

Short Communication

Prospective Study Evaluating the Interest of SF6 Gas Injection in the Management of Acute Corneal Hydropsy

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Abstract

Corneal hydrops is an aqueous infiltration of the cornea following a breach in the descemet membrane. Its occurrence is a turning point in the evolution of keratoconus. Its diagnosis is clinical. Its therapeutic management can be divided into two parts, medical and surgical. This has seen some progress in recent years. We expose during this article the interest of the injection of SF6 gas in the rapid resolution of acute hydrops.

Keywords: Keratoconus; Hydrops; Corneal sutures; Scleral lens

Introduction

Corneal hydrops corresponds to an aqueous infiltration of the cornea following a breach in the descemet membrane. It usually complicates keratoconus but it can occur on a pellucid marginal degeneration, a keratoglobule or other. The management of acute hydrops has seen therapeutic progress in recent years.

Materials and Methods

We report a series of 18 patients with acute hydrops on keratoconus. Our patients were collected at the ophthalmology B department of the ibn sina university hospital of Rabat between November 2016 and January 2022.

Nine consecutive eyes (group 1) with acute corneal hydrops were prospectively treated with SF6 injection in addition to conventional medical therapy, and their data were analyzed. Central Corneal Thickness (CCT) and visual acuity at presentation were recorded. Stored data from 9 other eyes with hydrops were taken as controls, which were age, sex and disease matched and treated with medical therapy alone (group 2). Conventional therapy included hypertonic saline (5%, every 4 hours), sodium chloride eye drops (6%) twice daily, tropicamide drops (1%) twice daily and ciprofloxacin drops (0.3%) twice daily until resolution of corneal edema and formation of a corneal scar. Ultrasound pachymetry was performed at presentation and 1, 2, 3, 4, 6, and 12 weeks after treatment.

Results

The two groups were matched for age and sex and had similar degrees of hydrops at presentation. There was no difference between the two groups with respect to time of presentation. The mean age was 22.67 +/-4.27 years in Group 1 and 25 +/-5.32 years in Group 2 (P = 0.34, not significant). Visual acuity at presentation in both groups varied from hand movement near the face to 1/20 (0.05 equivalent) (P = 0.70, not significant) in the affected eyes. The mean time to presentation was 8.56 +/-2.30 days in group 1 and 6.86 +/- 3.08 days in group 2 (P = 0.35, not significant). All 18 eyes had grade III hydrops. The mean CCT at presentation in both groups was 0.1 mm. The mean CCT was not changed in the 2 groups at the first and second week. However, there was a statistically significant difference in mean CCT during weeks 3 to 12 in favor of group 1 (P=0.000 to 0.002).

The Best Corrected Visual Acuity (BSCVA) at 3 months in group 1 was between 2/10 and 6/10 in 7 eyes and CLD and PL + in 2 eyes. The last two eyes in group 1 had a late presentation between 15 and 17 days and did not have early resolution of corneal edema compared with the other seven eyes (Figure 1). There was also a statistically significant difference in BSCVA at 12 weeks in both groups, with a mean BSCVA of 0.39 in group 1 versus 0.24 in group 2. No patient had elevated intraocular pressure at any time point.

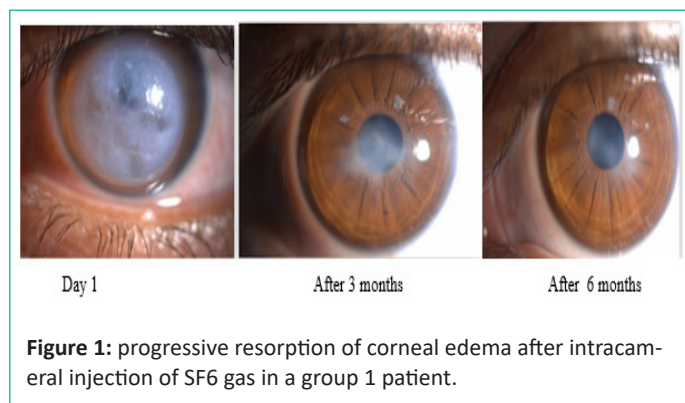


Figure 1: progressive resorption of corneal edema after intracameral injection of SF6 gas in a group 1 patient.

Discussion

Acute hydrops in eyes with keratoconus is the consequence of a tear in Descemet's membrane. This tear in turn breaks the integrity of the corneal endothelial barrier, which results in the free flow of water into the stroma, causing stromal edema. However, because the process of corneal edema resolution takes months to occur and these patients are usually young, there is a great loss to the family and society both economically and emotionally. Thus, shortening the healing period in these eyes is essential. As early as 1987, Zusman et al [1] used "Descemetopy" gas exchange to repair intraoperative Descemet membrane detachment. The explained mechanism of action could be the prevention of aqueous penetration into the stroma in the supine position. Other effects may be caused by tamponade and stretching of both ends of the detached Descemet membrane. Other agents could be used: air [3], perfluoropropane (C3F8) [2], or sodium hyaluronate [4]. In 2002, Miyata et al [3] evaluated the efficacy and safety of intracameral injection of 0.1 mL of filtered air in the treatment of acute hydrops in keratoconus. Another 0.1 mL of filtered air was injected if corneal edema persisted when the air disappeared. The period of persistence of corneal edema, the interval between the onset of acute hydrops and the time when the eye could begin wearing a hard contact lens, and the best corrected visual acuity with glasses and hard contact lenses after the corneal edema subsided were used as criteria to assess any difference between the air injection and those who were treated conventionally.

Their results suggest that the mean period of persistence of corneal edema was 20.1 +/- 9.0 days in the intracameral air injection group and 64.7 +/- 34.6 days in the control group ($P = 0.0008$). However, the best corrected visual acuity when the corneal edema subsided was similar between the two groups. There were no complications after intracameral air injection, suggesting that the procedure was a safe and useful treatment to shorten the period of corneal edema in acute hydrops secondary to keratoconus. However, this is a short-term study, and the issue of complications needs to be addressed in a study with longer follow-up. However, the disadvantage of using air as a tamponade agent is that air is nonexpansive and is absorbed for a short time. Therefore, its use is not recommended as therapy in such eyes. C3F8 in undiluted form dilutes 4 times in 4 days inside the anterior chamber and is considered a better alternative. This gas in a 14% dilution persists in the anterior chamber for 6 weeks, which is considered a boon for hydrops. Shah et al [9] reported a case of acute hydrops with intrastromal fissure in a patient with keratoconus associated with Marfan syndrome, treated with intracameral injection of perfluoropropane gas (C3F8). They concluded that intracameral perfluoropropane gas in isoexpansive concentration can be a useful modality. However, because the gas persists in the anterior chamber for

a longer period of time, there is a chance of development of secondary glaucoma, which can lead to permanent blindness. In addition, the gas is toxic [7-9] to the endothelium, which can lead to corneal decompensation and future corneal opacities. In contrast, SF6 gas [8-10] takes 2 weeks for complete absorption in the anterior chamber. It is non-toxic to the corneal endothelium. Nevertheless, because it expands twice between 24 and 48 hours, it is considered safer than C3F8. For the above reasons, SF6 injection was preferred for this study.*** Sii et al [6] reported a case of acute perforated hydrops that was successfully managed with intracameral SF6 gas and cyanoacrylate adhesive. Our study also found that in the intervention group, CTA had progressively decreased from 3 weeks and above to near-normal values by 12 weeks. This was in contrast to group 2, where the 12-week CCT corresponded to the third-week value in group 1. Furthermore, in our study, intraocular pressure did not increase because patients received oral acetazolamide after the procedure for 3 days, and the size of the gas bubble gradually decreased over time. In conclusion, our results suggest that intracameral injection of SF6 is a useful therapy to decrease the period of corneal edema in acute hydrops secondary to keratoconus.

Conclusion

Corneal hydrops is a rare complication of keratoconus but it marks a turning point in the evolution of the disease. The intracameral injection of gas, initially intended for posterior segment surgery, has accelerated the healing process.

Conflicts of interest

The authors have no conflicts of interest to declare.

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