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Prophylactic Intravenous Hydration Mitigates Postoperative Hypotony and Prevents Choroidal Detachment After Trabeculectomy: A Prospective Case Series

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ABSTRACT

Objectives: Choroidal detachment is a common and potentially serious complication following trabeculectomy, often associated with postoperative hypotony. This prospective case series investigated the efficacy of prophylactic intravenous hydration in reducing the incidence of choroidal detachment and mitigating hypotony after trabeculectomy.

Methods: Fifty patients undergoing trabeculectomy, of these 20 (40%) were male and 30 (60%) were female. The mean age at presentation was 66.15 years for males and 59.3 years for females, patients were divided into three groups:

Control Group (n=4): Received no prophylactic hydration.
Postoperative Hydration Group (n=6): Received intravenous fluids after the onset of hypotony.
Preoperative Hydration Group (n=40): Received prophylactic intravenous hydration.
Intraocular pressure (IOP) was monitored at various intervals pre- and postoperatively.

Results: The mean IOP was 18 ± 2 before surgery. Patients were treated medically with diuretics. The experimental group, which received serum therapy before surgery, exhibited a higher mean IOP initially but did not experience any cases of choroidal detachment.

Since the p-value (0.0345) is less than the significance level ((alpha = 0.05)), we reject the null hypothesis.

This means there is a statistically significant difference between the mean intraocular pressures of the control group and the experimental group.

Conclusion: The incidence of choroidal detachment and the degree of IOP reduction were compared between groups. Our findings suggest that prophylactic intravenous hydration is a safe and effective strategy for minimizing the risk of choroidal detachment and postoperative hypotony following trabeculectomy.

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Introduction

Trabeculectomy is a surgery used to treat glaucoma. It helps lower eye pressure, reducing the risk of further vision loss [1]. However, trabeculectomy has some drawbacks. The main problem is that the healing process after surgery can be unpredictable.

Too much scarring: If the wound heals too quickly, it can block the new drainage pathway, making the surgery less effective.

Too little scarring: If the wound heals too slowly, the eye pressure can drop too low, leading to other eye problems.

Finding the right balance between these two extremes is a challenge for surgeons [2,3]. This is why researchers continue to look for better surgical techniques to treat glaucoma.

We used a Special type of Glaucoma Surgery (Inverted Sclera Autograft in Glaucoma Trabeculectomy Surgery)

Stages of Trabeculectomy (Inverted Scleral Autograft) Surgery in Detail:

Creating a conjunctival incision parallel to the sclera approximately 1-2 mm below the sclera with a length of 8-10 mm and dissecting it to the same length using dissecting scissor

Creating a Square Flap

- A small piece of sclera is cut in a square shape using scissors or a scalpel. The thickness of the flap is usually about 0.5 mm. or 5+4.
- **Purpose:** This flap will be lifted and returned to its place after the surgery is completed

Creating a Triangular flap

- A second triangular flap is made. This flap is inverted into the eye to increase the drainage area.
- Removing a portion of the trabecular meshwork:

- A small portion of the trabecular meshwork (tissue located at the angle where the iris meets the sclera) is removed using forceps or a surgical vacuum.
- Purpose: This part of the tissue obstructs the flow of aqueous fluid, so it is removed to create a new drainage path.

Flap Replacement

- The square scleral flap is replaced and closed using fine sutures or stitches depending on the part of the trabecular meshwork removed.
- If a triangular flap is present, it is turned inside out and placed under the square flap

Shallow anterior chamber (AC) remains a significant complication after glaucoma filtration surgery, particularly when the anterior chamber is already shallow preoperatively or antimetabolites are used. While prevention is always preferable, this complication occurs frequently even with skilled surgical technique. Effective management requires a systematic approach beginning with a comprehensive slit-lamp and fundus examination to accurately diagnose the cause. Key aspects of this examination include assessing intraocular pressure (IOP), evaluating the filtering bleb's characteristics, verifying peripheral iridectomy patency and iris configuration, performing a Seidel test to detect wound leaks, and conducting a thorough fundus examination. A shallow AC combined with low IOP often indicates a wound leak, overfiltration, or choroidal detachment. Conversely, a shallow AC with elevated IOP suggests pupillary block, aqueous misdirection, or suprachoroidal hemorrhage. Determining the specific cause is essential for guiding appropriate treatment, which should be followed by meticulous monitoring. Accurate diagnosis and timely intervention are critical for managing this potentially vision-threatening complication [4-6].

This study aims to evaluate the efficacy of prophylactic intravenous hydration in reducing the incidence of these complications.

Methods

This prospective case series included 50 patients undergoing trabeculectomy. Patients were divided into three groups: (1) control group (n = 4), who did not receive preventive hydration. (2) postoperative hydration group (n = 6), who received intravenous hydration after hypotony. and (3) preoperative hydration group (n = 40), who received prophylactic intravenous hydration. The preoperative hydration group was given 2000 cc of mixed serum starting [just before surgery with 500 cc of serum and we called it time 0] and for the patients, serum up to one hour after the surgery continued. IOP measurements were performed at [specified time points, 0, 3, 6, 12, 18, and 24 hours].

"Descriptive statistics (mean ± SD, median [IQR], proportions) were used to summarize patient characteristics and IOP measurements. The chi-square test (or Fisher's exact test) was used to compare the incidence of choroidal detachment between groups. Repeated measures ANOVA (or [alternative test]) was used to analyze the changes in IOP over time. A p-value < 0.05 was considered statistically significant."

This study adhered to the principles of the Declaration of Helsinki and informed consent was obtained from all participants.

Results

Fifty glaucoma patients referred to the glaucoma clinic were included in the study. Of these, 20 (40%) were male and 30 (60%) were female. The mean age at presentation was 66.15 years for males and 59.3 years for females.

Table 1: Baseline Intraocular Pressure by Sex

Number of Patients	Average IOP (mmHg)
30	34.1
20	32.1
50	33.1

"Based on the severity of glaucoma, as determined by visual field tests and optic nerve damage, we categorize them into three groups..."

We have examined three types of glaucoma with the following characteristics [7-9].

Table 2: Three Types of Glaucoma

Glaucoma Severity	Disease Severity	Cup-to-Disc Ratio	Visual Field Characteristics	Visible Changes in the Optic Nerve Head
Mild Glaucoma	Damage to the optic nerve and loss of visual field are very slight, and there may be no symptoms.	Usually less than 0.5, indicating minimal optic nerve damage.	Slight reduction in peripheral visual field that may not be noticeable to the patient and can only be detected through specialized tests.	Alpha zone may be present, but Beta zone is usually absent. Hemorrhages at the optic nerve head are rare, and vascular changes are minimal.
Moderate Glaucoma	Increased damage to the optic nerve, and blind spots begin to appear in the visual field.	Between 0.5 and 0.7, indicating moderate optic nerve damage.	Noticeable reduction in the peripheral visual field that the patient may observe. Blind spots in the visual field increase in size and number.	Beta zone may be present, and hemorrhages at the optic nerve head are more common. Vascular changes include thinning and alteration of vessel paths.
Severe Glaucoma	Significant damage to the optic nerve with substantial loss of visual field.	Greater than 0.7, indicating severe optic nerve damage.	Severe reduction in visual field leading to tunnel vision. In this stage, there is a risk of complete blindness.	Beta zone is clearly visible, and hemorrhages at the optic nerve head are common. Vascular changes include thinning and alteration of vessel paths. There may be asymmetry in the optic nerve head between the eyes.

Table 3: The Percentage of Patients operated on According to the Severity of Glaucoma

Glaucoma Severity	Percentage
Mild Glaucoma	0%
Moderate Glaucoma	10%
Severe Glaucoma	90%

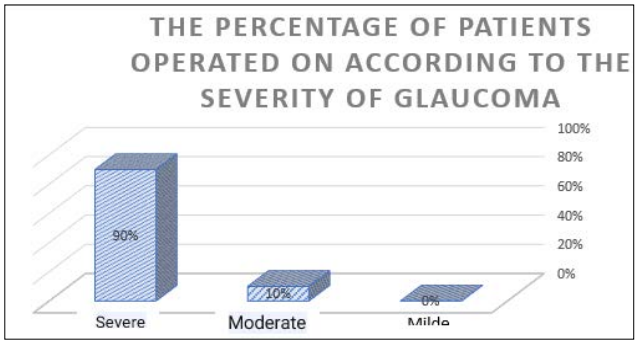

Figure 1: The Percentage of Patients

- The mean IOP was 18 ± 2 before surgery. Patients were treated medically with diuretics.

Table 4: Average Intraocular Pressure of 40 Patients Who Started Serum Therapy Before Surgery

After 24 hours	After 18 hours	After 12 hours	After 6 hours	After three hours	Before injection	Average eye pressure
8	8	8	7	7.5	18 ± 2	First day
8.5	8	8.5	8	8	8	Day 2
9	9	8.5	8	8	8.5	Day 3
10	9	9.5	9	9	9	Day 4
11	10	10	10	10.5	10	Day 5
12	11.5	11.5	11	11.5	11	Day 6
12	13	11	13	11	12	Day 7
13 ± 2						Day Fourteen
13 ± 2						After the month
14 ± 2						After three months
17 ± 1						After the year

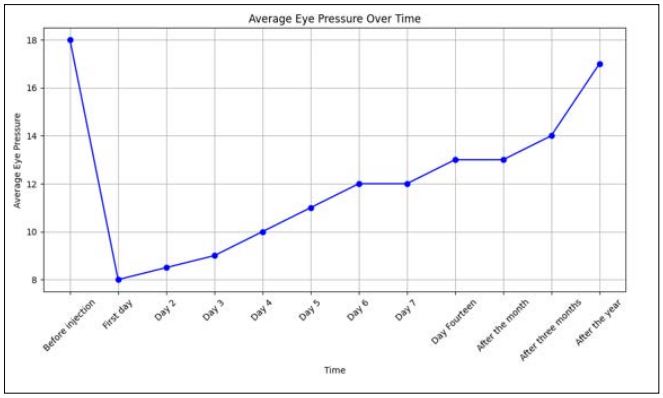

Figure 2: Average IOP for 40 Patients

Table 5: The Average Eye Pressure of 10 Patients who Underwent Surgery at the Beginning and the Control Group

Time Period	Mean (mmHg)	Intraocular	Pressure
First day	3.19		
Second day	4.60		
Third day	5.50		
Fourth day	5.80		
Fifth day	7.60		
Sixth day	9.70		
Seventh day	10.10		
Fourteenth day	12.60		

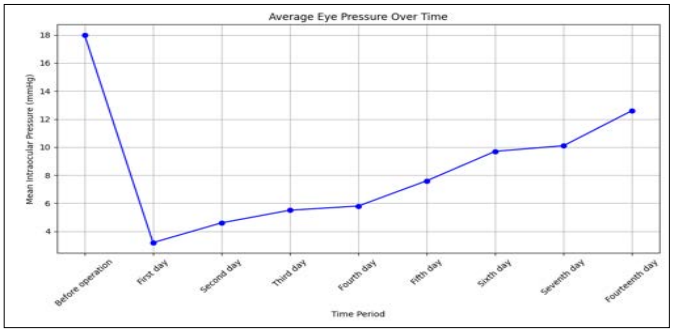

Figure 3: Average IOP for the Control Group

The data indicates a significant difference in the outcomes between the control and experimental groups. The control group, which did not receive serum therapy before surgery, showed a lower mean IOP initially but had cases of retinal detachment. Conversely, the experimental group, which received serum therapy before surgery, exhibited a higher mean IOP initially but did not experience any cases of choroidal detachment.

Explanation of the Result

P-value: 0.0345

o Since the p-value (0.0345) is less than the significance level ((alpha = 0.05)), we reject the null hypothesis.

o This means there is a statistically significant difference between the mean intraocular pressures of the control group and the experimental group.

o In other words, the pre-operative serum therapy has a significant effect on reducing intraocular pressure compared to post-operative serum therapy.

This result supports the hypothesis that pre-operative serum therapy is more effective in maintaining lower intraocular pressure and preventing complications such as choroidal detachment.

The data indicates a significant difference in the outcomes between the control and experimental groups. The control group, which did not receive serum therapy before surgery, showed a lower mean IOP initially but had cases of retinal detachment. Conversely, the experimental group, which received serum therapy before surgery, exhibited a higher mean IOP initially but did not experience any cases of choroidal detachment.

Conclusion

The findings suggest that pre-operative serum therapy may play a crucial role in preventing choroidal detachment and stabilizing intraocular pressure post-surgery.

This could be due to the therapeutic effects of serum in maintaining ocular health and preventing complications associated with eye surgeries.

Implications for Clinical Practice

Implementing pre-operative serum therapy could potentially reduce the incidence of choroidal detachment and improve patient outcomes in ocular surgeries. Further studies with larger sample sizes and longer follow-up periods are recommended to validate these findings and establish standardized protocols for serum therapy in ophthalmic procedures.

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