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Minimally invasive surgery in primary hyperparathyroidism

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ABSTRACT

Aim: To describe the general and laboratory characteristics of patients with primary hyperparathyroidism (PHPT) who underwent surgery in our clinic, as well as surgery-related morbidity.

Methods: The study population were selected: Patients with clinical and radiological diagnosis of PHPT were included in the study. Minimal invasive parathyroid surgery, aimed only the affected gland, was chosen for the patients. Preoperative calcium (Ca), parathyroid hormone (PTH), and postoperative Ca and PTH levels were recorded. Preoperative sonography and scintigraphy studies to determine localization were obtained from the same database.

Results: 116 patients were undergone minimal invasive surgery for hyperparathyroidism, which is mainly focused on the pathological gland. The mean preoperative PHT was 397 ng/L and postoperative PTH was 53 ng/L. Preoperative and postoperative Ca levels were 11.7 mg/dL and 9.3 mg/dL, respectively. Histopathological evaluation revealed following results: 108 patients had adenoma. None of the subjects had malignancy. The mortality rate was 0% and the morbidity was 1.7%, related to this procedure.

Conclusion: According to the data in present study, we suggest that minimally invasive surgical techniques should be preferred in sake of higher success and lower postoperative morbidity in patients with a single gland disease.

Keywords: Primary hyperparathyroidism, minimal invasive surgery, pathology, morbidity.

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Introduction

There are four parathyroid glands in human. Despite having more than one gland could be beneficial, diseases related to the parathyroid glands may be troublesome. Parathyroid glands have important regulatory role in calcium metabolism which is very crucial for bodily functions. Disorders of parathyroid gland may cause various signs and symptoms, therefore, patients usually seek medical attention from physicians rather than surgeons. The surgeons are referred to patients with a diagnosis. Surgery is the most preferred treatment in primary hyperparathyroidism (PHPT). PHPT is either symptomatic or asymptomatic common disease the population. The most common cause of hypercalcemia in outpatient setting is PHPT [1,2]. A variant of PHPT is so called normocalcemic hyperparathyroidism [3]. Despite asymptomatic patients can be followed without surgery,[4] most of the cases require surgical removal of the affected parathyroid

gland. In surgery, removal of single gland for adenoma and total excision and transplantation to forearm is preferred treatment[5].

In this retrospective study, we aimed to present the general and laboratory characteristics of the patients with PHPT that undergone minimal invasive parathyroid surgery, define the cause of PHPT (adenoma, hyperplasia) and describe the morbidity related to the surgery in our clinic.

Materials and methods

Patients with symptomatic hyperparathyroidism who were operated on in our clinic between 2015 and 2020 were retrospectively analyzed after obtaining approval from the institution directorate (dated 370/01.06.2016 and no/date). Patients with clinical and radiological diagnosis of primary hyperparathyroidism were included in the study. Exclusion criteria were as follows: patients with secondary hyperparathyroidism (e.g. chronic kidney disease), tertiary hyperparathyroidism, and thyroid disease with hyperparathyroidism. Patients' characteristics and laboratory data obtained from medical database of the institution and from patient files. All patients were undergone minimal invasive surgery for hyperparathyroidism, which is mainly focused on the pathological gland. Frozen techniques were used in all case per-operatively.

Age, gender, initial complaints, preoperative calcium (Ca), parathyroid hormone (PTH), and postoperative Ca and PTH levels (at 12^{th} hour after surgery) were recorded. Preoperative sonography and scintigraphy studies to determine localization were obtained from the same database. Localization of the pathological glands in imaging studies were classified as lower-left, upper-left, lower-right and upper-right. Patients were followed up in general surgery ward at least for 2 days. Postoperative outcome, pathological assessment of the glands were recorded.

Data were analyzed by SPSS software (SPSS 15.0 for Windows, IBM Inc, Chicago, Il, USA). Distribution of variables in study groups was analyzed with Kolmogorov-Smirnov test. Normally distributed variables were compared by independent samples test and expressed as mean ± standard deviation. Paired samples t test was used to compare preoperative and postoperative Ca and PTH levels. Comparison of categorical variables were conducted with Chi-Square test. A p value lower than 0.05 is set for statistically significance.

Results

A total of 116 patients underwent parathyroid surgery and all patients were operated with the diagnosis of PHPT. 90 (77.5%) of the patients were women with a mean age of 55.7 ± 12 years and 26 (22.5%) were men with a mean age of 58.7 ± 14 years. Age was not statistically different between women and men (p=0.32). Initial complaints of the subjects were nephrolithiasis in 40 (34%), psychic complaints in 30 (26%), bone pain in 20 (17%), abdominal discomfort in 15 (13%), and excessive exhaustion in 11 (10%) of the subjects. The mean preoperative PHT was 397 ± 43 ng/L (reference range: 15-68.3 ng/L) and postoperative PTH was 53 ± 8 ng/L. The difference was statistically significant (p<0.001). Preoperative and postoperative Ca levels were 11.7 ± 0.1 mg/dL (reference range: 8.4-10.2 mg/dL) and 9.3 ±0.1 mg/dL, respectively. The Ca difference was statistically significant (p<0.001). Table 1 shows the Ca and PTH levels of study population before and after surgery. Pathologic gland localizations in preoperative imaging studies were as follows: 50 (43.1%) in left lower gland, 9 (7.8%) in left

Table 1. Serum calcium and PTH levels before and after surgery.

Parameters	Pre-op	Post-op	*p*
Ca (mg/dL)	11.7 ± 0.1	9.3 ±0.1	<0.001
PTH (ng/L)	397 ± 43	53 ± 8	<0.001

PTH: parathyroid hormone.

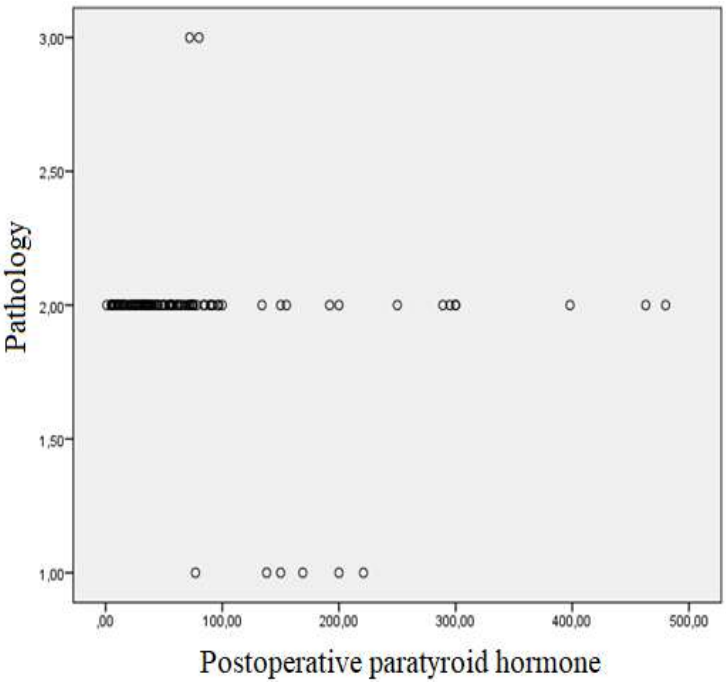

Figure 1. Correlation between postoperative PTH and diagnosis.

upper gland, 55 (47.4%) in lower right gland, and 2 (1.7%) in upper right gland. Histopathological evaluation revealed following results: 108 (93.1%) patients had adenoma, 2 (1.7%) had hyperplasia, 6 (5.2%) had normal gland (Figure 1). None of the subjects had malignancy. Subjects with hyperplasia and with normal gland were re-operated for PHPT since PTH of these subjects remained in higher levels.

One patient had unilateral recurrent laryngeal nerve injury and one patient had hematoma which responded well to medical treatment. All subjects were discharged from hospital without event on the postoperative 1st day. The mortality rate was 0% and the morbidity was 1.7%.

Discussion

The most important result of present study is that general surgery department of our institution has similar morbidity and mortality rates in parathyroid surgery to the literature [6]. Another important result of present study is the most common cause of PHPT was parathyroid adenoma, which is also similar finding to the literature knowledge [7]. The third significant finding of our study is that minimal invasive technique in parathyroid surgery has beneficial effects in morbidity and mortality, which has already been well established.

There are four Parathyroid glands in human. These glands are anatomically located in the ventral and dorsal part of the recurrent laryngeal nerve behind the thyroid gland. Parathyroid hormone released from parathyroid glands is a very important factor on calcium balance. It regulates the level of serum calcium through its activity on skeleton, kidneys and gastrointestinal system. Increased PTH secretion is defined as hyperparathyroidism. Hyperparathyroidism can generally be classified as primary, secondary and tertiary. Among these, primary hyperparathyroidism is the most common condition that surgeons encounter. The frequency of primary hyperparathyroidism is 1/500-1/1000 and 3 times more frequently in women than men [6]. In present study, it was more frequent in men with a female/male ratio 1/3,4.

Flint et al. [8] reported that 72% of patients undergone parathyroid surgery were referred to general internal medicine specialist from a general practitioner, 55% were referred to the

surgeons by general internal medicine specialist, 33% were referred by endocrinologists and only 6 were referred by geriatrists. In our study, the patients were initially admitted to a general internal medicine specialist in 60%, to an endocrinologist in 30% and to a surgeon in 10% of the cases.

High serum PTH and calcium levels are two important features in the diagnosis of primary hyperparathyroidism. In our study, the mean serum calcium level of the patients was 11.6 mg / dl and the mean PTH was 396 ng / l.

Scintigraphy and sonography are recommended for localization of the underlying cause of the primary hyperparathyroidism [9]. When parathyroid scintigraphy and USG are performed together, sensitivity, specificity and diagnostic accuracy increase to 86%, 98%, and 96%, respectively. The specificity of Sestamibi is nearly 100% in single adenoma cases [10,11]. In our study, we detected localization of all patients with 95% scintigraphy and 94% sonography In 94.8% of the cases, the affected gland was diagnosed accurately.

Bilateral neck exploration, which is used in hyperparathyroidism surgery, is known to increase the risk of recurrent nerve damage and hypoparathyroidism [12,13]. The tendency in primary hyperparathyroidism surgery is focused exploration, which is increasing day by day, instead of bilateral exploration approach. In our study, it was determined that 116 patients had focused exploration in surgery.

Frozen examination in parathyroid surgery is used to distinguish parathyroid tissue from other tissues [14]. Westra et al [15], reported in a series of 1579 cases that the suitability of the frozen examination was 99.2% in the determination of parathyroid tissue. In our study, despite the fact that the frozen tissue was confirmed to be parathyroid in all patients, the success of the affected gland was only 94.8%.

The causes of primary hyperparathyroidism are solitary parathyroid adenoma in 85-90%, hyperplasia in 10-15% and carcinoma in 1-2% of the cases [16-18]. In our study, the underlying cause in patients that undergone surgery were determined as adenoma in 93.1% and hyperplasia in 1.7% of the patients.

Complications of parathyroid surgery include wound infection, cervical hematoma requiring drainage, recurrent nerve injury, transient or permanent hoarseness and postoperative hypocalcemia [19]. In our study, mortality was 0% and morbidity was 1.7%.

Limitations of the present work include retrospective design and single center nature of the study. However, to the best of our knowledge, this is the first data of our institution regarding the results of minimal invasive parathyroid surgery.

Conclusion

Clinical signs and symptoms of the hyperparathyroidism is recognized and diagnosed earlier than it was, therefore, many cases were detected in asymptomatic period. Advances in radiological visualization methods make it easy to establish the affected gland. According to the data in present study, we suggest that minimally invasive surgical techniques should be preferred in sake of higher success and lower postoperative morbidity in patients with a single gland disease.

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