

SURGICAL ASPECTS OF STRUMECTOMY FOR TOXIC GOITER

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Abstract: The results of surgical treatment of 112 patients with toxic forms of goiter were analyzed. The technical techniques for performing individual stages of strumectomy have been improved, which made it possible to avoid intraoperative complications. A reduction in the time period for performing complex stages was achieved from 15.8 ± 0.9 to 6.7 ± 0.5 minutes ($p < 0.001$) and, accordingly, the total operation time from 92.7 ± 4.8 to 63.4 ± 3.6 minutes ($p < 0.001$).

Key words: diffuse toxic goiter, surgical treatment.

Relevance Treatment of patients with diffuse toxic goiter (DTG) remains an unsolved problem of modern medicine and, first of all, this is due to the fact that there is no single generally accepted approach to the treatment of this category of patients [5]. It is known that through conservative therapy it is not always possible to achieve a lasting clinical effect, and relapse of the disease, according to various sources, can reach 40% [1,3,4]. In Uzbekistan, surgical methods play a leading role in the treatment of these patients [2]. At the same time, the choice of the optimal volume of surgery for a particular patient with DTG remains a subject of discussion.

Purpose of the study. To improve technical techniques for performing strumectomy in patients with toxic forms of goiter.

Research material.

The study included the results of treatment of 112 patients with toxic forms of goiter admitted to the surgical departments of the multidisciplinary clinic of Samarkand State Medical University and city medical association No. 1 in the period from 2012 to 2021. The patients were conditionally divided into two study groups. In 2012-2016 52 (46.4%) patients who made up the comparison group were operated on from 2017 to 2021. 60 (53.6%) patients who were included in the main group underwent surgery. In the main group, 40 (66.7%) patients underwent subtotal resection of the thyroid gland (TG), 19 (31.7%) patients with significant proliferation of thyroid tissue and recurrent toxic goiter underwent thyroidectomy, and 1 (1.7%) patient underwent hemithyroidectomy.

We have improved individual stages of strumectomy for toxic goiter. The patient was placed on the operating table in the supine position with the head thrown back - hyperextension of the neck, for which a bolster was placed under the shoulder blades (Fig. 1).

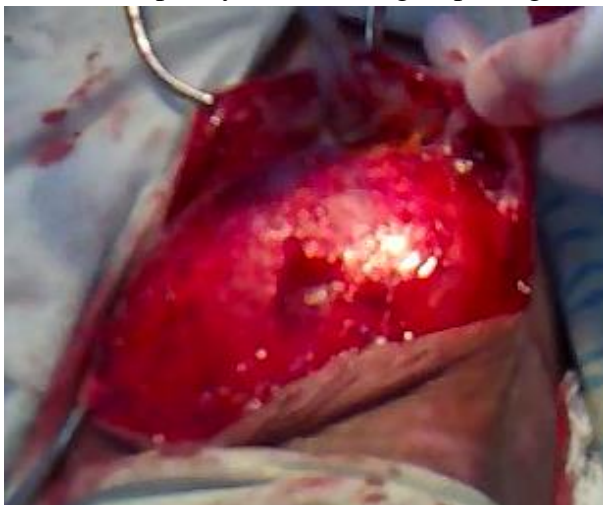


Rice. 1. Hyperextension of the neck using a "roller" placed under the shoulder blades

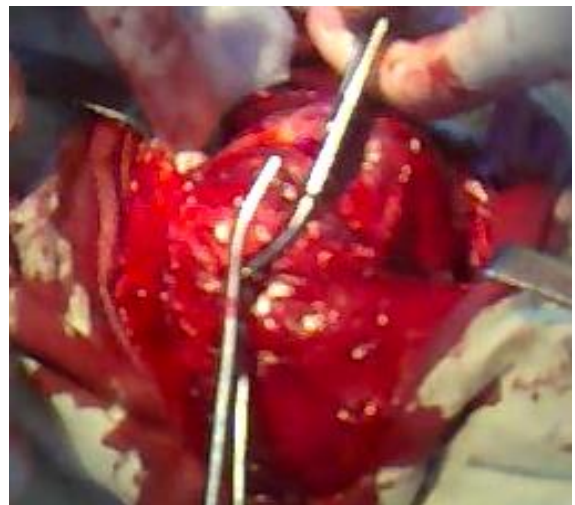


Rice. 2. Kocher skin incision line

In all patients, a collar-shaped Kocher incision was used (Fig. 2). The length of the incision depended on the size of the goiter, the nature of the pathology, the anatomical features of the patient's neck and varied from 6 to 20 cm. When cutting the skin, the scalpel was positioned strictly perpendicular to its surface. To prepare the upper cutaneous-subcutaneous flap, the scalpel was positioned at an angle of 20°-30° relative to the plane of the skin. After hemostasis, the wound was covered with sterile material. The platysma was dissected and transected together with the superficial veins located underneath it within the second fascia (Fig. 3). It was mandatory to mobilize the prethyroid muscle groups (Fig. 4).



Rice. 3. Preparation of skin flaps

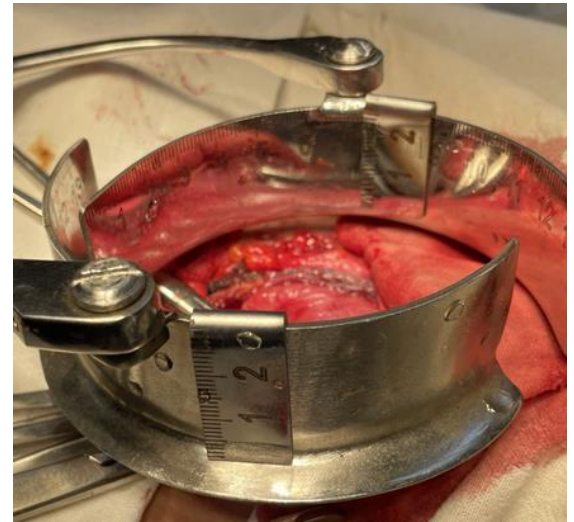


Rice. 4. Transverse section of the prethyroid muscles

Along the midline of the neck at a distance of 3-4 cm up and down, the anterior and posterior leaves of the third fascia of the neck were dissected, after which, using a Kocher probe, the prethyroid muscles were separated from the third fascia of the neck and dividing them on each side into portions, crossed with clamps or using electrocoagulation. For wide exposure of the thyroid gland, a retractor we proposed was installed.

In the practice of thyroid surgery, in order to provide access to the gland, the prethyroid muscles are retracted in the cranial and caudal direction using special dilators - Farabeuf or Vorobyov's instrument, which makes it difficult to conduct a full examination of the gland.

In order to level out the above technical difficulties, we proposed and used a modified wound retractor tool (Fig. 5).



Rice. 5. Modified retractor for performing operations on the thyroid gland

The retractor provided wide access to the thyroid gland, which made it possible to ensure sufficient exposure to the thyroid gland, examination and surgical actions without traumatizing the gland.

The surgical instrument we developed created favorable conditions for identifying all thyroid nodes, avoiding damage to the recurrent nerves and other important elements in the vicinity of the gland. In addition, the branches of the retractor are equipped with a centimeter ruler along the length and depth of the wound to measure the volume of thyroid tissue.

When performing subtotal resection of the thyroid gland, the volume of residual tissue was from 1.0 to 5.3 ml, on average 3.0 ± 1.2 ml. To determine the size and calculate the volume of the thyroid remnant in all patients of the main group, using a centimeter ruler of the retractor branch, the volume of residual tissue was measured and calculated. For this purpose, we used the formula

proposed by J. Brunn et al. (1981):

$$V = A \cdot B \cdot C \cdot 0,479$$

where: A – length, B – width, C – thickness, 0.479 – ellipsoidal coefficient. For values greater than 6 ml, resection of the remaining tissue was performed and the measurement of the residual volume was repeated using the above formula.

Thus, the retractor we proposed relates to surgical instruments and is used to provide access to the organs of the neck by retracting and fixing the edges of the wound, keeping the position of the neurovascular bundle in the neck under visual control. The device is a structure consisting of a tetrahedral curved crossbar, onto which are mounted two sliders with curved brackets rigidly attached to them. The sliders are equipped with clamping screws to secure them to the crossbar in the desired position. The brackets are equipped with two semicircular hooks with a width of 1 cm and a radius of curvature of 1.3 cm. The hooks distal from the crossbar are rigidly fixed to the bracket. The proximal hooks on the bracket can be moved along the bracket and rotated around its axis. The hook clamping screws allow you to lock them in the desired position.

After installing the retractor, we began palpation inspection of the thyroid gland, assessing its size, macroscopic changes and characteristics of the blood supply. Isolation of the thyroid gland began with the intersection of the ligaments fixing it to the trachea above and below the isthmus.

After isolating the pyramidal process of the thyroid gland, it was transected using clamps. Then they began to isolate the superior and inferior thyroid arteries, which, after crossing with clamps, were ligated twice on the thyroid capsule.

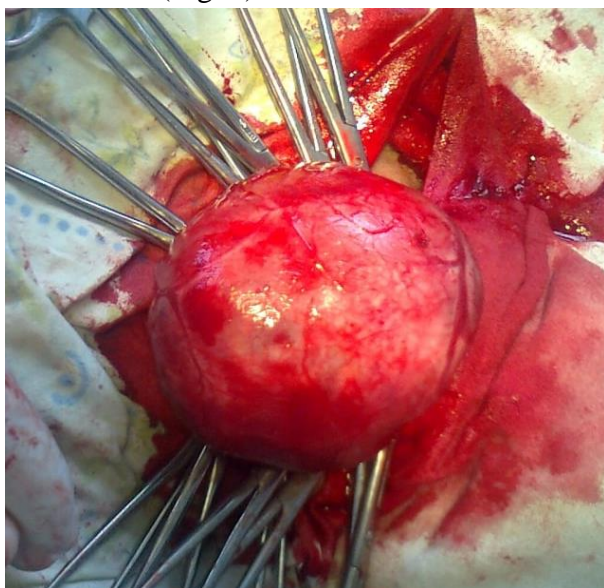
Before ligation of the arteries, any manipulation of the thyroid tissue was considered a gross technical error. Compliance with this rule made it possible to perform the stages of resection of the thyroid gland with minimal blood loss. To facilitate the isolation and ligation of the thyroid

arteries, the thyroid gland was sutured with thread-holders or the parenchyma was grasped with trenches. Dosed traction on them contributed to the removal of the thyroid gland into the wound, which facilitated manipulation when ligating the arteries.

Resection of the thyroid gland began with the intersection of the isthmus. To do this, a tunnel was formed between the anterior surface of the trachea and the posterior surface of the isthmus using a Billroth clamp. The isthmus was tied with two ligatures and then crossed between them, exposing the anterior surface of the trachea.

Mobilization and resection of the thyroid lobes was performed subfascially within the posterior layer of the fourth fascia. To do this, the index finger of the right hand was inserted from the outside under the posterior leaf of the fascia.

Resection of the thyroid gland began from the side of the transected isthmus. Clamps were applied along the tissue of the gland, sequentially separating its posterior surface from the larynx and trachea (Fig. 6).



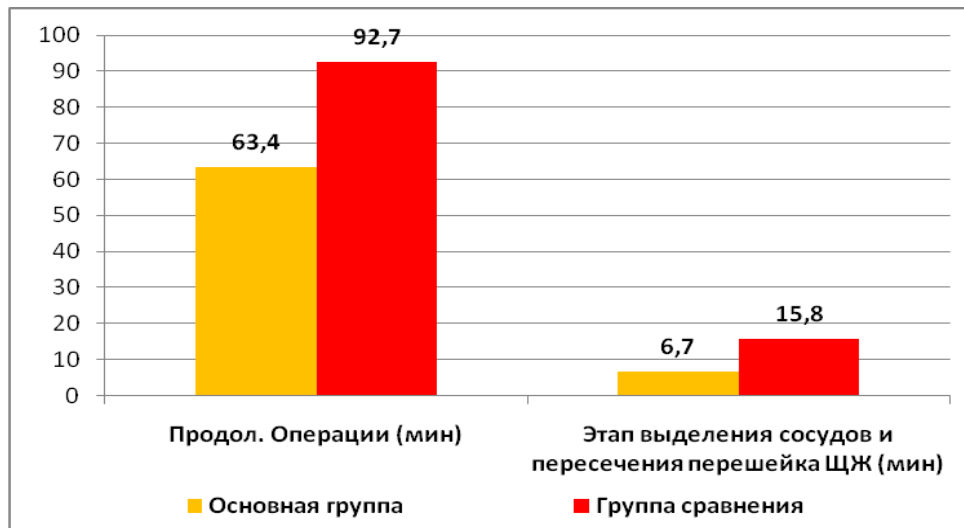
Rice. 6. Applying clamps to the gland tissue



Rice. 7. Mobilization of the thyroid gland from the trachea by crossing small vessels

Applying clamps to the vessels of the gland parenchyma, they were crossed with scissors. They tried to resect the gland wedge-shaped in order to facilitate the formation of thyroid lobes. After resection of part of the gland, hemostasis was performed by ligating the vessels. During mobilization, clamps were applied under visual control only on a “dry” surgical field, after which the lobe was finally resected (Fig. 7).

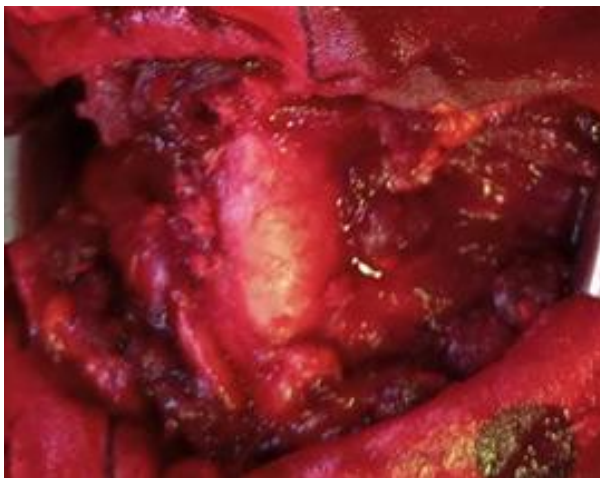
It should be noted that the stages of isolating the thyroid vessels and ensuring wide release of the anterior surface of the trachea are one of the difficult stages of strumectomy. However, improving the implementation of individual stages of the operation and the use of the proposed tool significantly simplified the operation. As a result, a reduction in the period of complex stages was achieved from 15.8 ± 0.9 to 6.7 ± 0.5 minutes ($p < 0.001$), respectively, the total operation time was reduced from 92.7 ± 4.8 to 63.4 ± 3.6 minutes ($p < 0.001$) (Fig. 8).



Rice. 8. Comparative indicators of operation duration (min.) in the compared groups

In fact, in only 11.6% of cases in the surgery of toxic forms of goiter in our observations, nodular forms of goiter were encountered, in the remaining 88.4% of cases diffuse, mixed and recurrent forms of goiter were encountered, and at the same time, the improvement of technical techniques made it possible to level out the risk of intraoperative complications such as bleeding, damage to the trachea and recurrent laryngeal nerve.

At the beginning of the work, to prevent relapse and postoperative hypothyroidism, the residual volume of thyroid tissue ranged from 3 to 10 mm (Fig. 9). After resection of the gland, the small vessels remaining on the clamps were ligated, and then a stump was formed by suturing the medial and lateral layers and fascia together with the remaining parenchyma of the gland.



Rice. 9. Exposed trachea after subtotal, subfascial strumectomy



Rice. 10. Removed thyroid tissue, material for intraoperative express biopsy

The peculiarity of the operation for unilateral toxic adenoma was that in the absence, according to additional studies, of nodular formations in the contralateral lobe of the thyroid gland after isolation, but before ligation of the thyroid gland, we performed a wedge-shaped dissection of it, allowing the incision to reveal the presence or absence of nodular formations in it. If there was no pathology, then after hemostasis the capsule of the gland lobe was sutured. If nodular formations were detected in the lobe, subtotal subfascial resection was also performed.

Total strumectomy or total removal of a lobe was performed for nodular formations occupying the entire thyroid parenchyma.

After resection, the removed thyroid tissue was sent for pathohistological examination (Fig. 4.10).

Here is a clinical observation: Patient D., 23 years old, was admitted to the clinic on December 12, 2018 with complaints of a tumor-like formation in the anterior neck, shortness of breath and difficulty swallowing, palpitations, and irritability. A tumor-like formation in the anterior neck appeared approximately 8 years ago; in the last year, shortness of breath and palpitations have increased; she was under the control of an endocrinologist, who was prescribed thyreostatics and recommended surgical treatment.

The general condition of the patient upon admission was moderate, the skin was clean and pale pink. Auscultation reveals vesicular breathing in the lungs on both sides, no wheezing. Heart sounds are clear, rhythmic, Ps 110 beats per minute. Tongue is wet. The abdomen is of normal shape, participates in the act of breathing, is soft, and painless on palpation. The liver and spleen are not palpable. Stool and urination are free.

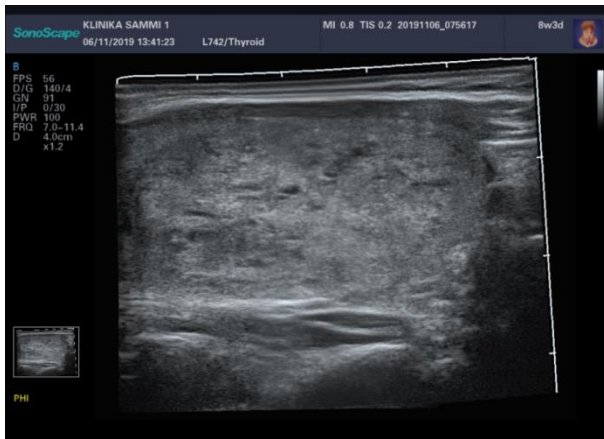
On local examination, the configuration of the neck is changed, a tumor-like formation is noted, on palpation it has a soft-elastic consistency, inactive, painless, measuring 10.0×12.0 cm. The skin in this area is not hyperemic, moist (Fig. 11).



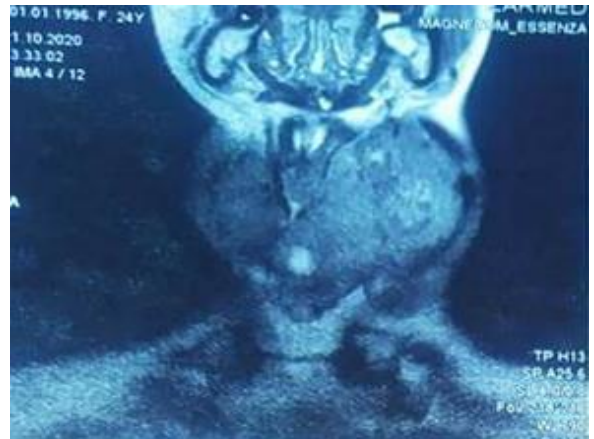
Rice. 11. Patient D., 23 years old, diagnosed with Diffuse toxic goiter of degree V, Thyrotoxicosis of degree II.

General blood test: Hb-106 g/l, er.-3.4x10¹²/μl, F-0.8, thrombus-230, l.-8.7x10⁹/μl, VSK-3'50"-4'00" , p.-3%, s.-65%, eos.-3%, lymph.-20%, mon.-7, ESR-5 mm/h, Ht-24. Biochemical blood test: bil.-12.65 mmol/l, direct.-4.27 mmol/l, ALT-0.46 mmol/l, AST-0.16 mmol/l, thym.pr.-2, urinary .-4.66 mmol/l, residual nitrogen-17 g/l, creat.-82.9 μmol/l, total protein-60.5 g/l. Chest X-ray: no focal opacities were detected. Ultrasound: diffuse enlargement of the thyroid gland with dimensions of 117×148 mm tissue structure (Fig. 12). MSCT of the neck: diffuse enlargement of the thyroid gland in the projection of the anterior region of the neck, measuring 112×146 mm (Fig. 13). The cytological conclusion corresponds to small follicles lined with low columnar epithelium, without proliferative changes in the thyroid tissue.

With a clinical diagnosis: "Diffuse toxic goiter of the V degree. Thyrotoxicosis degree II", the patient was prescribed drug therapy in order to prepare the patient for surgery. When re-examined two months later, the patient's thyrostatic status decreased to a euthyroid state.



Rice. 12. Ultrasound of the thyroid gland in patient D., 23 years old.



Rice. 13. MSCT of the neck of patient D., 23 years old.

02/14/2019 with a diagnosis of “Diffuse toxic goiter of the V degree. Thyrotoxicosis was treated with medication until euthyroidism” and “Subtotal, subfascial strumectomy” was performed. Intraoperatively, a rapid biopsy of the obtained thyroid tissue was performed, which revealed proliferation of connective tissue, without proliferation of thyroid tissue. The course of the postoperative period is smooth, wound healing is by primary intention. The patient was discharged home in satisfactory condition on February 19, 2019, under the supervision of an endocrinologist at her place of residence.

Conclusions. Improving the technical methods of performing strumectomy with the proposed surgical instrument allows us to simplify the technique of performing the operation and determining the size and calculation of the volume of the thyroid remnant, and neutralize the risk of intraoperative complications. A reduction in the time period for performing complex stages was achieved from 15.8 ± 0.9 to 6.7 ± 0.5 minutes ($p < 0.001$) and, accordingly, the total operation time from 92.7 ± 4.8 to 63.4 ± 3.6 minutes ($p < 0.001$).

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