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Surgical treatment of double parathyroid adenomas in primary hyperparathyroidism: A clinical case

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ABSTRACT

INTRODUCTION: The frequency of occurrence of double parathyroid adenomas in patients with primary hyperparathyroidism is from 2 to 11% of cases. Nowadays, double adenomas remain a difficult diagnostic and therapeutic task.

PRESENTATION OF CASE: A 64-year-old woman was referred to an endocrine surgeon to evaluate a persistently elevating level of calcium. In the biochemical analysis the serum level of total calcium was increased - 2.79 mmol/l, ionized calcium - 1.64 mmol/l, parathyroid hormone - 191.4 pg/mL. Ultrasound and MSCT scan of the neck showed an increase of the parathyroid glands under the lower poles of both lobes of the thyroid gland. No functionally active parathyroid glands were found on scintigraphy. The patient underwent bilateral neck exploration with identification of all four parathyroid glands and a double parathyroid adenomectomy. According to a histological study, the removed parathyroid glands are represented by adenomas from the dark main cells. Remission of primary hyperparathyroidism was achieved.

DISCUSSION: This clinical report confirms the literature on a decrease in the sensitivity of imaging methods in the diagnosis of double adenomas. A decrease in the effectiveness of intraoperative monitoring of parathyroid hormone with double adenomas was confirmed. In this patient, a double parathyroid adenomectomy was sufficient to achieve remission of hyperparathyroidism.

CONCLUSION: With double adenomas, a comprehensive assessment of all imaging methods is required. A positive test during intraoperative monitoring of IPTG does not exclude a double adenoma in a patient. It is necessary to perform a bilateral neck exploration with identification of all parathyroid glands.

1. Introduction

In 80–90% of cases, the cause of sporadic primary hyperparathyroidism (PHPT) is adenoma of one parathyroid gland, in 10–15% - hyperplasia of four parathyroid glands, in 5% - multi-gland disease (MGD) and less than 1% - cancer of the parathyroid glands [1]. The frequency of occurrence of MGD (both adenomas and hyperplasias) is from 7 to 33%, and double gland disease (DGD) from 2 to 11% [2].

Nowadays there is no single understanding of the phenomenon of DGD. On the one hand, DGD is a separate clinical unit [2]. On the other hand, DGD is an asynchronous form of hyperplasia of four parathyroid glands [3].

Currently, double gland disease is a difficult diagnostic task. The sensitivity of various imaging methods is 41.8% for ultrasonography, 34.5% for scintigraphy and 64.3% for multispiral computed tomography (MSCT) [3]. The sensitivity of imaging methods in the diagnosis of double adenomas: 88% for MSCT, 65% for scintigraphy and 57% for ultrasonography [4]. The sensitivity of the scintigraphy is 68% for double adenomas [5]. The use of two imaging methods increases the accuracy of localization of a single parathyroid adenoma to 99% [6]. The inconsistency of the results of imaging methods reaches 38% in double gland disease [7].

Usually, patients with DGD undergo a bilateral neck exploration (BNE) with four-gland identification and intraoperative monitoring parathyroid hormone [2,3]. The intraoperative monitoring of PTH in 97.5% of cases predicted success or failure of treatment of DGD [8]. Grerogio et al. reports in his article about the levels of intraoperative PTH in the surgical treatment of DGD (68 cases) [3]. In 35.3% (n = 24) cases, parathyroid hormone analysis was taken after removal of the first adenoma, and in 64.7% (n = 44) cases after removal of

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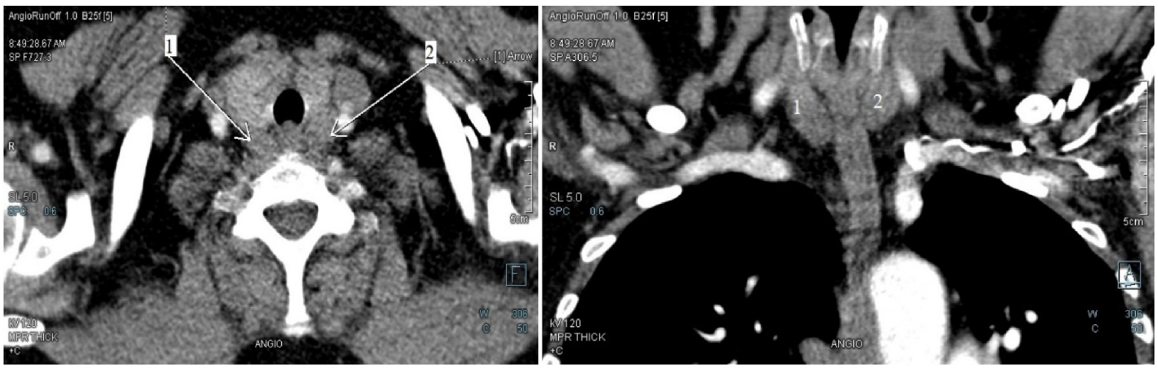

Fig. 1. Multi-slice CT scan with angiography: Sagital and Frontal scan right upper parathyroid gland (1) and left upper parathyroid gland (2).

two adenomas. The first group results of PTH were false positive [3].

Some authors claim, that intraoperative monitoring of PTH is sensitive to the detection of DGD and allows to determine the volume of resection [9,10]. Other authors inform, that intraoperative monitoring of PTH in 20–45% of cases did not allow the detection of a double adenoma [11,12].

We present our experience of surgical treatment of double parathyroid adenomas in patients with primary hyperparathyroidism.

2. Presentation of case

A 64-year-old woman has been under the care of endocrinologist with multinodular goiter for 7 years. Six months ago, she was referred to an endocrine surgeon in our clinic to evaluate a persistently elevating level of calcium. She has been complaining of nervousness and anxiety. In fact, she has not been suffering from pain in bones and joints and has not had pathological fractures, nephrolithiasis, gastropathy, as well as vitamin D deficiency. In the biochemical analysis of the patient's blood, the serum level of total calcium was increased - 2.79 mmol/l (reference values 2.1–2.6 mmol/l), ionized calcium - 1.64 mmol/l (reference values 1.15–1.27 mmol/l), parathyroid hormone - 191.4 pg/mL (reference values 15.0–68.3 pg/ml). The daily urinary calcium excretion was 7.66 mmol /day (reference values 2.5–6.25 mmol/day). An ultrasonography scan showed the presence of oval hypoechoic formations under the lower poles of both thyroid lobes: 15.0 × 8.0 × 22.0 mm in size under the right lobe and 21 × 13 × 27 mm under the left lobe. The total volume of the thyroid gland was 20.5 cm^3, the right lobe was 14.2 cm^3, the left lobe was 6.3 cm^3. A scintigraphy scan did not establish an increase in the functional activity of the parathyroid glands. MSCT scan showed the presence of formations on the posterior surfaces of both lobes of the thyroid gland with a density of 45–61 HU: 17 × 12 × 24 mm on the right and 15 × 10 × 24 mm on the left (Fig. 1). According to MSCT scan, the size of the right lobe of the thyroid gland was 33.6 × 23.4 × 35.6 mm, the isthmus was 10 mm, and the left lobe was 31 × 15 × 45.4 mm. In addition, the right lobe of the thyroid gland has been compressing and narrowing the diameter of the trachea to 12 mm. Bone mineral density scan showed that the minimum T-score was −2.6 in the lumbar spine.

According to a preoperative study, surgical intervention was planned in the amount of cervicotomy, BNE with four-gland identification and intraoperative monitoring parathyroid hormone, right-sided hemithyroidectomy.

The operation took place on January 22, 2020. A cervicotomy was performed according to a standard technique. An encapsulated right upper parathyroid gland measuring 2.5 × 1.5 × 1.0 cm in dark brown color was found dorsally to the right recurrent laryngeal nerve at the level of the middle third of the right lobe of the thyroid gland. The next step was an exploration of the central fatty tissue of the neck and upper horn of the thymus on the right. The right lower parathyroid gland was not reliably found. The upper left parathyroid gland 3.0 × 3.0 × 1.5 cm in size, dark brown, was found dorsally to the left recurrent laryngeal nerve and cranially to the upper pole of the left lobe of the thyroid gland. The left lower parathyroid gland 0.6 × 0.3 × 0.2 cm of gray-yellow color was found ventrally to the left recurrent laryngeal nerve and caudally to the lower pole of the left thyroid lobe. This gland was not visually changed. The mobilization of the right upper parathyroid gland was performed. This gland was removed without damaging the capsule. The operation was continued by mobilization and removal of the left upper parathyroid gland (Fig. 2).

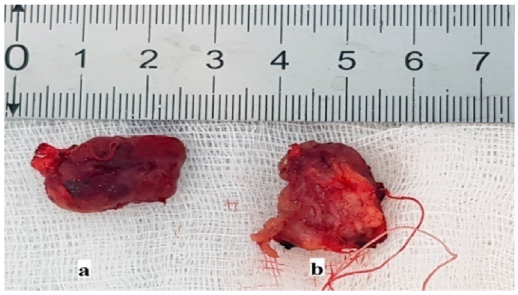

Fig. 2. Macrophotography of operative material. Excised right upper parathyroid gland (a) and left upper parathyroid gland (b).

The final stage was the intersection of the unpaired and superior thyroid artery and vein on the right, and extrafascial mobilization and removal of the right lobe of the thyroid gland with the isthmus under visual control and preservation of the right recurrent laryngeal nerve were performed. The operation was supplemented with a biopsy ¼ of the tissue of the left lower parathyroid gland for the purpose of histological control. The dynamics of the level of intraoperative monitoring of intact PTH (iPTH) was as follows: before the skin incision - 191.2 pg/ml; at the time of mobilization of the right upper parathyroid gland - 463.5 pg/ml; 10 min after removal of the right upper parathyroid gland - 189.4 pg/ml; after 10 min after removal of the left upper parathyroid gland - 36.3 pg/ml.

According to a histological study, the right and left upper parathyroid glands were represented by adenomas from the dark main cells (Fig. 3). They had capsule and a portion of unchanged parathyroid tissue with the light main cells. On sections of a biopsy ¼ of the left lower parathyroid gland, there was normal parathyroid tissue.

In the postoperative period, laryngoscopy was performed, on which the normal mobility of the vocal folds was established. On the first day after surgery, the level of PTH was 0.7 pg/ml. By the fourth

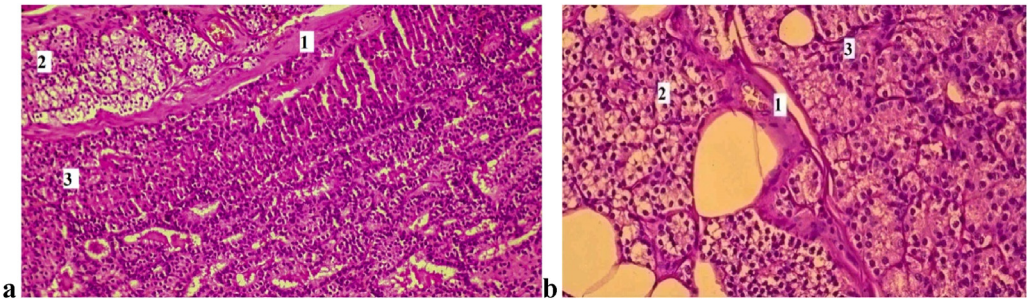

Fig. 3. Microphotography of operative material.Tinted with hematoxylin and eosine. (a) Magnification 10 × 0,25. Tissue of the left upper parathyroidgland adenoma (3) with a capsule (1) and a fragment of unchanged parathyroid tissue (2). (b) Magnification 20 × 0,45. Tissue of the right upper parathyroidgland adenoma (3) with a capsule (1) and a fragment of unchanged parathyroid tissue (2).

day, the level of ionized calcium decreased to 1.07 mmol/l. Substitution therapy was prescribed in the amount of calcium carbonate 4 g per day and alfacalcidol 4 mcg per day. Hypocalcemia was stopped. The patient was discharged on the 7th day after the operation under the care of an outpatient surgeon and endocrinologist.

3. Discussion

This clinical case confirms the existing point of view about double adenomas as a separate clinical unit [2]. According to the data of preoperative examination (ultrasound, MSCT), an increase in the parathyroid glands on both sides (upper left and upper right parathyroid glands) was established. By scintigraphy, the localization of enlarged parathyroid glands was not established. This confirms literature data that the sensitivity of imaging methods decreases when double adenomas are detected [4,5,7]. Based on the experience of surgical treatment of double adenomas [2,3], BNE was planned with a visual assessment of all parathyroid glands. The decrease in the level of iPTH after removal of the first adenoma was 59.1% of the level at the time of its mobilization. From the point of view of the "Miami criterion" [13] the test is positive. However, knowing the presence of a second adenoma, the test was of an academic nature. The decrease in the level of iPTH after removal of the second adenoma was 92.1% of the level at the time of mobilization of the first adenoma and reached reference values. An assessment of the levels of iPTH confirms the literature data that the sample has a low sensitivity in the detection of double adenomas [11,12]. The last test of iPTH allowed us not to continue the search for the fourth parathyroid gland and to shorten the operation time. The decision was correct, because by the time the patient was discharged, remission of primary hyperparathyroidism was achieved.

4. Conclusion

Double adenomas in primary hyperparathyroidism are a difficult diagnostic and therapeutic task. A comprehensive and thorough assessment of all methods for visualization of the parathyroid glands at the preoperative stage, including using MSCT angiography and MRI to establish multi-gland disease, is required. Double adenomas require a bilateral neck audit with a visual assessment of all parathyroid glands. A positive test during intraoperative monitoring of iPTH does not exclude a double adenoma in a patient.

Declaration of Competing Interest

The authors report no declarations of interest.

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No funds were received for any part of this case report.

Ethical approval

This case report is exempt from ethical approval at our institution as this is not a research study.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contribution

Ilyicheva E.A. – the surgical stage of therapy; data analysis and interpretation; development of the concept and design; substantiation of the manuscript and verification of critical intellectual content; editing and final approval of the manuscript.

Bersenev G.A. – development of the concept and design; collection of material, analysis and interpretation of data, substantiation of the manuscript and verification of critical intellectual content.

Registration of research studies

1. Name of the registry: Not required.
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