Introduction

Intraocular pressure (IOP) can become elevated during hemodialysis, but there are few reports of unilateral elevation of IOP during hemodialysis in an eye with exfoliative material. We report here on a patient with unilateral elevation of IOP and the usefulness of a hyperosmotic agent to reduce this increase in IOP.

Case Report

The patient was a 60-year-old man who complained of severe pain in his right eye during hemodialysis on March 6, 1999. At the age of 10, he had poor vision in both eyes, and a diagnosis of bilateral idiopathic optic atrophy was made. At the age of 20, the patient developed glomerulonephritis. From the age of 53, he started undergoing hemodialysis three times a week, using a hemodialyser (APS 180S, Asahi Medical). He also had renal retinopathy bilaterally. In February 1999, laboratory studies showed a decreased erythrocyte count, and decreased hemoglobin and platelet levels.

On examination, his visual acuity was hand motion OD and 0.05 OS. His IOP measured by Perkin’s hand-held applanation tonometer was 56 mm Hg, and increased repeatedly during hemodialysis. The IOP in his left eye remained within a normal range. Trabeculectomy failed to reduce the elevation of IOP in the right eye. Changes in plasma osmotic pressure during hemodialysis were marked when the IOP was elevated. The administration of a hyperosmotic agent prevented the elevation of IOP during hemodialysis.

Conclusions: Physicians should be aware that elevation of IOP in patients with eyes with exfoliative material may occur during hemodialysis even after trabeculectomy. This can be prevented by administering a hyperosmotic agent during hemodialysis. Jpn J Ophthalmol 2001;45:659–661 © 2001 Japanese Ophthalmological Society

Key Words: Hemodialysis, hyperosmotic agent, intraocular pressure
right eye. Wide-open anterior chamber angle was visible, but no exfoliative material was noted in the left eye.

Timolol maleate 0.5%, isopropyl unoprostone 0.12%, and dipivefrine 0.1% were topically instilled in the right eye, but the IOP in his right eye was elevated repeatedly at the end of hemodialysis and returned to normal range when hemodialysis was not being administered (Figure 1A). The IOP in his left eye remained within normal range at all times. The visual field could not be examined in the right eye, but an irregular visual field defect was found in the left eye on Goldmann perimetry.

On June 9, 1999, trabeculectomy was performed in the right eye and, for about 2 months, no marked elevation of the IOP in the right eye was noted. However, in September 1999, no filtering bleb was visible, and the IOP in his right eye increased during hemodialysis with peak values higher than 40 mm Hg. Changes in plasma osmotic pressure (26 ± 3.7 mOsm) and blood urea nitrogen (55.0 ± 5.4 mg/dL) levels were marked when the maximal changes in IOP in the right eye were more than 15 mm Hg (Table 1).

A hyperosmotic agent, Glyceol® (Ohtsuka, Tokyo), which contains glycerol, 10 g, and fructose, 5 g, in 100 mL, was intravenously administered at an infusion rate of 180 mL/4.5 h or 500 mL/4.5 h during hemodialysis in October. At that time no symptoms of elevated IOP were noted. A reduction in the IOP to less than 30 mm Hg was noted when the hyperosmotic agent was used (Figure 1B), and thereafter, the hyperosmotic agent was administered at the rate of 500 mL/4.5 h to prevent the elevation of IOP during hemodialysis. In December 2000, his visual acuity was 0.01 OD and 0.05 OS, and his IOP was 15 mm Hg in both eyes.

### Discussion

Burn suggested that IOP elevation might result from a rapid fall in serum osmolality during hemodialysis. In our patient, the IOP elevation was corre-
lated with the changes in plasma osmotic pressure and blood urea nitrogen between pre- and post-hemodialysis. Tawara et al\textsuperscript{4} proposed that impaired outflow facility might be involved partly in the increase of IOP during hemodialysis. In our patient, the elevation of IOP was noted in the right eye with exfoliative material associated with impaired outflow facility. Choong and Menage\textsuperscript{3} reported that an acute rise of IOP following hemodialysis could be successfully reduced with use of a topical \(	extbeta\)-blocker; however, in our patient topical timolol did not reduce the elevated IOP. Masuda et al\textsuperscript{5} reported that a rise in IOP during hemodialysis decreased after laser trabeculoplasty. However, many studies have commented on the late failure of trabeculoplasty in the treatment of exfoliative glaucoma.\textsuperscript{6} Although no marked elevation of the IOP was noted in our patient’s right eye for about 2 months after trabeculectomy, subsequently the absence of a filtering bleb was noted in September 1999. When hemodialysis was not administered, the IOP of the right eye did not increase and no filtering bleb was noted, resulting in progression of scarring of the bleb. Thus, we speculated that progressive scarring of the filtering bleb and elevation of IOP during hemodialysis in eyes with exfoliative material may occur even after trabeculectomy. Jaeger et al\textsuperscript{2} reported the prevention of glaucoma during hemodialysis by using mannitol and acetazolamide. In our patient the elevation of IOP was also prevented by using a hyperosmotic agent. It is possible that the infusion of a hyperosmotic agent may blunt the hemodialysis-induced reduction in osmolality.

References