Effect of Information Session for Glaucoma Patients on Intraocular Pressure Control

Glokom Hastalarına Yönelik Eğitim Seansının Göz İçi Basınç Kontrolüne Etkisi

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ABSTRACT Objective: To evaluate the effect of educational interventions about glaucoma and its proper medical treatment on intra ocular pressure (IOP) control. **Material and Methods:** Under medical treatment regimen, patients with good IOP control were assigned to group A (n=35), patients who were decided to change in medication due to poor control were assigned to group B (n=36), those who required surgery were assigned to group C (n=38). Patients were briefed about glaucoma and instructed on the proper dosage and route administration of medications. After briefing IOP was measured at week 4 and month 3. Changes in IOP readings and clinical managements applied to cases were analysed. **Results:** The baseline IOP level of 109 patients was 21.7±4.5 mmHg and at week 4 it was 19.1±3.5 mmHg ($p<0.001$). Thirteen cases in group A, 30 in group B, and 30 in group C showed more than a 1 mm Hg IOP reduction. Thirty five patients in group A, 19 patients in group B, and 19 patients in group C were evaluated to continue with their baseline medications. Seventeen patients in group B and three in group C were instructed to change their therapy. Sixteen patients in group C underwent to surgery. The mean IOP of 70 patients examined at the 3-month was 17.3±2.3 mmHg who have unchanged therapies. Four patients in group A were recommended reduction the number of the agents and 14 patients in group B as well as 11 patients in group C were proposed to continue with their initial regimen. **Conclusion:** An education session for glaucoma patients achieved reductions in IOP most probably by improving patient compliance. The effect of education could be sustained for at least 3 months.

Key Words: Glaucoma; patient education as topic; compliance; administration, topical

ÖZET Amaç: Glokom olgularına, hastalıkları ve doğru tedavi uygulamalarına yönelik verilen eğitimin, göz içi basınç (GİB) kontrolü üzerine olan etkisini araştırmak. **Gereç ve Yöntemler:** Almakta oldukları ilaç tedavisi altında hedef GİB'e ulaşılan olgular grup A (n=35), GİB kontrolünün mevcut ilaçlarla yetersiz olduğu düşünülerek ilaçlarının değiştirilmesi düşünülen olgular grup B (n=36) ve aynı sebeple cerrahi girişime gerek duyulan olgular grup C (n=38) olarak sınıflandırıldı. Olgular glokom hastalığının özellikleri ve göz damlalarının doğru doz ve yöntemle damlatılması konusunda bilgilendirildi. Eğitim sonrası 4. haftada ve 3. ayda GİB'ı ölçüldü. GİB'nda ve olguya uygun görülen klinik yaklaşımlardaki değişimler analiz edildi. **Bulgular:** Tüm olguların başlangıç GİB'leri 21.7±4.5 mmHg iken, 4. haftada 19.1±3.5 mmHg idi ($p<0.001$). Eğitim sonrası 4. haftada grup A'daki 13, grup B'deki 30 ve grup C'deki 30 olguda en az 1 mm Hg GİB düşüşü gözlendi. Dördüncü hafta sonrası grup A'dan 35, grup B'den 19 ve grup C'den 19 olgunun çalışmanın başlangıcındaki ilaçları kullanmaya devam etmesi uygun bulundu. Grup B'deki 17 olgu ve grup C'deki 3 olgunun ilaçlarında değişiklik yapılmasına karar verildi. Grup C'deki 16 olgu ise cerrahi yöntemle tedavi edildi. Üçüncü ay sonunda tedavisi değiştirilmeyen 70 hastanın ortalama GİB değeri 17.3±2.3 mmHg idi. Bu olgulardan grup A'daki 4 hastanın ilaçları azaltılırken, grup B'deki 14, grup C'deki 11 hastanın başlangıçtaki ilaçlarla tedaviye devam etmelerine karar verildi. **Sonuç:** Tıbbi tedavi almakta olan glokom hastalarına verilen eğitim, hasta uyumunu artırarak GİB'de düşüş sağlamaktadır. Eğitimin sağladığı bu etki en az 3 ay sürebilmektedir.

Anahtar Kelimeler: Glokom; konu olarak hasta eğitimi; uyum; uygulama, topikal

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Patients with glaucoma require lifelong treatment and follow-up care to preserve vision. Medical management, while not curative, can prevent or minimize the impact of the disease. Compliance, which has been defined as the extent to which patients' behaviors correspond with providers' recommendations, is one of the most important determinants of the treatment efficacy. Poor compliance in patients with glaucoma is considered to be an important factor for poor intraocular pressure (IOP) control and greater visual field loss and blindness.[1,2]

Multiple factors affect a patients' ability to comply with a therapeutic regimen. Given the asymptomatic nature of glaucoma and the effort required for the treatment, patients are at risk for noncompliance with the treatment. Despite the introduction of eye drops with fewer side effects and a simpler medication regimen, high numbers of glaucoma patients regularly omit prescribed doses.[1,3-6] Even if patients attempt to take their medicines, they may also be influenced by noncompliance due to failing to administer it correctly.[7,8]

Ineffectiveness of medical therapy may be falsely interpreted in cases of noncompliance with medications, and laser therapy or surgery may be performed. Thus, an improvement in compliance could prevent the need to advance to these more aggressive therapies. Unfortunately, even if noncompliance is diagnosed, physicians do not have reliable tools to improve compliance. An effective technique that could be used easily to help to improve patient compliance would be worthwhile to incorporate into routine practice.

It is reasonable to believe that a poor understanding about glaucoma and its treatment along with the practical difficulty of drop administration may contribute to poor treatment outcomes. Educational interventions involving patients, family members, or both can be effective for improving compliance. To the best of our knowledge, the impact of an education session for enhancing patients' perception about glaucoma and its treatment on IOP control has not been studied previously. This study was designed to document the effect of providing educational interventions about glaucoma and its proper medical treatment on patients' clinical status.

MATERIAL AND METHODS

This study was a comparative clinical trial conducted on patients with medically treated primary open-angle glaucoma and exfoliation glaucoma between May 2008 and November 2009. Consecutive patients were met on the day of their appointment, and the objective of the study was explained. The research protocol was approved by the Clinical Research Ethical Committee of Ankara. All patients provided written consent.

Patients were considered eligible for the study if they were older than 18 years, had a diagnosis of primary open-angle or exfoliative glaucoma, and were taking topical medications for at least 1 year before enrollment. Exclusion criteria were patients whose drops were administered by a caretaker, patients with any abnormality preventing reliable applanation tonometry; patients with visible side effects from the medication, any opacity or patient uncooperativeness that restricted adequate ophthalmologic examination, any concurrent infectious/non-infectious conjunctivitis, keratitis, or uveitis, or intraocular surgery within the past 6 months. All cases requiring urgent changes in their therapeutic approach were also excluded. The eye with the higher IOP at baseline was enrolled as the study eye; however, when no difference in IOP was found between the eyes, the right eye was selected.

At the baseline visit, all patients underwent a complete ophthalmic examination including assessment of best corrected Snellen distance visual acuity, anterior and posterior segment examinations, Goldmann applanation tonometry, gonioscopy with a Goldmann three-mirror lens, central corneal thickness measurements by ultrasonic pachymeter, visual field examinations with a Humphrey automated perimeter, and confocal scanning laser ophthalmoscopy by Heidelberg retinal tomograph (HRT III).

Patients were assigned to one of the following three groups based on the clinical judgment of the treating physician; those maintaining their target IOP with current medical treatment (group A), those who required a change in medical treatment protocol (group B), and those who required filtrating surgery (group C). This study was originally designed with a sample size of 40 cases in each group.

Patients were interviewed with a standardized questionnaire by the nurse (Eİ). Compliance was assessed by asking whether they used their medication as prescribed and, if not, how many doses were missed. In this study, noncompliance was defined as missing more than five doses of medication during a month. To assess patients' knowledge about the treatment regimen, patients were questioned for the name and the dosage of the medicines as well as the maintenance of proper intervals between medications. If patients were unable to recall the name of their glaucoma medications, they were asked to describe the bottle. The accuracy of the patients' description of the medication regimen was classified as adequate or poor. Patients' ability to instill drops was assessed by observation. Their technique was classified as proper or improper based on whether the administration was "on target" or "missed the eye."

After the interview and observations, patients were given some information about glaucoma. For each patient verbal information session which was presented by the nurse lasts 10 minutes. The main goal of the educational session was to improve the patients' understanding of the consequences of glaucoma and what to expect from the treatment, including a clear discussion that vision could be lost if the medications were not used properly. They were also instructed on the proper administration of eye drops, correct dosing schedules, and minimization of medication waste. At the end of the visit, patients were given a written chart describing glaucoma, in which included the possible effects on visual functions and the benefits of ocular hypotensive therapy.

Current ocular hypotensive treatments were continued. Follow-up examinations were scheduled at the same hours of the day at week 4 (first phase) and month 3 (second phase). IOP was measured by the same examiner. Outcome measures included IOP measurements, changes in IOP (IOP at baseline and IOP at follow-ups), and percent changes in IOP. The clinical management of the patients was re-evaluated by the treating physician according to the clinical status and the IOP readings at follow-ups. Patients requiring changes in treatment protocol (either medical or surgical) on follow-up visits were noted.

Statistical calculations were performed using SPSS 15.0 for Windows (SPSS, Inc., Chicago, IL, USA). Changes in IOP measurements and planned clinical management before and after the information session were analyzed. The chi-square test was used to compare demographic data. Continuous variables between the groups were analyzed with the Kruskal-Wallis and Bonferroni adjusted Mann-Whitney tests. The effect of education on IOP level within a group was analyzed with the *t*-test. p-values <0.05 were considered statistically significant.

RESULTS

One hundred twenty patients were included in the study over a 14-month period. One hundred nine patients completed the first phase (4-week control), and 70 patients completed the second phase (3-month control). The study population consisted of 59 men and 50 women with a mean age of 65.3±10.9 years (range, 38-90 years). The average duration for a glaucoma diagnosis was 7.1±5.6 years (range, 1-30 years). The mean number of glaucoma bottles prescribed at baseline was 2.0±0.71 (range, 1-3), and the mean IOP level was 21.7±4.5 mmHg (range, 8-34 mmHg).

Thirty-five (87.5%) patients in group A, 36 (90%) patients in group B, and 38 (95%) patients in group C completed the first phase, whereas 34 patients in group A, 18 patients in group B, and 18 patients in group C completed the second phase. Of the 39 patients that did not complete the second phase, 20 required a change in medical treatment regimen, 16 underwent surgery, and three were lost to follow-up.

TABLE 1: Demographic and clinical characteristics of patients and parameters releated with compliance (results were given as mean±SE and range).

Characteristics	Group A	Group B	Group C	P[1]	P[2]	P[3]
Age (Years)	64.2±10.7 (42-79)	66.4±12.5 (38-90)	65.2±9.5 (49-81)	0.43	0.66	0.66
Gender						
Male	21	21	17	1.0	0.24	0.26
Female	14	15	21			
Mean Glaucoma Time (Years)	7.1±5.3 (1-20)	7.5±5.6 (1-30)	6.6±5.8 (1-28)	0.73	0.70	0.48
Number of glaucoma medications	1.8±0.7 (1-3)	1.9±0.8 (1-3)	2.4±0.5 (2-3)	0.61	<0.001	0.001
Cup/Disc	0.6±0.11 (0.4-0.9)	0.64±0.12 (0.4-1.0)	0.7±0.14 (0.5-1.0)	0.49	0.07	0.4
Glaucoma Type (POAG*/EXG**)	24/11	23/13	22/16	0.88	0.76	0.68
Missing Dosages in 1 month						
≤5 times	24 (68.4%)	22 (61.1%)	16 (42.1%)	0.62	0.03	0.11
> 5 times	11 (31.6%)	14 (38.9%)	22 (57.9%)			
Knowledge About Treatment						
Adequate	29 (82.9%)	21 (58.3%)	21 (55.3%)	0.56	0.01	0.09
Poor	6 (17.1%)	15 (41.7%)	17 (44.7%)			
Instillation Technique						
Proper	25 (71.4%)	24 (66.7%)	25 (65.8%)	0.79	0.23	0.09
Improper	10 (28.6%)	12 (33.3%)	13 (34.2%)			

* Primary Open Angle Glaucoma, ** Exfoliative Glaucoma

P[1]: Difference between Group A and B

P[2]: Difference between Group A and C

P[3]: Difference between Group B and C

The baseline mean IOP, demographics, and parameters related to medication usage of the study groups were outlined in Table 1. Mean age and gender were not significantly different among the groups (p>0.05). A significant difference in the baseline IOP was found between groups A and B (p=0.001), A and C (p<0.001), and B and C (p<0.001). The cup-to-disc ratio in group C was significantly higher than that of in group A (p=0.013). No significant difference in the cup-to-disc ratio was detected between groups A and B (p=0.43) or groups B and C (p=0.08). Group A patients had a significantly lower mean number of IOP-lowering medications than those of groups B and C (p<0.001 for each comparison), and group B patients had a significantly lower mean number of IOP-lowering medications than that of group C (p=0.002). No statistically significant differences were observed among the three groups for mean glaucoma time (p=0.52).

The number of the doses missed in 1 month was highest in group C and lowest in group A (p=0.02). In addition, group A patients had a significantly better ability to accurately describe their medication regimen than those in groups B and C, whereever group B patients were noticed to be better than those of group C (p=0.01). No statistically significant differences were noted among the three groups, in the ability to instill drops (p=0.13).

At week 4, the mean IOP level of the study group was 19.1±3.5 mmHg (range, 8-28 mmHg). The mean IOP change and the mean percentage of IOP change from baseline to week 4 was 2.6±3.2 mmHg (from a 12 mmHg reduction to a 2 mmHg increase) and 10.8±12.8% (from a 42.9% reduction

TABLE 2: Mean±SE (range) intraocular pressure values of groups at baseline and control visits.

	Group A	Group B	Group C	P[1]	P[2]	P[3]
Baseline IOP* (mmHg)	16.0±3.2 (8-22)	22.3±2.3 (18-27)	25.3±4.2 (19-34)	<0.001	<0.001	<0.001
Week 4 IOP (mmHg)	15.4±3.0 (8-22)	20.1±3.0 (15-28)	20.6±4.0 (15-28)	<0.001	<0.001	0.51
Month 3 IOP (mmHg)	15.1±2.0 (8-21)	18.1±2.5 (15-25)	17.9±2.3 (14-23)	0.02	0.03	0.78

*IOP: Intraocular Pressure

P[1]: Difference between Group A and B

P[2]: Difference between Group A and C

P[3]: Difference between Group B and C

to a 26.5% increase), respectively. Table 2 shows the differences in posteducation IOP readings between the three groups.

Thirteen of 35 (37.1%) eyes in group A, 30 of 36 (83.3%) in group B, and 30 of 38 (78.9%) in group C showed more than a 1 mmHg IOP reduction. According to these IOP measurements and the clinical status, 35 (100%) patients in group A, 19 (52.8%) patients in group B, and 19 (50%) patients in group C were proposed to continue with their baseline topical antiglaucoma medications. Seventeen (47.2%) patients in group B and three (7.9%) in group C were decided to change their medical treatment regimen. Sixteen (42.1%) patients in group C were required surgical treatment (Table 3).

Of the 73 patients who were still using the same antiglaucoma medication after the first control visit, 70 returned for the 3-month visit. Their mean IOP was 17.3±2.3 mmHg (range, 8-23 mmHg), the mean IOP change from baseline to month 3 was 2.8±3.3 mmHg (from a 13 mmHg reduction to a 2 mm Hg increase), and the mean percentage of IOP change from baseline to month 3 was 12.0±13.3% (from a 46.4 % reduction to a 14.2% increase) (Table 4).

At the third month visit, four patients in group A reduced the number of agents they used according to the measured IOPs and clinical status. Fourteen patients in group B and 11 patients in group C were instructed to continue with their initial treatment regimen. Two patients in group C were required surgical treatment according to their IOP and clinical status at 3 months post education (Table 4).

DISCUSSION

The results of our analysis in this study indicated that an education session for glaucoma patients

TABLE 3: Changes in therapeutic approaches after education intervention.

		Group A	Group B	Group C
First Visit (n-%)	No Change	35 (100%)	19 (52.8%)	19 (50%)
	Addition of Medication	0	17 (47.2%)	3 (7.9%)
	Decrement of Medication	0	0	0
	Surgery	0	0	16 (42.1%)
Second Visit (n-%)	No Change	31 (88.6%)	14 (38.9%)	11 (28.9%)
	Addition of Medication	0	4 (11.1%)	5 (13.2%)
	Decrement of Medication	3 (8.6%)	0	0
	Surgery		0	2 (5.3%)

TABLE 4: Changes in mean±SE (range) intraocular pressure readings after education intervention at week 4 and month 3.

	Group A	Group B	Group C	P[1]	P[2]	P[3]
Change in IOP* (mmHg) (Week 4)	-0.6±1.5 (-4- +1)	-2.2±1.9 (-8.0- +2.0)	-4.7±3.8 (-12- +2.0)	<0.001	<0.001	<0.001
Percentage change in IOP (Week 4)	-2.6±8.7 (-22.2- +8.3)	-10.1±8.3 (-33.3+7.7)	-16.6±15.7 (-42.9±26.5)	<0.001	<0.001	0.001
Change in IOP (mmHg) (Month 3)	-0.6±1.6 (-5-+2)	-3.4±2.2 (-8.0-0.0)	-6.1±3.5 (-13.0-0.0)	<0.001	<0.001	0.009
Percentage change in IOP (Month 3)	-2.4±9.5 (-27.8- +14.2)	-15.2±9.7 (-33.3-0.0)	-24.4±12.3 (-46.6-0.0)	<0.001	<0.001	0.001

* IOP:Intraocular Pressure

P[1]: Difference between Group A and B

P[2]: Difference between Group A and C

P[3]: Difference between Group B and C

achieved reductions in IOP and that the effect of education could be sustained for at least 3 months. Patients who had poor IOP control were more likely assessed to gain benefit from this intervention. The results also showed that many patients had misconceptions regarding the details of their treatment regimens and had difficulties in accurate administration of eye drops, which could be corrected by educational interventions.

Compliance with chronic therapies is crucial to prevent the disease progression.[9] Glaucoma patients with poor medication compliance had higher rates of visual loss in one series.[2] Several studies have indicated that the incidence of self-reported noncompliance in glaucoma was between 24-59%.[3,10-13]

Acceptance of the diagnosis and understanding its impact on vision and quality of life may be the first step in compliance. Patients with a good knowledge and understanding of glaucoma have better compliance.[1,14,15] In contrast, a poor understanding of the need for chronic therapy is one of the identified causes of noncompliance for patients with glaucoma.[16,17] Forgetfulness is one of the major causes cited by the patients with glaucoma for the omission of prescribed doses.[3,12,13] The most probable reason for the glaucoma patients to forget to take their eye drops accurately is that there is no immediate disability from the disease and no direct advantage from the eye drops.[12,16,18] The Glaucoma Adherence and Persistency study demonstrated that poorer adherence in patients who did not believe that missing their eyedrops would increase their risk of loosing vision.[19] A patient's perceptions of the risk for vision loss and a means for gaining information regarding glaucoma increases compliance.[18] However, it has been shown that a high proportion of patients know that glaucoma can cause blindness, and no difference in this awareness was found between adherent and nonadherent patients.[20]

A poor knowledge about the details of the treatment regimens have been identified as a cause of noncompliance with medical therapy in glaucoma.[16,17] Being treated with various topical medications at the same time might be confusing for some, especially older patients, and seems to be an obvious reason for noncompliance. Moreover, simplification of treatment regimen by once-daily dosing may enhance the patient compliance with therapy.[21] We found that patients with poor IOP control were less accurately recalled their medication regimen, suggesting that improved patient knowledge about the more simple treatment regimen may result in a better IOP control.

Manual dexterity when administering eye drops has also been identified as an important component of treatment compliance.[15,16] In one study, nearly 20% of glaucoma patients relied on others to administer their drops, and the most

commonly cited reason was manual dexterity.[22] Insufficient skills, especially in older glaucoma patients or patients with comorbidities, have been recognized.[1,16,23] Stewart et al. and Kass et al. reported on patients who were incapable of drop instillation and stated that 7-48% of medicine was wasted.[7,24] According to Olthoff et al., many patients have difficulties correctly administering eye drops, and many patients require information on this issue.[25]

One of the most powerful approaches to improve the patient compliance is believed to consist of a combination of educational, behavioral, and affective components involving patients and family members.[26] Kharod et al. reported that writing down directions for medication use improved the accuracy of reporting medications regimen.[27] Granström stated that education and relating dosing to daily events might improve the compliance.[14] Blondeau and coworkers found that providing 2 hours information session with the aid of Microsoft Powerpoint presentation and video segments patient knowledge increased and persisted throughout the 10 months.[28] It is reasonable to expect that the improved knowledge about the treatment regimen and the proper drop instillation technique could lead to better compliance and better treatment outcomes. Okeke et al. suggested that intervention programs likely increase the compliance with glaucoma medications.[29] Although several groups have studied compliance using different methods, none of these studies directly assessed the effect of enhancing patients' understanding of their disease and treatment regimen on IOP control.

IOP control among the entire sample, regardless of regulation status, showed significant improvement after the education session. Seventy-three (70%) of our educated participants demonstrated more than a 1 mmHg reduction in IOP. This ratio was more striking in those patients whose IOP was controlled poorly with current medical treatment. The difference in the magnitude of improved IOPs between the groups B and C by comparing with those of group A was found to be larger. This result supported our hypothesis that the patients with poor glaucoma control may be less compliant. One of the reasons for noncompliance might be the poor understanding about the treatment protocol and the educational efforts might lead to improve the compliance.

The larger number of antiglaucoma drops usage in groups B and C, as well as less knowledge might have been the cause for less knowledge and higher noncompliance rates. Claxton performed a review of the systemic medical literature and noted that fewer doses per day correlated significantly with better compliance.[30] Nevertheless. it is unclear whether complex regimens lead to poor compliance, or poorly compliant patients are more likely to engender complex regimen.

This study also demonstrated the relationship between the enhanced patient knowledge and the required therapeutic approach. Treatment plans for patients in groups B and C changed significantly after the education session, and more aggressive therapies were prevented (Table 4). After the education session, nearly half of the patients in group B were achieved the target IOP with their baseline medication regimen and were decided to continue without any changes. Similarly, half of the group C patients, who were candidates for surgical intervention, were decided to follow up with medical treatment.

However, our study had some limitations. First, this was a nonblinded study; the IOP was measured by one of the authors, who was aware of that a particular patient had an educational session. Second, a single IOP measurement was used as the primary outcome variable. Third, the study was conducted in a single center with a limited sample size and specific population demographic characteristics (health insurance presence and similar socioeconomic and educational levels); hence, the generalizability of the results is limited.

Ophthalmologists remain as the main source of education for the patients.[19,31] Physicians must take a more proactive role in identifying, assisting, and motivating the noncompliant patients. Educating patients is a simple and inexpensive intervention that increases the treatment effect. Patients

should be educated on the potential implications of glaucoma before the irreversible damage and vision loss occur. Continuing patient education during the course of the disease should also be performed in a simple and personalized form.[32] In patients in whom the IOP continues to be high or progression of visual field loss occurs despite prescribing potent anti-glaucoma drugs, patients' compliance and skills administering eye drops should be checked before opting for laser or surgical therapy.

In conclusion, our data suggest that the IOP control with glaucoma drop use is improved with educational intervention. It is likely that educational efforts to improve the patient medication administration played an important role in improving patient compliance. Patients who could understand the consequences of their disease, the role of the treatment in controlling progression, what to expect from the treatment, and how to apply it are more likely to comply with their treatment regimen. However, further long-term studies with larger samples are needed to determine the effect of enhanced patient education about glaucoma and its treatment on IOP control.

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