E.A. Ilyicheva, G.A. Bersenev, V.S. Petrova , E.Yu. Pisarskaya, D.V. Belykh

IMPORTNACE OF PREOPERATIVE DIAGNOSIS OF ABERRANT RIGHT SUBCLAVIAN ARTERY IN PARATHYROID SURGERY: THE CLINICAL OBSERVATION

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Aberrant right subclavian artery (arteria lusoria) is an abnormality in the development of the aortic arch and its branches, which is often associated with the right non-recurrent laryngeal nerve. The presence of this anatomical variant increases the risk of intraoperative damage to the laryngeal nerve to 12.9% (in the classic version, the risk is 1-2%). **The purpose of this article** is to show a clinical observation of the preoperative diagnosis of arteria lusoria when planning surgical intervention for a patient with benign parathyroid disease. **Presentation of the case**. This clinical case presents a 53-year-old male patient with primary hyperparathyroidism. During an additional preoperative examination (MRI) in order to search for the localization of parathyroid adenoma and to exclude multiple disease of the parathyroid glands, an aberrant right subclavian artery was detected. To clarify the vascular architectonics of the branches of the aortic arch, multispiral computed (MSCT) angiography of the brachycephalic arteries was performed. The study showed that the first branch of the aortic arch is the common mouth of the carotid arteries, the second is the left subclavian artery and the third is the right subclavian artery (type H according to the Adachi – Williams classification). The latter goes from left to right in an oblique-lateral direction behind the esophagus, deforming its lumen along the posterior wall. A vascular anomaly was an accidental find that played a significant role in planning the progress of the operation. As a result of the preoperative assessment of the patient's anatomical features, the intraoperative trauma and the search time for the non-recurrent laryngeal nerve and parathyroid adenoma were minimal. **Discussion and conclusions.** We consider it necessary to use all possible methods for imaging the parathyroid glands, including MSCT angiography, MRI in order to exclude the possibility of multiple disease when planning surgical intervention for a patient with primary hyperparathyroidism. In this clinical case, this approach made it possible to diagnose an aberrant right subclavian artery in the preoperative period and suggest an association with an non-recurrent right laryngeal nerve.

Keywords: aberrant right subclavian artery, arteria lusoria, non-recurrent right laryngeal nerve, primary hyperparathyroidism, parathyroidectomy.

Introduction. Aberrant right subclavian artery is the most common anomaly in the development of the aortic arch and its branches [3]. According to autopsy studies, the prevalence of this anomaly ranges from 0.16 - 4.4% in the general population [12,14].

The first description of the aberrant right subclavian artery was given by Hanuld in 1735 [18]. D. Bayford in 1761 published an observation by a patient with long-term dysphagia, which led to her death. At autopsy, the author found an abnormal discharge of the right subclavian artery compressing the esophagus [5]. It was D. Bayford who called this anomaly “arteria lusoria” and the most common symptom is “dysphagia lusoria” from the Latin phrase “lusus naturae”, which literally translates as “freak of nature”. According to the Adachi – Williams classification, there are 4 types of arteria lusoria: type G — the right subclavian artery departs from the distal part of the aortic arch with the last branch. The remaining branches of the aortic arch depart unchanged; type CG - the right subclavian artery departs, as in type G, the left vertebral artery - from the aortic arch; type H - the right subclavian artery departs, as in type G, the common right and left carotid arteries depart as a single trunk; type N - is a reflection of type G [4.15]. In addition, 3 variants of the location of this anomaly are distinguished depending on the relationship to the trachea and esophagus: behind the esophagus (80%), between the esophagus and trachea (15%) and before the trachea (5%) [10].

Most often, the aberrant subclavian artery is combined with developmental abnormalities such as Commerl's diverticulum (saccular aneurysmal expansion in the area of the mouth of the left subclavian artery), the common mouth of the carotid arteries, Fallot tetrad, interventricular septal defect, atresia of the pulmonary trunk, pulmonary arteries [2]. From the point of view of the endocrine surgeon, it is extremely important to know about the combination of arteria lusoria with the right non-recurrent laryngeal nerve (NRLN). G. Stedman in 1823 for the first time reported the right of NRLN, which was accompanied by an anomaly in the branching of the branches of the aortic arch [16]. NRLN is a rare anatomical variant, in which the nerve departs from the cervical region of the vagus nerve and enters the larynx, without forming a loop under the subclavian artery in the mediastinum [8]. The prevalence of NRLN in the population is 0.3-0.8% on the right, 0.004% on the left [11] and is closely related to vascular abnormalities of the aortic arch [17]. The presence of this anatomical variant increases the risk of intraoperative damage to the laryngeal nerve to 12.9% (in the classic version, the risk is 1-2%) [17].

The main aim of this article is to show a clinical observation of the preoperative diagnosis of arteria lusoria when planning surgical intervention for a patient with primary hyperparathyroidism.

Presentation of case.

A 53-year-old patient turned to a local neurologist with complaints of anxiety in 2019. During the examination, an el-

ILYICHEVA Elena A. – Dr. Sc. (Med.), Professor, Head of the Scientific Department of Clinical Surgery, Irkutsk Scientific Centre of Surgery and Traumatology; Thoracic Surgeon at the Thoracic Surgical Department, Irkutsk Regional Clinical Hospital, e-mail: lena_isi@mail.ru, SPIN-код: 3624-4643, ORCID: http://orcid.org/0000-0002-2081-8665, тел.89025768100, **BERSENEV Gleb A.** – Postgraduate, Irkutsk Scientific Centre of Surgery and Traumatology, e-mail: glbersenev17@gmail.com, SPIN-код: 1467-8503, ORCID: http://orcid.org/0000-0002-6887-8325, тел.89526163222, **PETROVA Veronica S**.–radiologist at the X-ray computed and magnetic resonance imaging Department, Irkutsk Regional Clinical Hospital, e-mail: vspetrova2019@yandex.ru ,тел.89027607657, **PISARSKAYA Ekaterina Yu**. - radiologist at the X-ray computed and magnetic resonance imaging Department, Irkutsk Regional Clinical Hospital, e-mail: catherinepisarskaya@yandex.ru, **BELYKH Diana V**.- Head of the Department of General Pathology, Pathologist, Irkutsk Regional Pathological Office, e-mail:89246050301@bk.ru, тел.89994204033

evated serum level of total calcium was detected (02.15.2019) - 2.66 mmol / l (reference values: 2.10-2.60 mmol / l) and parathyroid hormone (02.15.2019) - 73.68 pg / ml (reference values: 15.00-65.00 pg / ml). According to the ultrasound examination (ultrasound) of the thyroid gland (03/07/2019): a hypoechoic homogeneous formation 1.2 × 0.9 × 0.9 cm in size was determined from the posterior contour of the right thyroid gland. To determine further treatment tactics, he was referred to an endocrine surgeon at the Irkutsk Regional Clinical Hospital (IRCH).

In 2020, it was examined on the basis of the IRCH. In the patient's biochemical blood analysis (02.26.2020), the serum level of total calcium was increased - 2.69 mmol / l (reference values 2.1-2.6 mmol / l), ionized calcium - 1.5 mmol / l (reference values 1.15-1.27 mmol / l), parathyroid hormone - 78.4 pg / ml (reference values 15.0 - 68.3 pg / ml). The daily urinary calcium excretion was 12.24 mmol / day (reference values 2.5-6.25 mmol / day). On scintigraphy, an increase in the functional activity of the parathyroid glands was not significantly established. The minimum T-score according to osteodensitometry was -1 in the neck of the left femur. Ultrasound scanning of the kidneys revealed the presence of microliths in both kidneys. In order to clarify the localization of the thyroid adenoma, magnetic resonance imaging (MRI) of the neck was performed with intravenous contrast (03.03.2020), on which the right upper thyroid gland, enlarged to 1.5x1.0x1.0 cm, was located at the lower pole of the right lobe of the thyroid gland (Thyroid gland) (Fig. 1).

In addition, it was found that the right subclavian artery is located behind the esophagus and departs directly from the aortic arch. To clarify the vascular architectonics of the branches of the aortic arch, multispiral computed (MSCT) angiography of the brachycephalic arteries was performed. The study showed that the first branch of the aortic arch is the common mouth of the carotid arteries, the second is the left subclavian artery and the third is the right subclavian artery (type H according to the Adachi – Williams classification) (Fig. 2a).

The latter one goes from left to right in an oblique-lateral direction behind the esophagus, deforming its lumen along the posterior wall (Fig. 2b).

According to a preoperative study, the patient was scheduled for surgery in the amount of cervicotomy, right upper parathyroid parathyroidectomy, a biopsy of the right lower thyroid with intraoperative monitoring of parathyroid hormone.

The operation took place on 03.04.2020. According to the standard method, a cervicotomy and access to the thyroid gland were performed. The patient had a peculiarity of vascular architectonics: an additional artery located deeper than the common carotid artery. Non-recurrent right lower laryngeal nerve extending from the vagus nerve in the neck, at the level of the upper pole of the thyroid gland, was also found (Fig. 3).

An encapsulated right upper parathyroid gland 1.5 x 1.0 x 1.0 cm dark brown in color was found dorsally with respect to the right non-recurrent laryngeal nerve at the level of the middle third of the right thyroid gland, encapsulated. Ventrally with respect to the right non-recurrent laryngeal nerve, at the level of the lower third of the right thyroid lobe, caudal to the lower pole of the right lobe of the thyroid gland, the left lower parathyroid gland of 0.6x0.3x0.2 cm of gray-yellow color was not visually changed. The mobilization and removal of the right upper thyroid and a 1/3 biopsy of the right lower thyroid for histological control were performed. The dynamics of the level of intraoperative monitoring of intact PTH was as follows: before the skin incision - 129 pg / ml; at the time of mobilization of the right upper parathyroid gland - 192 pg / ml; 10 minutes after removal of the right upper parathyroid gland - 36.3 pg / ml. The intraoperative test according to the Miami criterion is positive.

According to a

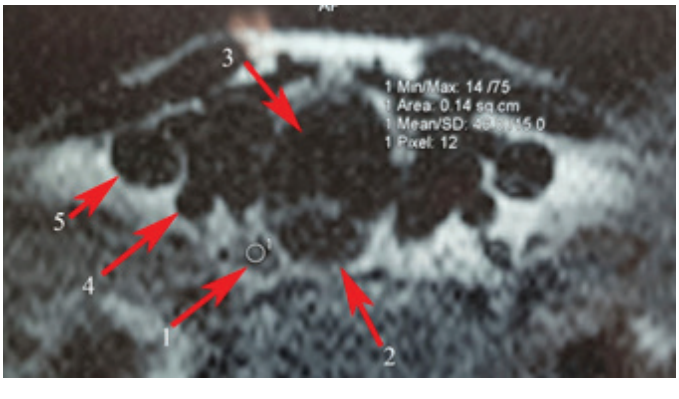
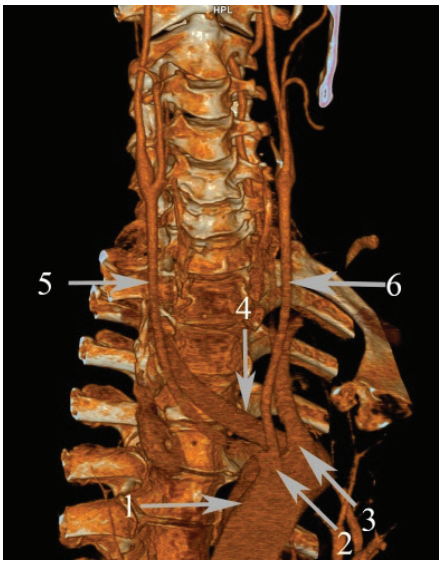
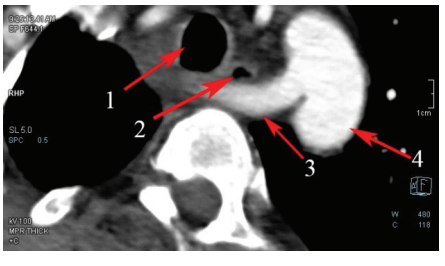


Fig. 1. MRI-image. MRI of the neck with intravenous contrast. Arrows indicate anatomical structures: 1 - the right upper parathyroid gland; 2 - the esophagus; 3 - trachea; 4- right common carotid artery



a



b

Fig. 2a. MSCT-image. 3D reconstruction, frontal projection. Angiography of the aortic arch and its branches. Arrows indicate vascular structures: 1 - aortic arch; 2 - a common trunk of the common carotid arteries; 3 - the left subclavian artery; 4- aberrant right subclavian artery; 5 - right common carotid artery; 6 - the left common carotid artery.

Fig. 2b. MSCT-image. Axial projection. Angiography of the aortic arch and its branches. Arrows indicate anatomical structures: 1 - lumen of the trachea; 2 - the lumen of the esophagus; 3 - aberrant right subclavian artery; 4- aortic arch

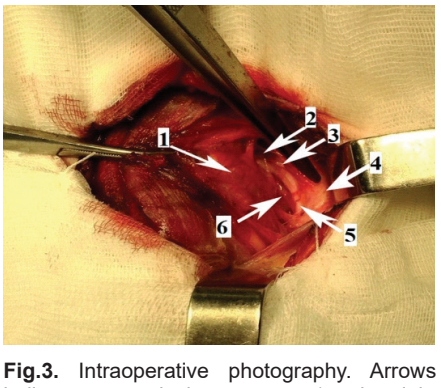


Fig.3. Intraoperative photography. Arrows indicate anatomical structures: 1 - the right lobe of the thyroid gland; 2- lower edge of adenoma of the right upper parathyroid gland; 3 - the right non-recurrent laryngeal nerve; 4- right common carotid artery; 5 - the right vagus nerve; 6 - upper edge of adenoma of the right upper parathyroid artery

histological study, the right upper parathyroid gland is represented by an adenoma from the dark main cells. She had her own capsule and a portion of unchanged tissue of the parathyroid gland from the main light cells on the periphery (Fig. 4). On biopsy sections, 1/3 of the right lower parathyroid gland had normal tissue structure.

In the postoperative period, laryngoscopy was performed - normal mobility of the vocal folds was established. On the 1st day after surgery, the level of PTH was 32.6 pg / ml. The total blood calcium was determined on 05.03.2020 2.26 mmol / l (albumin 48 g / l), 06.03.2020 - 2.54 mmol / l (albumin 44 g / l). On day 2, drainage was removed. Sutures were removed on day 7, healing by first intention. Discharged under the supervision of an outpatient surgeon and endocrinologist.

Discussion. According to the 2017 meta-analysis, the prevalence of NRLN on the right is 0.7%, and in 86% this anatomical feature is associated with an aberrant subclavian artery [9]. Another study reported a combination of NRLN with arteria lusoria in 97.7% of cases [6]. A high percentage of combination of NRLN with an aberrant right subclavian artery entails a high risk of intraoperative damage to the laryngeal nerve. Options for preoperative diagnosis of NRLN were considered. Ultrasound proved to be a simple, non-invasive, cost-effective method for diagnosing NRLN with a sensitivity of 99-100% and a specificity of 41-100% [7]. MSCT is an indirect method for the diagnosis of NRLN by detecting an aberrant right subclavian artery [13]. In most cases, the association of NRLN with the aberrant subclavian artery is established retrospectively in the postoperative period after targeted detection of an abnormality of the laryngeal nerve during surgery [1]. In the presented clinical case, diagnostic imaging methods (MRI, MSCT) were used to search for adenomas and exclude the multiple nature of the thyroid lesion (due to the negative result of scintigraphy). It should be noted that MRI was performed before MSCT for technical reasons, and not because of the preference of this method. A vascular anomaly was an accidental find that played a significant role in planning the progress of the operation. As a result of the preoperative assessment of the patient's anatomical features (Fig. 5), the intraoperative trauma and the time of searching for NRLN and parathyroid gland were minimal.

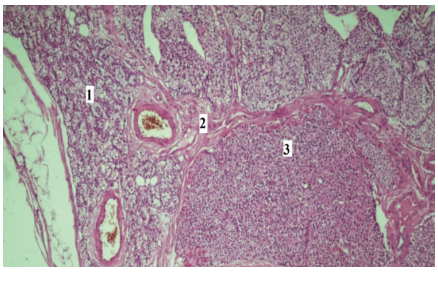


Fig.4. Microphotography of operational material. Hematoxylin-eosinoma staining. Magnification 10x0.25. Tissue of the right upper parathyroid gland. A section of unchanged tissue with light main cells (1), a section of connective tissue capsule (2), a section of adenoma tissue from the main dark cells (3).

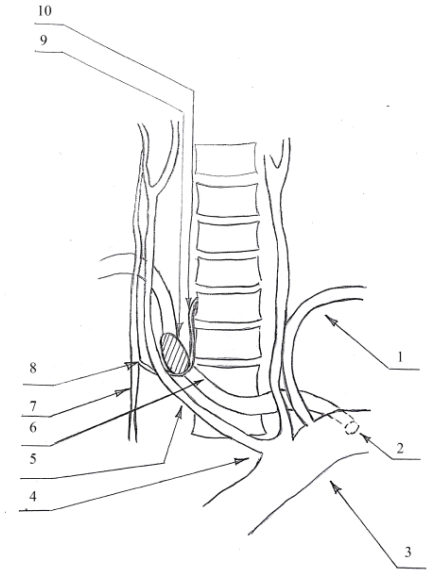


Fig.5. Schematic representation of the vascular architectonics of the branches of the aortic arch in relation to the right upper parathyroid gland and the right irreversible laryngeal nerve. Arrows indicate anatomical structures: 1 - left subclavian artery; 2- the mouth of the aberrant right subclavian artery; 3- aortic arch; 4- common mouth of the common carotid arteries; 5- left common carotid artery; 6- aberrant right subclavian artery; 7 - the right vagus nerve; 8.10 - the right non-recurrent laryngeal nerve; 9 - the right upper parathyroid gland.

Conclusion. The high frequency of association of the aberrant right subclavian artery with non-recurrent laryngeal nerve and the high risk of its intraoperative damage explains the high significance of this anomaly in parathyroid surgery. Given the low incidence of this anatomical variant in the population, a routine preoperative search is not economically feasible. When planning surgical intervention for primary hyperparathyroidism, we consider it necessary to use all possible methods for imaging the parathyroid glands, including MSCT angiography, MRI in order to exclude the possibility of multiple lesions. In this clinical case, this approach made it possible to diagnose an aberrant right subclavian artery in the preoperative period and suggest an association with non-recurrent right laryngeal nerve. The suggestion was confirmed intraoperatively and helped to avoid trauma to the laryngeal nerve.

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I.V. Krestyashin, A.Yu. Razumovskiy, V.M. Krestyashin, I.I. Kuzhelivskiy

TREATMENT OF CONGENITAL FOOT DEFORMITY IN CHILDREN

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Foot deformities in children with no proper correction are often accompanied by pain, functional changes and high risk of developing disability, which determines the high social significance of the nosology. The aim of this study was to evaluate the effectiveness of treatment of children's foot deformities in outpatient and inpatient settings. In the period from 2015 to 2020 109 children were examined and treated at the clinical base of the Moscow City Children's Clinical Hospital named after N.F. Filatov. The results of the study showed that in all children after the comprehensive assessment and the combination of conservative and operative correction techniques, there was complete elimination of congenital foot deformity. To achieve the complete and effective res equino-varus correction, the Ponseti procedure must be carefully followed. The early detection and correction of foot deformity is effective.

Keywords. clubfoot, adducted foot, vertical ram, congenital foot deformity, Ponseti procedure, pes equino-varus, metatarsus varus, vertical talus, pes varus, pes planovalgus, pes cavus.us.

Introduction. Pathology of the foot of congenital etiology is represented by such nosologies as Pes equino-varus (clubfoot), metatarsus varus (reduced foot), vertical talus (vertical RAM), pes varus (varus foot), pes planovalgus (flat foot), pes cavus (hollow foot). According to ICD-10 code Q66.5. The epidemiology of pes equino-varus is 1 per 1000 newborns [4], while vertical talus and metatarsus varus are quite rare [3, 8].

These nosologies are accompanied by a pronounced pain syndrome, functional changes in foot, which forces the patient to use orthopedic shoes. In the absence of proper surgical correction, the risk of disability is high. Functional disorders affect the patient's quality of life and determine the high social significance of these nosologies [5].

To date, there are a number of classifications of congenital foot pathology. According to Zatsepin-Bohm, there are two clinical forms of Pes equino-varus: typical and atypical [6]. Based on the literature available to us, the typical type of deformation accounts for 80% of cases. This type of deformity lends itself well to such treatment methods as bandaging and plaster casting.

There are also three types of soft tissue component involvement - soft tissue and bone (rigid). Belonging to a particular type of pathology is distinguished by the possibility and effectiveness of a conservative method of treatment. A number of soft-tissue types of deformations are described in the literature as the most common [1].

The aim of the study was to improve the results of treatment of pes equino-varus using the Ponseti procedure, as well as vertical talus correction by Dobbs in children in combination with massage, physiotherapy and physical therapy.

Materials and methods. In the period from 2015 to 2020, a double prospective cohort study was conducted at the clinical base of the Moscow state medical UNIVERSITY named after N. F. Filatov. 109 children with congenital deformities of the feet were selected for treatment with the proposed methods.

During the examination, 102 children (93.6%) were diagnosed with a typical and 7 (6.4%) with an atypical form of pes equino-varus. The soft tissue form was found in 51.4% of cases (in 56 children), and in 48.6% - the bone form (53 children). In 22.0% of cases, we found a left - sided type of deformity (24 children), in 18.3% - a right-sided type (20 children), and in 59.6% of cases (65 children), a bilateral lesion.

According to the age at which the deformity was detected, the patients were distributed as follows. In 73.4% of cases, deformity was diagnosed before 3 months (80 children), in 6.4% of cases from 3 to 6 months – (7 children), in 20.2% of cases over the age of 6 months (22 children). The average start time of clinical follow-up was 1.0 (1.0; 3.5) months. The average start time of treatment was 1.0 (1.0; 4.0) months. The average duration of surgical intervention was 3.0 (2.0; 4.25) months.

Surgical correction was performed in 100% of cases (91 children) with pes equino-varus and in 50% of cases (3 children) with vertical talus. Metatarsus varus

KRESTYASHIN Ilya Vladimirovich - Cand. honey. Sci., Associate Professor of the Department of Pediatric Surgery, N.I. Pirogov of the Ministry of Health of Russia, pediatric surgeon of the Children's City Clinical Hospital No. 13 named after N.F. Filatov, Moscow. Tel. 89037186634, krest_xirurg@mail.ru, **RAZUMOVSKIY Alexander Yurievich** - Dr. med. Sci., Professor, Corresponding Member of the Russian Academy of Sciences, Head. Department of Pediatric Surgery, Russian National Research Medical University named after N.I. Pirogov, Ministry of Health of Russia, head. Department of Thoracic Surgery, Children's City Clinical Hospital № 13 named. N.F. Filatov, Moscow, **KRESTYASHIN Vladimir Mikhailovich** - Dr. med. Sci., Professor, Professor of the Department of Pediatric Surgery, N.I. Pirogov of the Ministry of Health of Russia, pediatric surgeon of the Children's City Clinical Hospital No. 13 named after N.F. Filatov, Moscow. Tel. 89035065024, **KUZHELIVSKIY Ivan Ivanovich** - Dr. med. Sci., Associate Professor, Associate Professor, Department of Pediatric Surgical Diseases, FSBEI HE Siberian State Medical University, Ministry of Health of Russia, Tomsk Tel. 896277 88702, 9627788702@mail.ru.