more as pseudocysts.\[152,213,200\] Kuo et al\[201\] reported a case of an adenoma found lined in the cyst wall, surrounded by ciliated cells. References in the literature reveal that hyperfunctioning PCs can be formed by adenomatous tissue without any evidence of
adenoma or hyperplasia. A case of a carcinoma found in a PC has been reported. The cytological analysis of the cyst fluid includes the presence of small clusters of epithelial cells and fibroblasts, which are atypically proliferated and are mistaken for malignant cells. The fluid is colorless, clear, watery with high concentrations of CMPTH. Although, it can also be hemorrhagic, most in cases of hemorrhage of an adenoma. One case of high concentrations of Ca 19-9 in the cystic fluid has been reported. Immuno histochemically, PCs stain positive for parathormone peptide, glycogen, and focally for chromogranin.

The initial treatment of PCs is FNA, and in case of recurrence, surgical excision is recommended as the definitive treatment. A retrospective study carried out by Ippolito et al. have shown that from 14 patients who underwent FNA as initial treatment, 4 have a recurrence and a surgical excision followed. Until late 1970s, when Clark et al. first cured a PC with FNA, surgery was the main treatment. After then, several cases of PC were treated only with FNA. In 1992, Okamura et al. suggested the injection of sclerosants as an alternative treatment of PCs. This technique was especially used in case of a recurrence of PCs after FNA in order that open surgery is avoided. In the literature, there are several reports of sclerotherapy with tetracycline or ethanol injection used as treatment of PCs, leading to recurrent laryngeal nerve palsy seem to have an operative complications. Neck pain and neurotoxicity recur or appear with compressive symptoms should be excised. Capezzone et al. added another reason for surgical excision of nonfunctioning ones that recur or appear with compressive symptoms should be excised. In 1992, Okamura et al. suggested the injection of sclerosants as an alternative treatment of PCs. This technique was especially used in case of a recurrence of PCs after FNA in order that open surgery is avoided. In the literature, there are several reports of sclerotherapy with tetracycline or ethanol injection used as treatment of PCs, especially in nonfunctioning ones.

According to the clinical presentation of PCs, non-functioning ones are treated with FNA, whereas functioning ones with surgical excision. and Béguignon et al. mentioned that nonfunctioning ones that recur or appear with compressive symptoms should be excised. Capezzone et al. added another reason for surgical excision of nonfunctioning PCs, which is esthetic concerns. Yang et al. suggested the injection of sclerosants as an alternative treatment of PCs. This technique was especially used in case of a recurrence of PCs after FNA in order that open surgery is avoided. In the literature, there are several reports of sclerotherapy with tetracycline or ethanol injection used as treatment of PCs, especially in nonfunctioning ones. In 1992, Okamura et al. suggested the injection of sclerosants as an alternative treatment of PCs. This technique was especially used in case of a recurrence of PCs after FNA in order that open surgery is avoided. In the literature, there are several reports of sclerotherapy with tetracycline or ethanol injection used as treatment of PCs, especially in nonfunctioning ones. In 1992, Okamura et al. suggested the injection of sclerosants as an alternative treatment of PCs. This technique was especially used in case of a recurrence of PCs after FNA in order that open surgery is avoided. In the literature, there are several reports of sclerotherapy with tetracycline or ethanol injection used as treatment of PCs, especially in nonfunctioning ones. In 1992, Okamura et al. suggested the injection of sclerosants as an alternative treatment of PCs. This technique was especially used in case of a recurrence of PCs after FNA in order that open surgery is avoided. In the literature, there are several reports of sclerotherapy with tetracycline or ethanol injection used as treatment of PCs, especially in nonfunctioning ones. In 1992, Okamura et al. suggested the injection of sclerosants as an alternative treatment of PCs. This technique was especially used in case of a recurrence of PCs after FNA in order that open surgery is avoided. In the literature, there are several reports of sclerotherapy with tetracycline or ethanol injection used as treatment of PCs, especially in nonfunctioning ones. In 1992, Okamura et al. suggested the injection of sclerosants as an alternative treatment of PCs. This technique was especially used in case of a recurrence of PCs after FNA in order that open surgery is avoided. In the literature, there are several reports of sclerotherapy with tetracycline or ethanol injection used as treatment of PCs, especially in nonfunctioning ones.

Concerning the correct exeresis of the hyperfunctioning gland, we used the Miami criteria as per every hyperfunctioning parathyroid.

All the above treatments have their complications. Hemorrhage is reported as an early complication of FNA, while recurrence can occur as a late one. After surgical excision of PCs, hypocalcemia, hypercalcemic crisis, hemorrhage, and recurrent laryngeal nerve palsy have been referred as postoperative complications. Neck pain and neurotoxicity leading to recurrent laryngeal nerve palsy seem to have an association with sclerotherapy. We have however to comment a technical aspect probably leads to recurrence at the surgical technique. Those cysts have a very thin wall, and therefore, it is very difficult to excise them as a whole and without rupture. We would therefore consider the rupture of the cyst and its incomplete excision as the reason of recurrence.

In general, the prognosis is excellent in PCs. No recurrences or metastasis is observed, except for 14 cases of patients, from whom 10 patients appeared with 1 recurrence, 3 with 2 recurrences, and 1 with 3 recurrences within their follow-up period. These recurrences appeared after the first FNA and surgical excision was mandatory as their definitive treatment. According to a study published by Lorenzo et al. in 2008, malignant transformation has not been noted in 10 years follow-up of a case of a recurrent PC, which needed repeated FNA due to patient’s rejection to be operated. In the literature, there are no reports of malignancy of PCs. No deaths have been noted due to PC and long-term survival of patient seems to be certain.

5. Conclusion

We conclude that PCs are included in parathyroid glands’ pathologies and should be taken into consideration in case of parathyroid dysfunction as well as in differential diagnosis of asymptomatic neck masses. Neck ultrasound accompanied by FNA and fluid analysis (fluid PTH measurement) are useful tools in the diagnosis of PCs. When surgical excision is chosen as the appropriate treatment, the surgeon’s careful manipulations on the cyst, so that rupture is avoided, are crucial for a definitive treatment.

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Papavramidis et al. Medicine (2018) 97:28
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