

The effects of diazepam on blood pressure levels in cataract surgery

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ABSTRACT

الأهداف: تقييم آثار استخدام الديازيبام عن طريق الفم على تغييرات ضغط الدم في المرضى الذين أجريت لهم جراحة الماء الأبيض بتخدير موضعي.

الطريقة: بلغ عدد المرضى الذين أجري لهم استئصال العدسة تحت تأثير التخدير الموضعي 147 مريض تمت مراجعتهم بشكل استعادي. أجريت هذه الدراسة في قسم العيون، جامعة عدنان مندريس، كلية الطب، أيدين، تركيا خلال الفترة من يناير 2011م و يوليو 2013م. تم تقسيم المرضى إلى مجموعتين مجموعة الديازيبام ومجموعة لم تستخدم الديازيبام قبل العملية. تم فحص مستويات ضغط الدم لجميع المرضى عن طريق ملفاتهم. اختيرت 5 قراءات للاختبار الإحصائي. كانت القراءة الأولى في جناح العيون في صباح يوم العملية. والثانية أخذت في غرفة تجهيز قبل العملية، وأخذت قراءتان أثناء العملية وسجلت كقيم ثالثة ورابعة. وسجلت القراءة الخامسة في جناح العيون بعد العملية.

النتائج: بلغ معدل عمر مجموعة الديازيبام 62.17 ± 10.01 عام ومجموعة الشاهد 64.31 ± 10.88 عام. لم يظهر أي اختلاف بين المجموعتين في مستويات ضغط الدم الانبساطي والانقباضي قبل العملية في جناح العيون. كان ضغط الدم الانبساطي والانقباضي أعلى أثناء العملية في المجموعة التي لم تستخدم الديازيبام. وكان هذا الاختلاف مهم إحصائياً ($p < 0.001$).

الخلاصة: أن ارتفاع ضغط الدم قد يؤدي إلى زيادة المؤشرات الجراحية والتي قد تؤدي إلى مضاعفات غير متوقعة. ولخفض ارتفاع ضغط الدم والحد من المستويات الخطيرة أثناء العملية، يعد استخدام الديازيبام مفيد حتى لدى مرضى الضغط الدم الطبيعي.

Objectives: To evaluate the effects of oral diazepam on blood pressure (BP) alterations in patients that underwent cataract surgery under topical anesthesia.

Methods: A total of 147 patients that underwent phacoemulsification surgery under topical anesthesia,

were reviewed retrospectively. The study took place in the Department of Ophthalmology, Adnan Menderes University Medical Faculty, Aydın, Turkey, between January 2011 and July 2013. Patients were divided into 2 groups: Group 1: received 5 mg diazepam per oral one hour prior to surgery, and Group 2 (control group): none administered preoperatively. The BP readings of all patients were scanned through their files. Five readings were chosen for statistical analysis. The first reading was taken in the ophthalmology ward on the morning of the operation, the second was taken in the premedication room just before the surgery, 2 readings were taken intraoperatively and recorded as third and fourth values, and the fifth reading was recorded from those taken in the ophthalmology ward after surgery.

Results: Group 1 had a mean age of 62.17 ± 10.01 years, while the Group 2 had a mean age of 64.31 ± 10.88 years. There were no differences between the 2 groups by means of systolic and diastolic BP levels measured preoperatively in the ophthalmology ward. Intraoperative systolic and diastolic BP levels were significantly higher in Group 2 ($p < 0.001$).

Conclusion: Elevated BP can undermine surgical outcomes; and may lead to unforeseen complications. To prevent the elevation of BP to risky levels in the intraoperative period, diazepam administration may be beneficial, even in normotensive patients.

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Cataract surgery is often carried out using topical anesthesia.¹ Topical anesthesia has some advantages compared with regional ocular anesthesia or general anesthesia.² A reduced length of stay in the operating theater, and nausea and vomiting that can be experienced from general anesthesia is less common with topical anesthesia.³ Regional ocular anesthesia (peribulber and retrobulbar injection) may lead to complications such as globe perforation, oculocardiac reflex, and retrobulbar hemorrhage.⁴ Regional anesthesia related complications were not seen in topical anesthesia. However, it does not affect eye movements, and patients' compliance is very significant with topical anesthesia.⁵ Cataract surgery is usually performed on the elderly population, with one third of these patients having systemic illnesses.⁶ Hypertension (HT) is the most common, and is seen in approximately half of the patients.⁷ The variation of blood pressure (BP) may occur during cataract surgery. Blood pressure in particular increases intraoperatively, and then decreases in the postoperative period.⁸ Yap et al² reported that systolic BP increases during topical cataract surgery, especially in females.² Fazel et al⁹ reported that there was no difference in hemodynamic changes between retrobulbar and topical anesthesia during the perioperative period.⁹ In this study, we investigated the effects of diazepam on BP changes in patients that underwent cataract surgery under topical anesthesia.

Methods. A total of 147 patients aged between 30-85 that underwent cataract surgery under topical anesthesia in the Department of Ophthalmology, Adnan Menderes University Medical Faculty, Aydın, Turkey, between January 2011 and July 2013 were reviewed retrospectively. Patients who underwent uneventful phacoemulsification in the morning time were included in the study. Cataract surgery under general anesthesia or regional ocular anesthesia, hypertensive patients and patients who received anti-hypertensive treatment for any reason were excluded from the study.

The local ethics committee approved the study. Additionally, our study was performed according to the principles of the Helsinki Declaration. The patients were divided into 2 groups. The first group comprised 70 patients receiving 5 mg diazepam per oral (PO) one hour prior to surgery (Group 1), and the second group (control group) comprised 77 patients receiving nothing before surgery (Group 2). The BP readings of the patients on the day of the operation were scanned from their files. A total of 5 readings were recorded for statistical analysis. The readings were evaluated separately as systolic and diastolic BP. The first reading

was taken in the ophthalmology ward during the morning of the operation, the second reading was taken in the premedication room just before the surgery, 2 readings taken in the operating theater were recorded as the third and fourth (the third one was measured at the beginning of the surgery, the fourth one was measured 15 minutes after the surgery), and the final reading taken in the ophthalmology ward postoperatively was recorded as the fifth value. Blood pressures were evaluated at the level of the upper extremity with a manual sphygmomanometer, both preoperatively and postoperatively. Blood pressures were evaluated by automated BP instruments in the premedication room and intraoperatively. Blood pressures were measured in the supine position while patients were in the premedication room, and intraoperatively, and other measurements were taken in the sitting position.

Cyclopentolate 1% (Sikloplejin®, Abdi İbrahim, İstanbul, Turkey), tropicamide 1% (Tropamid Forte®, Abdi İbrahim, Turkey), and phenylephrine 2.5% (Mydfrin®, Alcon, Fort Worth, Texas, USA) were used 3 times for pupil dilatation preoperatively. Proparacaine 0.5% (Alcaine®, Alcon Laboratories Inc., Fort Worth, Texas, USA) was used for topical anesthesia 5 minutes prior to surgery, and just before the beginning of the surgery. All phacoemulsification surgeries were performed under topical anesthesia and intracameral anesthesia was not used during the surgery. There were no differences in the infusion fluids. Both Groups 1 and 2 received intraocular irrigating balanced salt solution (BVI® Beaver Visitec, Abingdon, Oxfordshire, UK) without epinephrine as infusion fluids during phacoemulsification. The phacoemulsification was carried out by 2 surgeon. Phacoemulsification was performed through a 2.8 mm clear corneal incision with a peristaltic phacoemulsification machine (Sovereign® Compact Abbott Medical Optics, Abbott Park, Illinois, USA.). Sodium hyaluronate 3% (Ocu+®, Pittsburgh, USA) was used before capsulorhexis creation and sodium hyaluronate 1.4% (Ocu+®, Pittsburgh, USA) was used before the intraocular lens implantation. Intraocular lens, which was made of hydrophobic acrylic materials, were implanted (Acriva® UD 613, İstanbul, Turkey) in the capsular bag.

Statistical analysis. Data analysis was performed using the Statistical Package for Social Sciences, version 18.0 (SPSS Inc., Chicago, Illinois, USA). The comparison between the 2 groups was obtained by Mann-Whitney U test, and the results were expressed as means ± standard deviations. We used Friedmann test for repeated measurements of each group. A *p*-value of <0.05 was considered statistically significant.

Results. Patients were divided into 2 groups. Group 1 received diazepam as premedication, had a mean age of 62.17 ± 10.01 (40-85 years). Group 2 received no premedication had a mean age of 64.31 ± 10.88 (40-87 years). Accompany systemic diseases, except for HT, were presented in Table 1. The demographic data of the patients are summarized in Table 1.

There were no differences between the 2 groups in terms of systolic and diastolic BP levels measured preoperatively in the ophthalmology ward. Intraoperative systolic and diastolic BP levels were higher in Group 2. This difference was found to be statistically significant ($p < 0.001$, Mann-Whitney U test) (Table 2). The postoperative systolic BPs were found to be statistically significantly different ($p = 0.03$, Mann-Whitney U test)

Table 1 - Demographic data of 147 patients aged 30-85 that underwent cataract surgery under topical anesthesia.

Demographic data	Group 1 (n=70)	Group 2 (n=77)	P-value
Age (mean $\pm$ SD)	62.17 $\pm$ 10.01	64.31 $\pm$ 10.88	0.149
Female/male (%)	28/42 (40/60)	23/54 (29.9/70.1)	0.153
Coexisting systemic disease (n)	19	22	0.211

Gender was shown as frequency (percentage)

Table 2 - Blood pressure values on the operating day among 147 patients aged 30-85 that underwent cataract surgery under topical anesthesia.

Variables	Group 1 (n=70)	Group 2 (n=77)	P-value
Preoperative 1			
Systolic BP	115.3 $\pm$ 11.9	118.3 $\pm$ 11.0	0.160
Diastolic BP	70.9 $\pm$ 8.8	75.3 $\pm$ 8.6	0.163
Preoperative 2			
Systolic BP	140.7 $\pm$ 3.8	123.8 $\pm$ 16.5	0.000
Diastolic BP	77.1 $\pm$ 9.2	77.1 $\pm$ 9.1	0.227
Intraoperative 1			
Systolic BP	137.8 $\pm$ 15.6	153.2 $\pm$ 20.7	0.000
Diastolic BP	76.9 $\pm$ 9.3	87.8 $\pm$ 10.5	0.000
Intraoperative 2			
Systolic BP	118.7 $\pm$ 11.0	144.2 $\pm$ 21.4	0.000
Diastolic BP	73.7 $\pm$ 6.6	84.2 $\pm$ 11.9	0.000
Postoperative			
Systolic BP	118.9 $\pm$ 13.4	114.2 $\pm$ 13.2	0.030
Diastolic BP	74.0 $\pm$ 7.8	73.6 $\pm$ 6.4	0.674

Values are given as mean $\pm$ SD. BP - blood pressure,

Preoperative 1 - reading was taken in the ophthalmology ward on the morning of operation, Preoperative 2 - reading was taken in the premedication room just before the surgery, Intraoperative 1 - reading was taken in the operating theater at the beginning of the surgery,

Intraoperative 2 - reading was taken in the operating theater 15 minutes after the surgery, Postoperative - reading was taken in the ophthalmology ward postoperatively, Mann Whitney U test was used for the comparison of 2 different groups. Intraoperative systolic and diastolic BP levels were higher in group 2. This difference was found to be statistically significant ($p < 0.001$).

(Table 2), but not clinically significant. Individuals with these values are considered in normal range in terms of cardiology and not treated. In Group 1, preoperative systolic BP was measured as 115.3 ± 11.9 in the ophthalmology ward during the morning operation, and as 118.7 ± 11.0 15 minutes after the surgery. This difference was not clinically and statistically significant ($p = 0.297$, Friedmann test). However, in Group 2, preoperative systolic BP was 118.3 ± 11.0 in the ophthalmology ward, and 144.2 ± 21.4 15 minutes after the surgery ($p = 0.001$, Friedmann test). This difference was clinically and statistically significant. When we compared preoperative BP values, which were taken in the ophthalmology ward and postoperative BP values in each group, the differences were not statistically significant ($p = 0.297$ in Group 1 and $p = 0.420$ in Group 2, Friedmann test).

In the postoperative period in both groups, BP levels decreased, and the measured values were close to the preoperative levels. The highest systolic BP recorded was 230 mm Hg, and the highest diastolic BP was 110 mm Hg. These readings were taken from a patient intraoperatively (Group 2). In Group 1, the highest readings were taken again, in the operating theater, the highest systolic BP was 165 mm Hg and the highest diastolic BP was 100 mm Hg.

Discussion. Cataract surgery is one of the world's most widely performed procedures, and most subjects are over the age of 60.^{10,11} Cataract are often accompanied by coexisting systemic diseases in these elderly patients.^{12,13} Hypertension is the most common, and approximately half of the cataract patients have HT.⁷ In addition, patients with HT perform cataract surgery approximately twice more often than other patients.¹⁴ Blood pressure tends to rise during cataract surgery.² Yap et al² found that systolic BP is statistically higher intraoperatively and BP is higher, particularly in women. They reported increasing BP during surgery did not depend on old age, but on antihypertensive drug usage, and having a family history of HT.² Mamiya et al¹⁵ measured BP in 39 elderly patients during cataract surgery under local anesthesia. Nineteen of their patients the systolic BP increased of more than 20% during cataract surgery.¹⁵ The reasons for the rise in BP during cataract surgery are ocular pain, increase in the patient's anxiety, discomfort, operation microscope light sensitivity, and so forth.^{2,16} In cataract surgery, the use of topical anesthetic agents alone causes discomfort and pain in more than 30% of patients.¹⁷ Pain and discomfort reduced significantly with the use of intracameral anesthesiology.^{18,19} Cupo

et al²⁰ compared the effect of peribulbar and topical/intracameral anesthesia on the vital parameters during phacoemulsification. They reported mean and diastolic BP, and the heart rate remained more stable using topical/intracameral anesthesia. Lidocaine is the best known agent for intracameral anesthesia. Low concentration intracameral lidocaine is well tolerated, but high concentration intracameral lidocaine may cause permanent damage to the corneal endothelium.²¹ Premedicating agents may be used in patients undergoing cataract surgery under local anesthesia to provide analgesia, for patient's comfort, anxiolytic effect, and hemodynamic stability. Clonidine, fentanyl, melatonin, midazolom, clorazepate dipotassium, and gabapentin are used as premedicating agents in cataract surgery, and are shown to be effective.²²⁻²⁶ Diazepam has sedative, anxiolytic, and anticonvulsant properties.²⁷ Diazepam affects the GABA-A receptors, which lead to central nervous system depression.^{27,28} In addition, there is a hypotensive effect from diazepam. The reason for the hypotension mechanism is unknown, but may be due to the central mechanism.²⁹

Study limitations. The patients were not given diazepam before May 2011 in our clinic and some operations were cancelled due to high BP in the operating room. From now on it has been decided to give diazepam as premedication to all patients who were selected for phacoemulsification according to the anesthesiologist advice. The retrospective nature of the study seems to be the weak point. On the other hand, an anesthesiologist or ophthalmologist could not be biased. Prospective future studies will possibly provide better results. Prolonged operation under local anesthesia of patients may cause high BP by increasing stress. No record of surgical time was carried out; thus, the relationship between the surgical time and blood pressure has not been evaluated. The BP tends to increase intraoperatively most likely due to anxiety. Low BP fluctuation could be connected with the anxiolytic effect of diazepam in patients who received diazepam orally an hour before surgery.

In conclusion, high BP may decrease surgical success due to complications and anxiety. Per oral diazepam could be a good option to control anxiety and to normalize BP in perioperative period.

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