Application of canaloplasty in glaucoma gene therapy
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Purpose: Schlemm's canal (SC) inner wall is adjacent to the juxtacanalicular trabecular meshwork (TM) over their entire circumference. We aimed to transfer reporter and therapeutic genes to these outflow-modulating tissues via canaloplasty surgery in live cynomolgus/rhesus monkeys.

Methods: A standard canaloplasty surgical approach was performed in cynomolgus monkeys using flexible canaloplasty catheters, modified for monkey eyes with a 175 um outer diameter and an LED-lighted tip. A 6-0 prolene suture was used for the exact localization of SC. Trypan blue was injected during catheter withdrawal to document catheter placement within SC and to determine ease of injecting fluid into SC. Position of the catheter and the anatomic details were video-captured with an externally positioned noncontact endoscopic imaging system and 50 mHz ultrasound biomicroscopy (UBM). Finally, lentiviral vector/transgene labeled with green fluorescent protein (GFP) was injected and the GFP expression was followed by using a customized microscope (Nikon Instruments, Inc., Melville, NY) with a 12-bit, monochromatic, cooled-CCD camera (Retiga 2000RV; Q-Imaging Burnaby, BC, Canada), a specific GFP filter set and a Swan Jacob gonioscopy lens.

Results: 360° catheterization, injection of dye into SC was achieved. Trypan blue was seen in the SC over five clock hours after a one clock-hour insertion of the catheter and imaged. GFP expression in the live monkey eyes is still being followed.

Conclusions: A modified canaloplasty catheter (175 um) might be used for gene delivery to the SC/TM area without circumferential catheterization. Further studies for increasing vector/transgene expression in SC are being undertaken.