学 位 論 文 の 要 旨

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学 位 論 文 名	Assessment of Filtration Bleb and Endplate Positioning Using Magnetic Resonance Imaging in Eyes Implanted with Long –Tube Glaucoma Drainage Devices
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論 文 内 容 の 要 旨

INTRODUCTION

Glaucoma is a chronic disease characterized by progressive loss of the retinal nerve fiber layer and associated visual field loss, and the intraocular pressure (IOP) is currently the only modifiable risk factor. The treatment approach to decrease the IOP traditionally starts with topical medications followed by laser surgery and eventually invasive surgery in patients refractory to earlier interventions. Trabeculectomy remains the gold standard when non-invasive techniques have failed, although newer techniques are currently in use and under investigation.

Recently, implantation of glaucoma drainage devices (GDDs) made of different materials are being used increasingly to treat early and advanced glaucoma worldwide and more recently in Japan. Among the various types of GDDs, the device with an endplate and long tube has been successfully used in complicated glaucoma cases, including neovascular glaucoma, aphakic and pseudophakic glaucoma, postpenetrating keratoplasty glaucoma, pediatric glaucoma, and uveitic glaucoma. The long-tube types of GDDs currently used often include the Ahmed Glaucoma Valve (AGV) (New World Medical, Rancho Cucamonga, CA), the Baerveldt glaucoma implant (BGI) (Abbott Medical Optics, Abbott Park, IL), and the Molteno Implant (Molteno Ophthalmic, Dunedin, New Zealand). The aim of long-tube GDDs surgery is to create a functioning bleb around the endplate portion of the implant at the bulbar equator to facilitate flow of aqueous humor through the bleb wall. Compared to the bleb after trabeculectomy, because of its posterior formation, the bleb formed after long-tube GDD surgery is difficult to

assess during regular ophthalmic examinations such as slit-lamp, anterior-segment optical coherence tomography (OCT), or ultrasound biomicroscopy (UBM).

The purpose of the current study was to evaluate the intraorbital status of ocular fluid filtration and endplate positioning in glaucomatous eyes implanted with either the AGV or BGI, two of the most common types of long-tube GDDs, using magnetic resonance imaging (MRI). MRI seems to have advantages for assessing bleb formation around the equator of eyeball with a large field of view without depth limitation, although there are some challenges like limited spatial resolution. The possible effects of various MRI-measured parameters including bleb volume, bleb height, and plate positioning on the postoperative IOP also were assessed.

MATERIALS AND METHODS

This observational case series included 27 consecutive glaucomatous eyes (18 men, 7 women; mean age ± standard error, 63.0±2.0 years) who underwent GDD implantation (n=8 Ahmed Glaucoma Valves [AGV] and n=19 Baerveldt Glaucoma Implants [BGI]). Tubes were inserted into the pars plana in 23 eyes and anterior chamber in 4 eyes. Six months postoperatively, high-resolution orbital images were obtained using 3-Tesla MRI with head-array coils, and the filtering bleb volume, bleb height, and distances between the anterior endplate edge and corneal center or limbus or between the endplate and orbital wall were measured. The clinical parameters, including age, sex, preoperative IOP, number of antiglaucoma medications, postoperative IOP, and number of antiglaucoma medications at the time of the MRI examination were collected from the medical charts. Possible correlations between the IOP and the five MRI-measured parameters were analyzed using Spearman's rank correlation coefficient. The clinical and MRI-measured parameters were compared between AGV and BGI groups using the Mann-Whitney U test for numerical parameters and by Fisher's exact probability test for categorical parameters.

The study protocol was approved by the Ethics Committee of Shimane University and written informed consent was obtained from all subjects.

RESULTS AND DISCUSSION

In MR images obtained by three-dimensional fast imaging employing steady-state acquisition (3D-FIESTA) sequences, the shunt endplate was identified as low-intensity signal and the filtering bleb was identified as high-intensity signals above and below the endplate in all eyes. The 6-month-postoperative IOP level was correlated negatively with bleb volume (r=-0.4510, P=0.0182) and bleb height (r=-0.3954, P=0.0412). We also compared the MRI findings between two commonly used GDDs. The postoperative IOP was significantly (P=0.0026) lower in BGI-implanted eyes (12.2±0.7 mmHg) than AGV-implanted eyes (16.7±1.2

mmHg); bleb volume was significantly (P=0.0093) larger in BGI-implanted eyes (478.8±84.2 mm^3) than AGV-implanted eyes (161.1±52.3 mm^3). Other parameters did not differ.

CONCLUSION

The presence of intraorbital/periocular accumulation of ocular fluid affects postoperative IOP levels in eyes implanted with long-tube GDDs. Larger filtering blebs after BGI than AGV implantations explain lower postoperative IOP levels achieved with BGI than AGV. The findings will contribute to better understanding of IOP reducing mechanism of long-tube GDDs.