CLINICAL ARTICLE
GIANT PARATHYROID ADENOMA - A DIFFICULT DIAGNOSIS OR A LACK OF SPECIALIST TRAINING?

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Received: Jul. 26, 2023; Accepted: Aug. 27, 2023; Published: Sep. 5, 2023

Abstract
A clinical observation of a 48-year-old patient with a giant adenoma of the left lower parathyroid gland is presented. Peculiarities of preoperative planning of asymmetrical mini-access on the anterior surface of the neck and methodology of intraoperative optimization of the key parameters of surgical access in the process of tumor mobilization are shown. Considering the difficulties arising in the process of diagnostics and treatment of the disease, importance of additional information of wide range of specialists concerning clinical manifestations, peculiarities of diagnostics and treatment of patients with primary hyperparathyroidism on the background of the solitary parathyroid adenoma is pointed out. The expediency of additional specialization of surgeons within the framework of the multidisciplinary specialty "Surgical Cervicology", previously proposed by the authors, is emphasized.

Keywords: parathyroid adenoma, mini-access, surgical cervicology
**Introduction**

The neck is an area of interest to 14 surgical disciplines - traumatology and orthopedics, neurosurgery, vascular surgery, endocrine surgery, general and abdominal surgery (esophagus), otorhinolaryngology, thoracic surgery, combustiology, endoscopy, endovideosurgery, oncology, damage-control surgery, plastic surgery, etc. This is because the most important anatomical objects belonging to different human organs and organ systems (central nervous, cardiovascular, respiratory, digestive, endocrine, musculoskeletal, lymphatic, and integumentary systems) are concentrated in the neck area. Of the existing organ systems of the body, only elements of the urinary and reproductive systems are missing in the neck area. The uniqueness of the neck in terms of topographic anatomy lies in its extreme mobility. Biomechanical studies have established that flexion of the neck is normally 85°, and extension is 70°. Tilting to the right or left has an amplitude of up to 40°, and the ability to twist when turning the head is 80’ to each side. Due to these abilities, the relative positioning of organs and anatomical entities of the predominantly anterior part of the neck also changes significantly when changing the position of the head. During in vivo topographic-anatomical studies using magnetic resonance imaging (MRI) on volunteers, we found that, for example, the vertical mobility of the thyroid gland relative to the jugular notch of the sternum is on average 1 cm (0.7 to 1.3 cm).

Despite a wide range of surgeons working on the neck, some well-known diseases that are relatively common and cause severe pathological changes in the various organs and systems of the human body may not be recognized by specialists even in modern conditions for a long time. This applies to primary hyperparathyroidism (PHPT) with parathyroid adenoma (PTA). It is the third most common endocrine disorder after diabetes mellitus and thyroid disease. The incidence in adults averages 1-2%.\(^1\)

Solitary PTA is the cause of PHPT in 80-90% of cases, in 10-15% of cases PHPT is caused by hyperplasia of four parathyroid glands, in 5% by multiple PTAs, and in less than 1% by parathyroid cancer.\(^2\) Giant PTA (weight greater than 3.5 g) is a relatively rare pathology.\(^3\) Surgical interventions for solitary PTA are currently performed predominantly using minimally invasive approaches.\(^4,6\) The unique mobility of the neck can be used to optimize the parameters of a surgical mini-access to an altered parathyroid gland.

**Clinical case**

Patient L., 48 years old was admitted for planned surgical treatment to City hospital of Saint Elizabeth, St. Petersburg (clinical site of the department of operative and clinical surgery with topographic anatomy named after S. A. Simbirtsev) on 25 January 2023 with a diagnosis of adenoma of the left lower parathyroid gland. The patient was preliminarily consulted and examined in the out-patient department of the hospital. Past medical history showed that on 25.07.2022, against the background of infection (Covid-19), the patient had nagging pain in the right lower extremity from hip to knee joints. She was treated with non-steroidal anti-inflammatory drugs (NSAIDs) for 14 days as an outpatient for the pain. The pain syndrome was soothed.

After 2 months, the pain in the lower extremity resumed, with pain in the ribs on both sides. She also had severe chest pain when breathing and moving the right lower extremity, which was mainly in the hip joint area. The pain later spread to the lumbar spine. The pain syndrome worsened during treatment in the outpatient clinic. The patient was admitted to the neurology department of the hospital with the diagnosis "degenerative-dystrophic disease of the lumbosacral spine with pain syndrome and restricted walking". During treatment, she received glucocorticosteroids, NSAIDs, B vitamins, opioid analgesics, and physiotherapy for the lumbosacral spine. The pain syndrome has been partially relieved.

02.12.2022 consulted oncologist. Osteoscintigraphy on a single-photon emission computed tomography E. CAM var. (Siemens) scintigraphic signs of total skeletal bone damage was found. The diagnosis was “Multiple myeloma with osteolytic bone disease, mainly of the pelvic bones. Osteoporosis. Neoplasia of the left lobe of the thyroid gland or parathyroid gland”. Chemotherapy was suggested. At the same time, she was also consulted by a haematologist - recommended a bone marrow trepan biopsy, which the patient refused to have.

On 06.12.22 (about 6 months after the onset of the disease), the patient was examined for the first time to

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detect PHPT and PTA. A spiral computed tomography (CT) scan of the neck and thorax revealed a giant adenoma of the left lower parathyroid gland descending into the posterior mediastinum (Figure 1), systemic osteoporosis including the spine (rarification of bone trabeculae, accentuation of longitudinal trabeculae) (Figure 2) and chest wall deformity due to pathological rib fractures (Figure 3).

In the biochemical blood tests, there were significant increases in blood alkaline phosphatase (1764 units/l); total serum calcium (3.05 mmol/l); and parathormone (3057 pg/ml). Absolute indications for selective parathyroidectomy surgery (removal of the altered left lower parathyroid gland) were established.

The data obtained from spiral CT scan of the neck were used in the planning of the surgical intervention. The optimum location of the center of the mini-access was determined by holotopy of the central part of the tumor. The planned depth of the surgical wound was calculated as perpendicular from the center of the surgical access to the posterior surface of the PTA. Given that the angle of surgical approach should not be less than 15°, we calculated the optimal length of

Figure 1. Spiral CT of the neck and upper mediastinum

Figure 2. CT of the spine. Sagittal (A) and coronal (B) reconstructions. Signs of osteoporosis (indicated by arrows)

Figure 3. CT of the thoracic organs. Chest wall deformity (indicated by arrows)
the asymmetric mini-access to the tumor, which was 1.14 cm (Figure 4).

The surgery was performed on 26.01.23 under general combined anaesthesia. To intraoperatively improve the parameters of surgical access to different parts of the tumor, we used previously obtained data on the displacement of anatomical structures in the anterior part of the neck when the head position was changed. To mobilize the lower pole of PTA, maximal extension of the neck was performed intraoperatively; thus, the wound depth was reduced from 65 to 60 mm. To optimize access to the upper pole of the tumor, moderate head flexion was performed resulting in an 8 mm reduction in wound depth at this stage of the operation. During mobilization of the medial parts of the tumor, the patient's head was turned 45˚ to the outside and 45˚ to the inside during mobilization of the lateral parts. This increased the angle of surgical action by 7˚ relative to the initial position. At the final stage of the intervention, the length of the skin access was increased to 2.5 cm to remove the mobilized specimen due to its size.

Macroscopic description of the specimen (Figure 5): a 7 x 3 x 1.5 cm grayish-yellow, lobular formation.

The tissue is homogeneous. Histological report: Light cell adenoma of the parathyroid gland (Figure 6).

In the postoperative period, correction of hypocalcemia developed after tumor removal was performed in the surgical department and after the patient was transferred to a day-care hospital. On the 5th day after surgery with a sudden decrease of the total blood calcium level to 1.05 mmol/l the patient developed generalized tenderness syndrome which required intensive therapy in the Intensive Care Unit for 1 day. Complete normalization of blood calcium levels was achieved on the 15th day after the intervention.

Discussion

The widespread prevalence in the general population of solid PTA as a cause of PHPT (about 85% of observations), the availability of clinical guidelines of the Russian Ministry of Health devoted to this disease, with information on its prevalence, clinical manifestations, diagnostic and treatment methods, does not always lead to timely diagnosis and treatment of this type of pathology. Despite widespread use in modern clinical practice of laboratory determination of the level of parathormone, total and ionized blood calcium, spiral CT as a method of visualization of anatomical objects and tumors (these methods are usually sufficient for diagnosis of PHPT caused by a giant solitary PTA), the diagnosis...
in a patient of working age was established only 7 months after the appearance of a pronounced clinical manifestation of the disease. This was after oncologists were ready to treat the mistakenly suspected myeloma after special skeletal examinations had been carried out. Insufficient monitoring of blood calcium levels in the early post-operative period led to the development of a generalized seizure syndrome with severe hypocalcemia, which required the transfer of the patient to the Intensive Care Unit. These data indicate a lack of awareness among doctors of various specialties about the clinical manifestations of PHPT against the background of PTA, methods of its diagnosis and peculiarities of the early postoperative period after its removal.

Conclusion

Preoperative planning of the location and size of a surgical mini-access using SCT data, as well as intraoperative optimization of surgical access parameters, based on the features of the positional topography of the neck, proposed by us, may contribute to minimizing surgical trauma in removing PA. Additional surgical specialization in the previously proposed multidisciplinary surgical specialty “Surgical cervicology” can improve the quality of surgical care for patients with PA.9

Funding Additional information

Conflict of interest and financial disclosure

The author declares that he has no conflict of interest and there was no external source of funding for the present study. None of the authors have any relevant financial relationship(s) with a commercial interest.

Ethical approval

Research protocol was approved by the local Ethical Committee (2018/23) and in accordance with those of the World Medical Association and the Helsinki Declaration.

Informed consent

Informed consent was obtained from all individual participants included in the study.

Source of Funding

Non funding.

Availability of Data and Materials

Not applicable.

Acknowledgements

Not applicable.

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Giant parathyroid adenoma

Journal of Stomatology and Maxillofacial Surgery, Vol. 19 № 3

2017;353(5):506. 
doi:10.1016/j.amjms.2016.08.009


Представлено клиническое наблюдение пациентки 48 лет с гигантской аденомой левой нижней околощитовидной железы. Показана особенности предоперационного планирования ассиметричного минидоступа на передней поверхности щен и методика интраоперационной оптимизации ключевых параметров хирургического доступа в процессе мобилизации опухоли. Учитывая сложности, возникшие в процессе диагностики и лечения заболевания, указано на важность дополнительного информирования широкого круга специалистов о клинических проявлениях, особенностях диагностики и лечения пациентов с первичным гиперпаратиреозом на фоне солитарной аденои околощитовидной железы. Подчеркнута целесообразность дополнительной специализации врачей-хирургов в рамках ранее предложенной авторами мультидисциплинарной специальности «Хирургическая цервикология».

Абстракт

Представлено клиническое наблюдение пациентки 48 лет с гигантской аденомой левой нижней околощитовидной железы. Показана особенности предоперационного планирования ассиметричного минидоступа на передней поверхности щен и методика интраоперационной оптимизации ключевых параметров хирургического доступа в процессе мобилизации опухоли. Учитывая сложности, возникшие в процессе диагностики и лечения заболевания, указано на важность дополнительного информирования широкого круга специалистов о клинических проявлениях, особенностях диагностики и лечения пациентов с первичным гиперпаратиреозом на фоне солитарной аденои околощитовидной железы. Подчеркнута целесообразность дополнительной специализации врачей-хирургов в рамках ранее предложенной авторами мультидисциплинарной специальности «Хирургическая цервикология».