Robot assisted retinal vein cannulation.


1UZ Leuven, Ophthalmology, Leuven, Belgium, no financial interest
2Production Engineering, Machine Design and Automation, KULeuven, Leuven, Belgium, patent interest
3ThromboGenics nv, Leuven, Belgium, patent interest

Purpose
Topical intravessel drug delivery currently is an experimental therapy for retinal vein occlusions (RVO). Some reported to be successful but others suffered from significant complications because of the technical difficulties related to the brittle and small sized retinal veins. (1,2) A new tool in the form of robot assistance for intraocular surgery was designed to facilitate this surgical approach. This study aims at performing and reporting on in vivo retinal vein cannulations with the help of a dedicated robot.

Methods
A custom built micro needle with a 30 micron outer diameter tip was connected to the KULeuven robot for intraocular surgery (fig 1). (3) Domestic pigs were anesthetized and a standard 3-port pars plana core vitrectomy was performed. Subsequently, rose Bengal was administered systemically and a clot was induced via direct laser application on the targeted vein (fig 3). Afterwards the microneedle was inserted via a sclerotomy and the cannulation performed (fig 2).

Results
Cannulation was successful in 8 out of 10 eyes and visually confirmed by blood wash out while injecting BSS through the needle. A stable intravessel position of the needle tip was achieved for a period ranging between 20 seconds and 3 minutes. The eye remained motionless during the intra-operative manipulations when the remote center of motion of the robot was aligned with the sclerotomy. After needle retraction a self-limiting hemorrhage occurred in all eyes.

Conclusion
Robot assistance renders the required precision and stability to perform a retinal vein cannulation in animal experiments.

References

E-mail: koen.willekens@uzleuven.be