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COMPARISON OF RESULTS AND QUALITY OF LIFE IN PATIENTS WITH THYROID EYE DISEASE AFTER DIFFERENT METHODS OF ORBITAL DECOMPRESSION

© W. Zhu [1], E. Katinas [1, 2], M.M. Solovyov [1, 2], K. Fedotova [1], A.I. Yaremenko [1], E.V. Chachanidze [3], V.V. Potemkin [1, 2]

[1] Academican I.P. Pavlov First St. Petersburg State Medical University of the Ministry of Healthcare of the Russian Federation, Saint Petersburg, Russia;

[2] City Multidisciplinary Hospital No. 2, Saint Petersburg, Russia;

[3] State Budgetary Educational Institution School No. 153, Frunzensky District, Saint Petersburg, Russia

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✧ ***Purpose.*** To evaluate the changes in the quality of life of patients with thyroid eye disease after different methods of orbital decompression.

Materials and methods. The study included 24 patients (37 orbits) with thyroid eye disease, aged 41.6 ± 20.6 (from 20 to 79 years), 18 women and 6 men. The patients were divided into two groups. The first group included 12 patients (19 orbits) who underwent orbital fat decompression. The second group included 12 patients (18 orbits) who underwent endoscopic endonasal bony orbital decompression. The Graves' ophthalmopathy quality of life questionnaire (GO-QOL) was completed before surgery, and 3 and 6 months after it. Outcome analysis included also the assessment of visual acuity, proptosis, eyelid retraction, and palpebral fissure height.

Results. The GO-QOL visual function scores in both groups did not change significantly in 3 and in 6 months after orbital decompression ($p > 0.05$): in the first group, before and after 6 months, scores were 69.27 ± 20.02 and 68.96 ± 18.44, in the second group — 53.13 ± 29.13 and 57.81 ± 23.56, respectively. An improvement in the GO-QOL visual function estimation was observed in those patients whose visual acuity improved after surgery. The GO-QOL facial appearance scores significantly improved 3 months after surgery, and continued to increase up to 6 months: in the first group, facial appearance scores improved from 23.96 ± 23.01 to 48.42 ± 25.56 ($p = 0.004$), in the second group — from 47.92 ± 21.04 to 66.15 ± 23.15 ($p = 0.037$).

Conclusions. Orbital decompression significantly improves the quality of life of patients with thyroid eye disease, this is primarily associated with an improvement in facial appearance.

✧ ***Keywords:*** orbital decompression; thyroid-associated orbitopathy; quality of life; endoscopic orbital decompression; bony orbital decompression; orbital fat decompression.

СРАВНЕНИЕ РЕЗУЛЬТАТОВ И КАЧЕСТВА ЖИЗНИ ПАЦИЕНТОВ С ЭНДОКРИННОЙ ОФТАЛЬМОПАТИЕЙ ПОСЛЕ РАЗЛИЧНЫХ МЕТОДОВ ДЕКОМПРЕССИИ ОРБИТЫ

© В. Чжу [1], Е.Б. Катинас [1, 2], М.М. Соловьев [1, 2], К. Федотова [1], А.И. Яременко [1], Е.В. Чачанидзе [3], В.В. Потемкин [1, 2]

[1] Государственное бюджетное образовательное учреждение высшего образования «Первый Санкт-Петербургский государственный медицинский университет им. академика И.П. Павлова» Министерства здравоохранения Российской Федерации, Санкт-Петербург;

[2] Санкт-Петербургское государственное бюджетное учреждение здравоохранения «Городская многопрофильная больница № 2», Санкт-Петербург;

[3] Государственное бюджетное общеобразовательное учреждение школа № 153 Фрунзенского района, Санкт-Петербург

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✧ ***Цель*** — оценить изменения в качестве жизни пациентов с эндокринной офтальмопатией после различных методов декомпрессии орбиты.

Материалы и методы. В исследование было включено 24 пациента (37 орбит) с отёчным экзофтальмом, в возрасте 41,6 ± 20,6 года (от 20 до 79 лет), из которых 18 женщин и 6 мужчин. Пациенты были разделены на две группы. Первая группа включала 12 пациентов (19 орбит), которым выполняли внутреннюю (жировую) декомпрессию орбиты. Во вторую группу вошли 12 больных (18 орбит), которым проводили эндоскопическую эндоназальную костную декомпрессию орбиты. Пациенты заполняли опросник качества жизни GO-QOL до и через 3 и 6 мес. после декомпрессии орбиты. В послеоперационном периоде оценивали остроту зрения, экзофтальм, ретракцию век, ширину глазной щели.

Результаты. По результатам опросника GO-QOL через 3 и 6 мес. после декомпрессии орбиты в обеих группах балльная оценка зрительных функций статистически значимо не изменилась ($p > 0,05$): в первой группе до и через 6 мес. составила 69,27 ± 20,02 и 68,96 ± 18,44 балла, во второй группе — 53,13 ± 29,13 и 57,81 ± 23,56 балла соответственно. Улучшение оценки зрительных функций наблюдали у тех пациентов, у которых в послеоперационном периоде повысилась острота зрения. Через 3 мес. после операции зафиксировано значительное улучшение балльной оценки внешнего вида, которая продолжала увеличиваться до 6 мес.: в первой группе отмечено улучшение показателей с 23,96 ± 23,01 до 48,42 ± 25,56 балла ($p = 0,004$), во второй группе — с 47,92 ± 21,04 до 66,15 ± 23,15 балла ($p = 0,037$).

Выводы. Декомпрессия орбиты существенно повышает качество жизни пациентов с эндокринной офтальмопатией, в большей степени связанное с улучшением внешности.

✧ ***Ключевые слова:*** декомпрессия орбиты; эндокринная офтальмопатия; качество жизни; эндоскопическая декомпрессия орбиты; костная декомпрессия орбиты; жировая декомпрессия орбиты.

INTRODUCTION

Thyroid eye disease (TED) is a chronic autoimmune disease, which is characterized by the involvement of soft orbital tissues into the pathologic process. In the foreign literature, such term as ophthalmopathy or Graves orbitopathy, as well as thyroidassociated ophthalmopathy [1, 2, 3]. Lymphocyte infiltration of extraocular muscles and retrobulbar tissue, activation of orbital fibroblasts, secretion of proinflammatory cytokines, accumulation of glycosaminoglycans, and edema lead to remodeling of orbital soft tissues, with subsequent fibrosis development [4, 5]. Persistent proptosis, eyelid retraction, limitation of the motility of the eyeball may lead not only to cosmetic discomforts and work productivity impairment, but also to the disability as a result of vision loss [2].

In about 25–50% of cases, thyroid eye disease occurs in patients with diffuse toxic goiter (Graves disease, Basedow disease), hereby in 80% of cases, TED occurs within 18 months after disease manifestation. But TED may appear both simultaneously and precede functional abnormalities of the thyroid gland [6–9]. Herewith, in 3–6.1% of patients, severe forms of the disease develop, sight-threatening because of compression optic neuropathy and severe keratopathy up to its perforation [6, 7, 10, 11].

Thyroid eye disease treatment options are divided into medical and surgical methods. The choice of treatment option depends on the degree of severity and of disease activity [12, 13]. Orbital decompression is the main surgical procedure aimed to surgical rehabilitation of thyroid eye disease patients [14]. According to the literature data, only in 5% of patients, surgical treatment is performed within the first year from diagnosis, and in 20% – within first 10 years [15]. Indications for surgery: compressive optic neuropathy, severe keratopathy with impending perforation, inefficacy of carried-out medical treatment, persistent and prominent proptosis [15, 16]. The aim of decompression surgery – to increase the orbital volume by resection of one or several orbital walls (bone decompression), removal of orbital fat (internal decompression), or combination of both methods, maximally decreasing by that the pressure on orbital soft tissues and optic nerve in its apical part, and the amount of proptosis. Further steps of surgical treatment foresee surgical procedures on extraocular muscles to correct the eyeball position and eliminate diplopia, as well as eyelid surgeries [14, 17, 18].

Architectural face distortment by proptosis – from barely perceptible relevant one – is perceived by a patient as an esthetic defect, and significantly influences the quality of life and psychological status of the patient [19–21]. A group of authors (C.B. Terwee, et al.) elaborated and proposed a special questionnaire GOQOL (GOQualityofLife) to detect the quality of life in patients with thyroid eye disease, taking into consideration special aspects of individual disease [22]. This validated questionnaire is a reliable instrument, which could be used as a separate index in clinical trials [23]. At the present time, the quality of life of patients with TED is studied thoroughly before surgical treatment, but in the literature there are few publications, in which the dynamics of quality of life changes was studied in patients after orbital decompression [24–26].

The aim of present study is to evaluate quality of life changes in patients with thyroid eye disease after different methods of orbital decompression.

MATERIALS AND METHODS

This investigation was performed in the design of a comparative prospective study, which was carried out at the St. Petersburg State Budgetary Healthcare Institution "City multi-field hospital No. 2", at the maxillofacial surgery department with ORL beds and the eye microsurgery department No. 5 over the 2018 to 2020, in accordance with World Medical Association Declaration of Helsinki, and was approved by the Local Ethic Committee of the Academician I.P. Pavlov First St. Petersburg State Medical University. Inclusion criteria were as follows: patients of over 18 years, with thyroid eye disease of lipogenic, myogenic, or mixed form with compensated thyroid function and laboratory euthyroidism. Non-inclusion criteria: presence of infectious and inflammatory diseases of nasal cavity, paranasal sinuses, eye and its adnexa; pregnancy; presence in the case history of surgical procedures in the orbital area, pathologic changes and abnormal development of nasal cavity and paranasal sinuses' structures; patients with severe uncompensated concomitant somatic conditions.

In the study, 24 patients (37 orbits) took part, age 41.6 ± 20.6 years (from 20 to 79 years), from which 18 (75%) were women, and 6 (25%) men. In most patients (n = 21; 87.5%), in past medical history, there were functional disorders and diseases of the thyroid – diffuse toxic goiter (n = 17; 81%) and autoimmune thyroiditis (n = 4; 19%). In 3 patients, TED appeared on the background of euthyroidism, in the absence of thyroid pathology (so-called euthyroid Graves disease). Thyroid eye disease duration was between 5 months and 36 years. Preceding thyroid diseases' treatment included both medical one with prescription of thyreostatic medications and radioiodine therapy delivery and surgical methods: radioiodine therapy was executed in 2 patients, and thyroidectomy – in 14 patients.

Patients were divided into two groups. First group included 12 patients (19 orbits), in whom internal (fat) decompression was performed using transconjunctival approach: in 7 cases (14 orbits), bilateral surgery was carried out, and in 5 cases (5 orbits) – unilateral one. Second group consisted of 12 patients (18 orbits), in which endoscopic endonasal orbital decompression in the medial wall and the medial third of the orbital floor area was made: in 6 cases (12 orbits), bilateral procedures was performed, and in 6 cases (6 orbits), – unilateral one. When choosing surgical procedure, anatomic features of the orbit and its content according to multispiral computed tomography data were taken into account – predominance of muscular or fat component. In such a way, orbital fat decompression was performed in lipogenic form of the thyroid orbitopathy and in mixed form in case of orbital fat's predominance, and orbital bone decompression was carried out in patients with predominant lesion of extraocular muscles (myogenic and mixed forms). Preoperative calculation of the excess soft tissues' volume when planning fat (internal) decompression was done according to D.V. Davydov, et al. [27, 28].

The age of first group patients (39.08 ± ± 6.17 years) was less than of those in the second one (53.17 ± 12.33 years). According to the clinical activity scale CAS (Clinical Activity Score), inactive thyroid eye disease was present in 8 (66.7%) and 7 (58.3%) patients of the first and the second groups, and active form – in 4 (33.3%) and 5 (41.7%) patients, respectively. To evaluate the disease severity, modified NOSPECS classification (1977) was used, which includes following classes: class 0 (N) – No thyroid eye disease signs or symptoms; class 1 (O) – Only signs, no symptoms; class 2 (S) – Soft tissue involvement; class 3 (P) – Proptosis; class 4 (E) – Extraocular

Table 1 / Таблица 1

General characteristics of the patient groups
Общая характеристика групп пациентов

Index	Group 1	Group 2
Number of patients (of orbits)	12 (19 orbits)	12 (18 orbits)
Mean age, years	39.08 ± 6.17	53.17 ± 12.33
Sex (male/female)	1/11	5/7
TED activity (according to CAS): non-active / active	8/4 (66.7/33.3%)	7/5 (58.3/41.7%)
Mean activity score (according to CAS)	1.85 ± 1.04 (from 1 to 4)	2.74 ± 1.1 (from 1 to 4)
Severity degree of TED: moderately severe / severe	11/1 (91.7/8.3%)	9/3 (75/25%)
Overall ocular severity estimate (according to NOSPECS), score	9.37 ± 4.32 (from 4 до 20)	17.39 ± 8.0 (from 7 to 35)

Note. TED – thyroid eye disease.

muscle involvement; class 5 (C) – Corneal involvement; class 6 (S) – Sight loss (due to optic nerve involvement). All classes, except classes 0 (N) and 1 (O), include 4 ascending severity degrees (0 = 0, a = 1, b = 2, c = 3 points). Overall ophthalmic severity estimate is calculated by multiplication of each class of the NOSPECS system (not including class 0) by its severity degree, received scores are summarized. Accordingly, thyroid eye disease of moderate severity in the first and the second groups was in 11 (91.7%) and 9 (75%) patients, and severe – in 1 (8.3%) and 3 (25%) patients, respectively. In the second group, mean activity score CAS (2.74 ± 1.1 points) and overall severity estimate NOSPECS (17.39 ± 8.0 points) were higher ($p< 0.05$), than those in the first group (CAS1.85 ± 1.04 and NOSPECS9.37 ± ± 4.32 points) (Table 1). Proptosis value in first group patients was 22.0 ± 2.4 mm (18–28 mm), herewith asymmetric proptosis wit a difference of 2 mm and more between the paired eyes (3.14 ± 1.1 mm; 2–5 mm) was noted in 7 patients (58.3%). In the second group proptosis values were 21.11 ± 3.36 mm (16–29 mm), in 7 patients (58.3%) asymmetry in proptosis values amounted to 2.88 ± 0.69 mm (2–4 mm).

Orbital decompression surgery was performed in patients with an inactive thyroid eye disease form (inactive form during 6 months and more) on the background of euthyroid state of the thyroid gland, aiming to eliminate cosmetic defect in significant and persistent proptosis. In active TED form, indications to orbital decompression were insufficiency of the medical corticoid therapy and states that were sight-threatening as a result of optic neuropathy or in corneal lesions. To decrease the disease activity and treat the optic neuropathy, patients preoperatively received steroid pulse therapy.

Before surgery, patients underwent standard laboratory and general clinical tests with determination of thyroid stimulating hormone (TSH) level, thyroid hormones (free T4 and T3) in the blood, titers of thyroglobulin (TG) antibodies, anti-thyroid peroxidase (ATPO) antibodies, and TSH receptor antibodies. Furthermore, computed tomography of orbits and paranasal sinuses was performed. Prior to surgery, as well as in early and late post-op period (in 6 months) patients underwent complete ophthalmological and otorhinolaryngological examination, consultation by psychologist and endocrinologist. Internal (fat) decompression was performed by an ophthalmologist, and endoscopic endonasal bone orbital decompression – by a maxillo-facial surgeon together with otorhinolaryngologist.

Analyzing the efficacy of different orbital decompression methods, psychosocial, functional, and esthetic results of surgical treatment were evaluated. Following parameters were examined –

visual acuity, presence or absence of diplopia, its degree, proptosis value, upper and lower eyelid retraction, palpebral fissure's width, quality of life changes. Quality of life estimation was performed before surgery, in 3 and 6 months after it using the GOQOL questionnaire designed for patients with thyroid eye disease. The questionnaire allows evaluating two main aspects influencing the quality of life: the degree if visual function limitation due to diplopia and visual acuity decrease (questions 1–8), as well as the psychosocial status in relation to appearance modification (questions 9–16). Two total scores are calculated, between 0 and 100, higher values suggest improvement in condition and in quality of life.

Statistical analysis was carried out in the StatPlus program (academic license). The significance of differences between groups was determined using Mann-Whitney test for two independent samples. Non-parametric Wilcoxon test was used for evaluation of differences in two linked samples. Differences were considered as significant ones at significance level $p < 0.05$.

RESULTS AND DISCUSSION

According to GOQOL questionnaire results, evaluation of visual functions' score before surgery in second group patients was non-significantly lower ($p = 0.285$), than in first group patients. In that way, in the first group, the baseline score of visual functions was 69.27 ± 20.02, in the second one, – 53.13 ± 29.13. This could be due to the fact that in the second group, visual acuity before surgery (0.63 ± 0.33) was significantly lower ($p = 0.027$), than in the first group (0.9 ± 0.1). And what is more, in the second group, in more patients, there was diplopia, which influences the quality of life. Accordingly, in 5 patients (41.7%) of the first group and in 8 (66.7%) patients of the second group, diplopia was present.

Visual acuity after surgical procedure in the second group showed statistically significant increase from 0.63 ± 0.33 to 0.74 ± 0.28 ($p = 0.025$). Improvement of visual functions was found in 5 patients. In the first group, visual acuity virtually did not change, and was 0.9 ± 0.1 and 0.86 ± 0.14, respectively.

According to GOQOL questionnaire results in 3 and 6 months after orbital decompression, visual function score did not experience statistically significant changes ($p > 0.05$), and had values similar to those before surgery. This may suggest that the presence of diplopia both before and after surgery did as well limit everyday activities related to vision. In this way, before surgery and 6 months after it, this score was 69.27 ± 20.02 and 68.96 ± 18.44, and in the second group, 53.13 ± 29.13 and 57.81 ± 23.56 respectively. There were no statistically significant differences between groups ($p > 0.05$). In the second group, in 5 patients, which demonstrated an improvement of visual acuity after surgery, in 6 months, visual acuity score also increased from 40.0 ± 21.47 to 67.5 ± 21.37 ($p = 0.043$).

Groups did not have statistically significant differences in proptosis value, both before surgical treatment ($p = 0.145$), and 6 months after it ($p = 0.988$). In the first group, in 6 months after internal orbital decompression, proptosis value decreased from 22.0 ± 2.4 to 18.50 ± 2.29 mm ($p = 0.0001$), proptosis regression was 3.5 mm (from 1 to 5.5 mm). Baseline proptosis values in second group patients were 21.11 ± 3.36 mm, and after 6 months after endoscopic endonasal bone orbital decompression became 18.56 ± 3.18 mm ($p = 0.0002$), on average proptosis decreased by 2.55 mm (from 1 to 4 мм). This means that in both groups, statistically significant decrease of proptosis was established ($p < 0.001$).

Before surgical procedure and in 6 months after it, there were no statistically significant differences ($p > 0.05$) both in upper and lower eyelid retraction values, and palpebral fissure width. In the postoperative period, within the timeframes from 2 to 4 months after orbital decompression, in 5 (41.7%) patients of the first group and in 4 (33.3%) patients of the second group a second stage of rehabilitation treatment was performed – eyelid surgery to correct their position and to decrease retraction (Table 2).

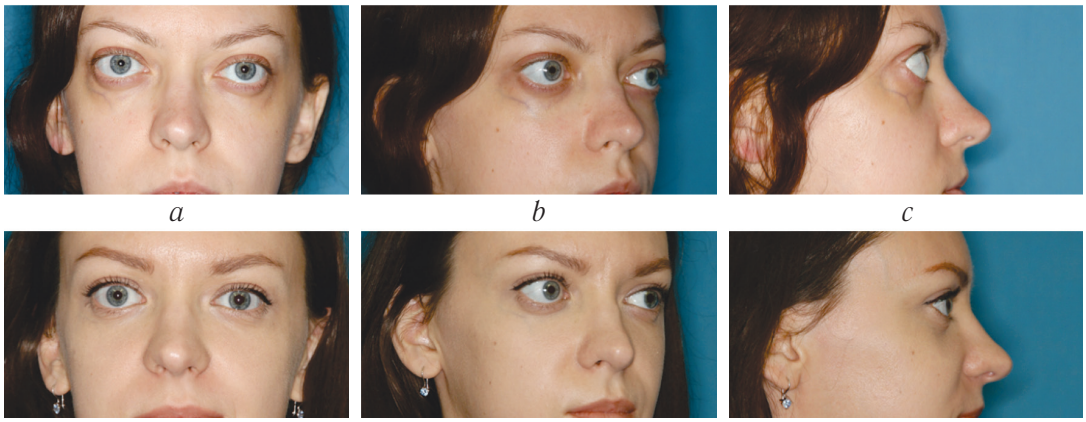
According to GOQOL questionnaire results, groups had statistically significant differences in baseline (before surgery) values of facial appearance evaluation scores – in the second group patients, this score (47.92 ± 21.04) was reliably higher ($p = 0.023$), than in the first group (23.96 ± 23.01). In as much as 3 months, in patients of both groups, there was a significant quality of life amelioration related to appearance. This was reflected in an increase of general appearance evaluation, which reached maximal values in 6 months after orbital decompression (Fig. 1, 2), –

Table 2 / Таблица 2

Comparison of the two groups before and 6 months after surgical treatment of thyroid-associated ophthalmopathy ($M \pm \sigma$)
Сравнение двух групп до и через 6 месяцев после хирургического лечения эндокринной офтальмопатии ($M \pm \sigma$)

Index		Group 1, $n = 19$ orbits	Group 2, $n = 18$ orbits	Statistical significance (p)
Proptosis, mm	before surgery	22.0 ± 2.4	21.11 ± 3.36	0.145
	after 6 months	18.50 ± 2.29*	18.56 ± 3.18*	0.988
Visual acuity	before surgery	0.9 ± 0.1	0.63 ± 0.33	0.027**
	after 6 months	0.86 ± 0.14	0.74 ± 0.28*	0.325
Palpebral fissure's width, mm	before surgery	14.39 ± 1.36	15.31 ± 5.29	0.903
	after 6 months	12.84 ± 1.83*	13.72 ± 4.46*	0.494
Upper eyelid retraction, mm	before surgery	2.26 ± 1.80	2.0 ± 1.68	0.638
	after 6 months	0.74 ± 1.05*	1.17 ± 1.47*	0.543
Lower eyelid retraction, mm	before surgery	1.5 ± 1.26	0.83 ± 1.2	0.125
	after 6 months	0.47 ± 0.84*	0.83 ± 0.99	0.261
Estimation of visual functions, score	before surgery	69.27 ± 20.02	53.13 ± 29.13	0.285
	after 6 months	68.96 ± 18.44	57.81 ± 23.56	0.149
Appraisal of facial appearance, score	before surgery	23.96 ± 23.01	47.92 ± 21.04	0.023**
	after 6 months	48.42 ± 25.56*	66.15 ± 23.15*	0.117

* Statistically significant differences at $p < 0.05$ with baseline data (before surgery); ** statistically significant differences at $p < 0.05$ between groups.

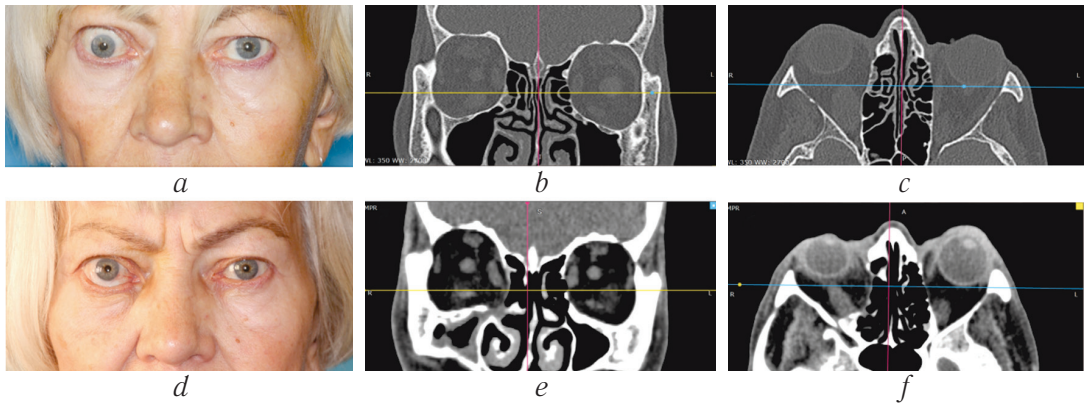


a *b* *c*

d *e* *f*

Fig. 1. Patient's appearance before surgery (*a*, *b*, *c*) and 6 months after bilateral orbital fat decompression (*d*, *e*, *f*)

Рис. 1. Внешний вид пациентки до операции (*a*, *b*, *c*) и через 6 месяцев после двусторонней внутренней (жировой) декомпрессии орбиты (*d*, *e*, *f*)



a *b* *c*

d *e* *f*

Fig. 2. The patient's appearance (*a*) and CT scan before surgery: *b* – frontal plane, *c* – axial plane; and 6 months after right side endoscopic endonasal orbital decompression: *d* – appearance; *e* – frontal plane; *f* – axial plane

Рис. 2. Внешний вид (*a*) пациентки и компьютерная томография до операции: *b* — фронтальная проекция, *c* — аксиальная проекция; и через 6 месяцев после правосторонней эндоскопической эндоназальной декомпрессии орбиты: *d* — внешний вид; *e* — фронтальная проекция, *f* — аксиальная проекция

in the first group, it increased from 23.96 ± 23.01 to 48.42 ± 25.56 ($p = 0.004$), in the second group, from 47.92 ± 21.04 to 66.15 ± 23.15 ($p = 0.037$).

CONCLUSIONS

The treatment of patients with thyroid eye disease demands a multidisciplinary approach involving different specialists – endocrinologists, ophthalmologists, maxilla-facial surgeons, and otorhinolaryngologists. Study results show the efficacy of different orbital decompression methods in thyroid eye disease – internal orbital decompression (fat decompression) and endoscopic endonasal bone orbital decompression. Decrease of proptosis and realization of acceptable facial appearance, close to the state prior to disease development, impacts quality of life the most – facial appearance appraisal significantly increases after surgery according to the GOQOL questionnaire data. In patients, in whom visual acuity increased after surgery, the estimation of visual functions and related quality of life also ameliorated according to the GOQOL questionnaire.

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No conflict of interest present.

Participance of the authors:

- study conception and design – W. Zhu, V.V. Potemkin, E. Katinas, M.M. Solovyov, A.I. Yaremenko;
- collection and statistical analysis of the material, analysis of data obtained, writing of the text – W. Zhu, K. Fedotova;
- survey, quality of life estimation, and psychological follow-up of patients, analysis of data obtained – E.V. Chachanidze;
- editing – V.V. Potemkin, E. Katinas, M.M. Solovyov, A.I. Yaremenko.

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Information about the authors

Wen Zhu — MD, Oral and Maxillofacial Surgeon, Postgraduate Research Student of the Department of Dental and Maxillofacial surgery. FSBEI HE I.P. Pavlov Spb SMU MOH Russia, Saint Petersburg. E-mail: zhuwen@mail.ru

Elena Katinas — MD, PhD, Assistant Professor of the Department of Otorhinolaryngology with Clinic, FSBEI HE I.P. Pavlov Spb SMU MOH Russia, Saint Petersburg; Otorhinolaryngologist, SPb SBHI "City Multidisciplinary Hospital No. 2", Saint Petersburg, Russia. E-mail: elena_katinas@mail.ru.

Mikhail M. Solovyov — MD, PhD, Assistant Professor of the Department of Dental and Maxillofacial surgery, FSBEI HE I.P. Pavlov Spb SMU MOH Russia, Saint Petersburg, Russia; Head of the Department of Maxillofacial Surgery SPb SBHI "City Multidisciplinary Hospital No. 2", Saint Petersburg, Russia. E-mail: mmsolovyov@gmail.com.

Karolina Fedotova — MD, Ophthalmologist, Postgraduate Research Student of the Department of Ophthalmology with Clinic. FSBEI HE I.P. Pavlov Spb SMU MOH Russia, Saint Petersburg. SPIN: 6935-9837. E-mail: karo-luna@mail.ru.

Сведения об авторах

Вэнь Чжу — врач-челюстно-лицевой хирург, аспирант кафедры стоматологии хирургической и челюстно-лицевой хирургии. ФГБОУ ВО ПСПбГМУ им. акад. И.П. Павлова Минздрава России, Санкт-Петербург. E-mail: zhuwen@mail.ru.

Елена Борисовна Катинас — канд. мед. наук, доцент кафедры оториноларингологии с клиникой, ФГБОУ ВО ПСПбГМУ им. акад. И.П. Павлова Минздрава России, Санкт-Петербург; врач-оториноларинголог, СПбГБУЗ «Городская многопрофильная больница № 2», Санкт-Петербург. E-mail: elena_katinas@mail.ru.

Михаил Михайлович Соловьев — канд. мед. наук, доцент кафедры стоматологии хирургической и челюстно-лицевой хирургии, ФГБОУ ВО ПСПбГМУ им. акад. И.П. Павлова Минздрава России, Санкт-Петербург; заведующий отделением челюстно-лицевой хирургии, СПбГБУЗ «Городская многопрофильная больница № 2», Санкт-Петербург. E-mail: mmsolovyov@gmail.com.

Каролина Федотова — врач-офтальмолог, аспирант кафедры офтальмологии с клиникой. ФГБОУ ВО ПСПбГМУ им. акад. И.П. Павлова Минздрава России, Санкт-Петербург. SPIN: 6935-9837. E-mail: karo-luna@mail.ru.

Information about the authors

Andrey I. Yaremenko — MD, PhD, DMedSc, Professor, Head of the Department of Dental and Maxillofacial surgery. FSBEI HE I.P. Pavlov Spb SMU MOH Russia, Saint Petersburg. E-mail: ayaremenko@me.com.

Ekaterina V. Chachanidze — Teacher-Psychologist. SBEI School No. 153, Frunzensky district of St. Petersburg, Saint Petersburg. E-mail: evkozlova1@mail.ru.

Vitaly V. Potemkin — MD, PhD, Assistant Professor of the Department of Ophthalmology with Clinic, FSBEI HE I.P. Pavlov Spb SMU MOH Russia, Saint Petersburg, Russia; Ophthalmologist, SPb SBHI "City Multidisciplinary Hospital No. 2", Saint Petersburg, Russia. SPIN: 3132-9163. E-mail: potem@inbox.ru.

Сведения об авторах

Андрей Ильич Яременко — д-р мед. наук, профессор, заведующий кафедрой стоматологии хирургической и челюстно-лицевой хирургии. ФГБОУ ВО ПСПбГМУ им. акад. И.П. Павлова Минздрава России, Санкт-Петербург. E-mail: ayaremenko@me.com.

Екатерина Владимировна Чачанидзе — педагог-психолог. ГБОУ школа № 153 Фрунзенского района, Санкт-Петербург. E-mail: evkozlova1@mail.ru.

Виталий Витальевич Потемкин — канд. мед. наук, доцент кафедры офтальмологии с клиникой, ФГБОУ ВО ПСПбГМУ им. акад. И.П. Павлова Минздрава России, Санкт-Петербург; врач-офтальмолог, СПбГБУЗ «Городская многопрофильная больница № 2», Санкт-Петербург. SPIN: 3132-9163. E-mail: potem@inbox.ru.