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Analysis of subjective signs in patients after secondary glaucoma surgeries

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Purpose. Implementation of quality-of-life standards for patients with secondary glaucoma after surgery.

Material and methods. Data analysis included secondary surgical glaucoma patients with a time interval of 4 years. Patients were followed up to 3 years after surgery to answer questions related to subjective perceptions after the surgical intervention (pain, discomfort, near vision, distance vision, intermediate vision, and normal activity). We were also interested in the overall quality of life and the effect on the patient's psyche when performing certain surgical techniques.

Results. As part of the questionnaire, patients were asked 36 questions. Responses were received from 98 patients. Thirty-five respondents (97.2%) of patients who underwent cyclocryopexy reported tolerable, minimal, or no pain during and immediately after surgery, with the majority of patients reporting minimal pain. Twenty-one patients (58.3%) did not complain of pain until one year after surgery.

According to the survey, 16 respondents (25%) had undergone trabeculectomy. Most respondents reported tolerable pain during surgery, minimal pain for 2 weeks after surgery, and no or minimal pain for 2 years after surgery. Eleven respondents (68.8%) answered that their eyesight improved in daily life, but the majority of nine (56.3%) did not notice any change in their vision during short-distance movement, short-distance work, or reading. Most serious problems had patients after cyclocryocoagulation or enucleation of the eye globe.

Conclusion. Secondary glaucoma surgery for every patient should be personalized and tailored to the patient's every need, taking into account the patient's current health status, knowledge and skills as well as socioeconomic circumstances.

Introduction. According to the latest conclusions of the European Glaucoma Society, the main goal of glaucoma treatment is to achieve the target IOP value, lifelong preservation of the patient's visual functions and maintaining an acceptable quality of life of the patient, taking into account his individual needs, depending on the type and progress of the glaucoma disease, expected life expectancy, prevalent diseases and risk factors. In addition to reducing intraocular pressure (IOP), the aim of glaucoma treatment is to improve blood flow in the optic nerve area, prevent the progression of nerve fiber loss and damage to the optic nerve, as well as minimize side effects and complications of treatment. Glaucoma treatment can be divided into conservative (medicated), laser and surgical. The standard algorithm for treating glaucoma begins with conservative monotherapy, which, in case of failure, is increased by additional active substances with a maximum combination of four active substances. In case of insufficient effect, we approach laser and then surgical treatment. In exceptional cases and specific types of glaucoma,

the algorithm is adjusted and individualized to the current needs of the patient. [1–6]

Different surgical treatment techniques have other indication criteria depending on the type and current state of glaucoma in a particular patient. The choice of procedure and surgical approach. It is highly individual and depends on several criteria from both the patient and the surgeon: - set target IOP for a specific patient - previous treatment – medication, laser, previous procedures and surgeries - degree of damage to the visual field and central visual acuity - risk profile of the patient, such as monocus, refractive disorders, risky occupation - preferences and experience of the surgeon - patient expectations and patient compliance with the proposed treatment. [7–10]

When deciding when and how to start the surgical treatment of glaucoma, it is necessary to consider all the criteria mentioned above, including the latest knowledge

and recommendations. It is essential to use surgical treatment whenever the previous drug and laser treatment are ineffective or if it is the only option to maintain visual functions in the glaucomatous eye. Due to the effectiveness and improvement of surgical procedures, as well as long-term good post-surgery results, surgical treatment should not represent the last treatment option. [11–13]

Material and methods

Our follow-up was conducted in the glaucoma outpatient clinic and the eye Department of Ophthalmology, Faculty of Medicine, Comenius University, Bratislava. The data analysis of patients with glaucoma surgery in a time interval of 4 years (July 2015 - July 2019), patients were observed up to 3 years after surgery. The file systematically includes patients diagnosed with secondary glaucoma, according to the international classification of diseases, based on data in the surgery book and the hospital information system. The age and gender of the patients were not taken into account when enrolling them patients. In addition to the established diagnosis, the included patients had to meet the following criteria: in the observed interval, each patient had to undergo one of the anti-glaucoma surgical procedures determined by us, while in the post-surgery period, he had to undergo check-ups at the glaucoma outpatient clinic or the eye department in the intervals of the first day, the first and third month, the first and the third year after surgery. Patients not meeting these essential criteria were automatically excluded. Also, the group did not include patients who underwent another surgery or procedure during the observed period, which is unrelated to the diagnosis of secondary glaucoma and could affect the accuracy of the results of our observation. Patients, who could not be followed up for the next three years after a specific surgery, were not excluded from the set solely because of the implementation of another surgery directly related to the primary monitored diagnosis - secondary glaucoma. In the pre-surgery period, each patient was diagnosed with secondary glaucoma with the value of intraocular pressure and best-corrected visual acuity (BCVA), with the determination of a specific degree of damage to the optic nerve based on examination by imaging techniques. After the surgery, the intraocular pressure value of the patients was examined on the first day, first month, third month, first year and third year after the surgery. Another value we monitored was BCVA in the pre-surgery period, with an interval of one year after the surgery and the necessity of post-surgery adjuvant antiglaucoma treatment one year after the surgery. Patients whose records were missing or the given examinations were not performed were excluded from the file. During studying the medical documentation, we also focused on the records of objective complications during the surgical procedure and the subsequent post-surgery period. In patients, we recorded their subjective feelings, such as the pain feeling and discomfort, in the pre-surgery period, during the surgery, and in the post-surgery period. We used the method of quantitative research in the form of a questionnaire. At the beginning

of the survey, patients were informed of the purpose and anonymity was guaranteed. The questionnaire was based on the "Visual Functions Questionnaire-25" containing questions related to anti-glaucoma surgery added by us. Patients filled out the questionnaire electronically via the website "survio.com" or in printed form, which we then processed electronically. The questionnaire contained 36 questions, which were divided into five parts. The first part consisted of 2 essential questions regarding primary demographic data - age and gender. The third question related to the type of anti-glaucoma surgery performed on the patient. The given question served as a criterion for dividing the answers for further processing. In the second part of the questions, we investigated subjective feelings (quality of vision, pain) during the surgery and post-surgery. The other three parts of the questionnaire were based on the "Visual Functions Questionnaire 25". The third and fourth parts of the questionnaire focused on general difficulties, including vision during daily activities, reading, watching TV, working on the computer, playing games, seeing at a distance, as well as discomfort feeling, or other difficulties. Questions also deal in detail with subjectively perceived difficulties in driving. The results analyze the effects of the above-described difficulties on the patient's psyche, perception and feelings of the surrounding world, and the need for help from the environment. Over the past two years, we have contacted 98 patients who underwent anti-glaucoma surgery, trabeculectomy, cyclocryopexy, implantation of a drainage implant or other surgery to reduce intraocular pressure during 2015-2019. The questionnaire was sent to 98 patients; 65 patients submitted a completed questionnaire with all questions answered, which represents a 66.3% return rate for the questionnaire.

Data analysis

We analyzed the individual data of the monitored group (163 eyes) using the methods of descriptive and inferential statistics. We processed the questionnaire using the form of descriptive statistics. The results in this work are presented in the case of continuous variables as mean \pm standard deviation (SD) and categorical variables as absolute and relative frequencies. Using the Shapiro-Wilk normality test, we determined whether the data had a normal distribution. To assess the statistical significance of the influence of the investigated factors, we used the analysis of variance (ANOVA) test, and t-test (paired and unpaired) with normal distribution. In the case of the non-normal distribution of data, we used non-parametric tests: Mann-Whitney and Wilcoxon test for the comparison of two groups and the Kruskal-Wallis test followed by Dunn's test for the comparison of multiple groups. We considered results that reached a significance level of $p < 0.05$ to be statistically significant. Microsoft® Office Excel 2019 (Microsoft Co.) and GraphPad Prism 5.0 (San Diego, CA, USA) programs were used for statistical analysis, processing of data obtained in the form of a questionnaire and graphical processing of results.

Results

Analysis of subjective features of the set – questionnaire

The analyzed set consists of 163 eyes that underwent surgical intervention for secondary glaucoma of various types. The total number of patients is 152, of which 64 are women, and 88 are men. The average age of the patients is 63.4 ± 14.5 years, with a maximum of 92 years and a minimum of 19 years. From the total number of 163 eyes with surgery, trabeculectomy was performed in 35 eyes (21.5%), cyclocryotherapy in 96 eyes (58.9%), and other glaucoma surgeries in 21 eyes (12.9%). Other surgical procedures contain 17 enucleations, three lens surgeries, and one pars plana vitrectomy. Drainage implants were implanted in 11 eyes (6.7%), of which eight times Ahmed valve (4.9%) and three times Express shunt (1.8%).

As part of the research, one additional survey was conducted as a questionnaire among 65 patients who underwent anti-glaucoma surgery between 2015 and 2019.

The first two questions divided the respondents based on demographic data: 34 men (52.3%) and 31 women (47.7%). The age composition is shown in Figure 1. Most respondents were in the post-productive age, representing the interval of 61-75 years. Another question focused on the type of antiglaucoma surgery. There, most respondents were from the group "Cyclocryopexy" with 36 (55.4%) respondents, then the group "Trabeculectomy" with 16 (24.6%), the group "Drainage implants" with seven (10.8%), the group "Enucleation" with four (6.1%), and the group "Other surgical treatment" of high IOP with two respondents (3.1%). We present the results in Figure 2. This question further served as a criterion for a more accurate analysis of the questionnaire, given the set objectives of the work.

In the next question, we asked the respondents: "During antiglaucoma surgery: did you feel pain or discomfort?". For respondents after secondary glaucoma surgery, the most frequent answer was "minimal pain" in 29 cases (44.6%), followed by "tolerable pain" in 21 respondents

(32.3%), and "no pain" in 13 respondents (20.0%). Only two patients (3.1%) reported severe pain, and none of the respondents indicated extreme pain. According to the individual types of surgery, the answers were divided as follows: In the group "Cyclocryopexy", half of the respondents (18; 50%) answered "minimum pain"; in the group "Drainage implants", the most frequent answer was identical with the number of 5 respondents (71.4%). In the group "Trabeculectomy", the most common response was "tolerable pain" (9 respondents; 56.2%); for the group "Enucleation" the answers were "tolerable pain" (3 respondents; 75.0%) and "no pain" (1 respondent, 25.0%) and for the group "Other surgical treatment", the unequivocal answer was "minimal pain". The data is shown in Figure 3 (see cover page 2).

The next question of the questionnaire was: "Did you feel any pain during the two weeks after the surgery?". Among the respondents, the most frequent answer was "minimal pain" in the number of 33 times (50.7%), followed by "tolerable pain" in 15 respondents (23.1%), "no pain" in 13 respondents (20.0%), and four patients (3.1%) reported severe pain. None of the respondents indicated extreme pain. We divide the answers again according to the types of surgery; In the group "Cyclocryopexy", most respondents (15; 41.7%) answered "minimal pain". The exact most frequent answer was also in the group "Trabeculectomy" with 9 respondents (56.3%) and in the group "Drainage implants" with six respondents (85.7%). For the group "Enucleation", two respondents (50.0%) answered "minimal pain", "tolerable pain" and "no pain" by one respondent (25.0%). For the group "Other surgical treatment" the answer "minimal pain" was marked in one case and the answer "no pain" in the other case. The data is shown in Figure 4 (see cover page 2).

The next question was: "Did you feel pain or discomfort during the first year after the surgery?". For those interviewed after secondary glaucoma surgery, the most common answer was "no pain" for 37 respondents (56.9%), followed by "minimal pain" for 20 respondents (30.8%).

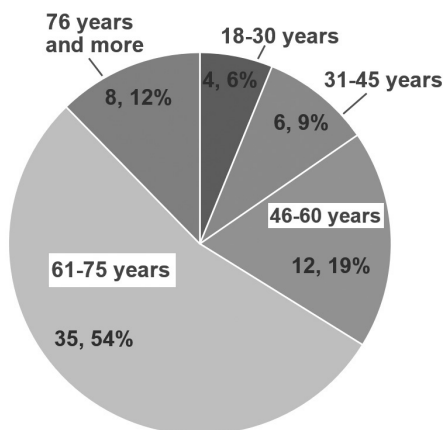


Figure 1. Age composition of respondents

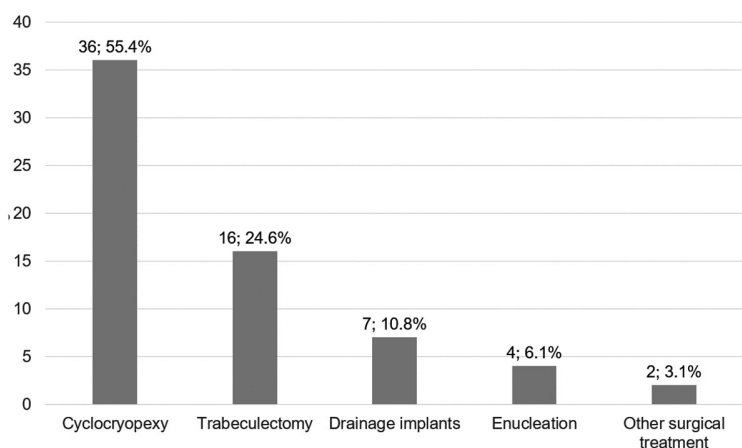


Figure 2. Type of anti-glaucoma surgery

The answer "no pain" was indicated by five respondents (7.7%), and "strong pain" was indicated by three respondents (4.6%). In the group "Cyclocryopexy", the most frequent answer was "no pain" in 21 respondents (58.3%). In the group "Trabeculectomy", the answer "no pain" was in 8 respondents (50.0%) and "minimum pain" in 7 respondents (43.8%), almost equally represented. In the group "Drainage implants", the most common answer was "no pain" in five respondents (71.4%); for the group "Enucleation" the answers were: "tolerable pain" in 2 respondents (75.0%), "strong pain" and "no pain" in 1 respondent (25.0%). For the group "Other surgical treatment", the answer "no pain" was indicated in two respondents (100%). The data is shown in Figure 5 (see cover page 2).

In the following question: "How was the quality of vision during daily activities and orientation in space 1-2 years after surgery compared to before surgery?" the results were as follows; the most frequent answer among all respondents was "no change" for 28 respondents (23.1%), "rather improvement" was given by 19 respondents (29.2%), ten respondents (15.4%) marked the answer as "rather worse", seven respondents (10.8%) answered "improving vision", with only one respondent (1.5%) reporting "worse". The most frequent answers; in the group "Cyclocryopexy", 23 respondents (63.9%) indicated no changes in vision, in the group "Trabeculectomy", nine respondents (56.3%) indicated "rather improvement", in the group "Drainage implants", was "rather improvement" by three respondents (42.8%). The improvement of vision for daily activities was also most often indicated by the respondents for the group "Enucleation" in two responders (75%) and the group "Other surgical treatment" in all two responders (100%). The data is shown in Figure 6 (see cover page 2).

The next question was: "What is the vision for near and short distance work (reading, mobile phone, smartphone, working with a tablet, PC etc)?" The most frequent answer was "no change" for 24 respondents (52.3%), the responses "rather improvement" in 13 responders (20.0%) and "rather worse" 12 times (18.5%) were approximately equally represented. The fewest respondents (6; 9.2%) reported "improving vision". Respondents in the group "Cyclocryopexy" marked the answer "no change" up to 23 times (63.9%) and in the group "trabeculectomy" nine times (56.3%). Respondents who were implanted with a drainage implant indicated in four cases (57.1%) the answer "rather improvement". After enucleation, two respondents (50.0%) marked the answers "rather worse" and two respondents (50.0%) the "rather improvement" in vision. In the group "Other surgical treatment" all two responders (100%) reported improved vision. The data is shown in Figure 7 (see cover page 2).

The following questions have no figures but are part of the results. The next question was texted: "What is your general state of health?". The answer "good" was the most frequent among 37 respondents (56.9%), followed by the response "very good" 22 times (33.8%). Four respondents (6.2%) answered "excellent", two (3.1%) answered "bad",

and none of the respondents marked the answer "very bad". For patients after cyclocryopexy, the most frequent answer is "good" by 24 respondents (66.7%), in the case of trabeculectomy, the answer is "good" by six respondents (37.5%), complementing the most frequent response "very good" by seven respondents (43, 8%). Similar results can be seen in the group of patients after the implantation of drainage implants.

The wording of the next question was as follows: "How is the quality of your vision with both eyes?". The answer was "good" in 46 respondents (70.8%), which also agrees with the most honest answers in individual groups; "Cyclocryopexy" 30 respondents (83.3%), "Trabeculectomy" eight respondents (50.0%), "Drainage implants" in four respondents (57.1%). In total, the answer "very good" was represented 15 times (23.1%) and the answer "excellent" and "bad" were given two times (3.1%) each. The response "very bad" was not provided by any respondent.

In the following question "How often do you experience impaired vision?", the answer "occasionally" occurs in 31 respondents (47.7%); 24 respondents (35.9%) marked the answer "exceptionally". Six respondents (9.2%) answered "often" and four answered "never". None of the respondents marked the answer "still". The answer "sometimes" is the most frequent even in the group "Cyclocryopexy", namely for 20 respondents (55.6%). For both "Trabeculectomy" and "Drainage implants", the response "exceptional" is more often marked; seven times (43.8%) after trabeculectomy and four times for drainage implant responders (57.1%).

In the last reported question, "Do you feel pain or discomfort (burning, itching, cutting...) in the eyes or around the eyes?", the same number of respondents indicated the answer "exceptionally" and "occasionally", namely 27 respondents (41.5%), the answer "never" six respondents (9.2%), and "often" five respondents (7.7%). Again, none of the responders marked the answer "still". Similar results also apply to individual groups. The group "Cyclocryopexy" with the most frequent response "sometimes" in 17 respondents (47.2%) and "exceptionally" in 15 respondents (41.7%). The group "Trabeculectomy" with the most frequent response "exceptionally" in eight respondents (50.0%) and "occasionally" in six respondents (37.5%). In the group "Drainage implants", the most frequent response was "never" in three respondents (42.9%).

Discussion

The patient's subjective perception of individual surgeries is not well clarified in the professional literature. In our study, we used a questionnaire of visual functions and its slight modification to evaluate the subjective results of the secondary glaucoma surgery during the post-surgery. We assessed the quality of the patient's health care and the impact on their long-term quality of life and health. As part of our questionnaire, the selected patients had to answer questions related to the subjective perception of the surgical performance and the post-surgery period regarding pain, discomfort, near vision, distance, medium

distance, and everyday activities. We were also interested in the overall quality of life and the impact on the patient's psyche during specific surgical techniques. Of the patients who underwent cyclocryopexy, 35 respondents (97.2%) reported tolerable, minimal or no pain during the surgery and shortly after the surgery, with most patients saying only minimal discomfort. Up to the first year after surgery, 21 respondents (58.3%) reported no pain. Bellows [14] describes that with cyclocryopexy there is a risk of loss of functional vision up to phthisis of the eye globe. Still, he also emphasizes the importance of this method in treating patients with some specific types of glaucoma and advanced glaucoma. In his 10-year retrospective analysis, Benson [15] admits that the high rate of complications, such as vision loss and bulbar phthisis, cannot be attributed directly to the procedure because the method was used in eyes with a poor prognosis. Despite the possible risks, from the pain point of view, cyclocryopexy appears to be very suitable and subjectively well-tolerated by patients both during-surgery and long-term after the surgery. Also, most patients reported no change in near or distant vision (23 respondents; 63.9%) within two years after surgery, with a small percentage of patients reporting even a slight improvement in vision. Only six patients (16.7%) describe a slightly worse vision during daily activities, and eight patients (22.2%) during close and short distance work. Up to 30 respondents (83.3%) describe an excellent overall quality of vision with both eyes, while 32 respondents (88.9%) indicate occasional or exceptional visual impairment or eye pain or discomfort. The above does not fully correspond to the opinions of several sources about the subsequent impairment of visual functions in patients after the cyclo-destructive method. [14–16] Other answers to the questions in our questionnaire concerning other daily activities also bring similar results. Reading ordinary press such as books, newspapers, or magazines was a minimal or no problem for 27 respondents, representing 75% of respondents after cyclocryopexy. An even higher number, up to 30 respondents (83.3%), reported no or minimal difficulties with everyday work and performing hobbies and activities close by. Recognizing small details such as things on an overcrowded shelf and also surrounding objects while walking had no or only a slight problem after surgery for up to 31 respondents, which represents 86.1%. An even more significant percentage of 88.9% (32 respondents) had minimal or no difficulties when reading street or store signs. For the remaining respondents, these activities are only moderately demanding. Slightly fewer respondents, 27 respondents (75%), describe minimal or no difficulties when going down stairs or a curb in the dark or at night. Then, three respondents (8.3%) say it is difficult for them. 33 to 35 respondents (91.7–97.2%) have no difficulties, or only minimal difficulties recognizing people on the street, seeing them in a foreign environment, in a restaurant, during visiting, and if choosing or matching clothes according to color or pattern. Ten respondents (27.8%) have difficulty watching movies, sporting events or playing games. These findings from our questionnaire

represent evidence of the minimal impact of cyclocryopexy on vision, the feeling of pain or discomfort from the patient's point of view, and the overall post-surgery comfort of the patient in the post-surgery period, as described in the work of Miljković et al. [17] from 2021. According to the questionnaire, 16 respondents underwent trabeculectomy (25%). Most respondents reported tolerable pain during surgery, minimal pain within two weeks, and no or minimal pain within two years of surgery. Eleven respondents (68.8%) reported an improvement in vision during daily activities, but for short distances, close work and reading, the majority - 9 respondents (56.3%) did not report any vision changes. As written by Kyari [18], soreness after trabeculectomy can occur as a result of applied sutures or as a result of the surgical procedure itself. Despite the various modifications, trabeculectomy is a relatively demanding method, especially due to the extent of surgical intervention in the anterior chamber and the anterior segment of the eye. A short-term change in the patient's vision post-surgery may also be related to this. [12, 19] Patients also reported only occasional, exceptional or no deterioration of vision or burning or discomfort in the post-surgery period, and visual acuity could be temporarily blurred during the first few days after surgery. The same problems may have patients after single cataract surgery also. [20–22] It is common for vision to be temporarily blurred in the first few days after surgery. Patients may experience redness, irritation, swelling and a foreign body sensation. Vision improves within a few days to weeks after surgery. [18, 23] Nevertheless, after trabeculectomy, there is no need to monitor IOP. Most serious problems have patients after cyclocryocoagulation or radical surgery, like enucleation of the eye globe due to secondary glaucoma in intraocular melanoma patients after irradiation, as reported in other studies. [24–27]

Conclusion

Secondary glaucoma is a severe eye disease that, without adequate treatment, may lead to gradual damage to the optic nerve and visual functions. Which method of treatment will be used depends on several factors: the state of visual impairment and visual functions, the stage of the disease in which the disease is present, the cooperation and willingness of the patient to be treated and follow the treatment procedure, the possibilities of the workplace for surgery or the knowledge and skills of the attending physician. Timely determination of risk factors, and establishment of an accurate diagnosis with the implementation of the most suitable treatment method based on the latest knowledge and recommendations make it possible to prevent the development of glaucomatous changes. The overall quality of life and the impact on the patient's psyche during specific surgical techniques are different but tolerable. Regular check-ups and dispensary examination of the patient are essential in managing glaucoma, but especially in secondary glaucoma, for a timely response to the onset of disease progression and adaptation of treatment based on the latest knowledge and recommendations.

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