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Initial Experience With a Novel Hypersonic Vitrectomy Device for Vitreoretinal Surgery

- Kevin J. Blinder, MD
- Carl C. Awh, MD
- Val Kolesnitchenko, MD
- Brian D McCary
- Nicole Bergmann
- Andrew Pilon

OBJECTIVE To report clinical and technical details of the largest individual surgeon experience to date with a novel hypersonic vitrectomy device in the performance of various vitroretinal procedures.

PURPOSE To compare hypersonic vitrectomy with conventional guillotine vitrectomy in a series of vitreoretinal cases and to evaluate the impact of variables (stroke length, vacuum, port geometry) on system performance. At the time of submission, this is the largest single-surgeon series and is the first report providing technical details related to hypersonic vitrectomy device performance and settings.

METHODS Prospective, single-surgeon, non-randomized, consecutive case series. 23-gauge hypersonic vitrectomy and conventional 23-gauge vitrectomy were used to address vitreoretinal pathology. Pre-operative diagnoses included: macular epiretinal membrane, macular hole, rhegmatogenous retinal detachment, diabetic retinopathy, retained silicone oil. For hypersonic vitrectomy cases, two port geometries were assessed – a 225 um round port and a larger teardrop port. Vitrectomy was assessed by

direct observation, video analysis, and associated varibles including stroke length (amplitude of axial oscillation), cumulative cuts, cut rate, hypersonic frequency, and activation time.

RESULTS Hypersonic vitrectomy cases (n=31) were performed at a frequency of 1.7 million cycles/min with an average stroke length of 43 um (± 14 um) and an average hypersonic activation time of 306 sec. (±156). The teardrop port provided superior flow to the round port. Guillotine vitrectomy cases (n=14) reported an average of 35,556 (±17,091) cuts and an average cutter activation time of 297 sec. (± 140). The vacuum settings used during active hypersonic vitrectomy averaged 159 (+/- 95) mmHg, vs 463 (+/- 67) mmHg with the guillotine cutter. All vitreoretinal pathology was successfully addressed. Reported complications (2.6%) with use of the hypersonic vitrector were: 1 case of of superficial scoring of a hydrophobic acrylic implant during posterior capsulotomy and 1 case of iatrogenic retinal break in a region of detached retina. I plan to present data from signifcantly more cases by the time of the Annual Meeting.

CONCLUSION Typical vitreoretinal pathology can be successfully addressed with hypersonic vitrectomy, but requires that surgeons learn to control a new set of sytem variables. Hypersonic vitrectomy allows effective removal of vitreous at rates similar to guillotine vitrectomy, but at lower vacuum settings. Further optimization of settings and port design should lead to performance improvements.

HUMAN RESEARCH This study involves human research.
IRB Approval Status: Exempt from approval

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Clinical Feasibility of Ultra-rapid, Non-pharmacologic Anesthesia for Intravitreal Injection in Patients Receiving Anti-VEGF Treatment

- Cagri G Besirli, MD, PhD
- STEPHEN J SMITH, MD

OBJECTIVE To determine the safety and efficiacy of ultra-rapid cooling for ocular anesthesia prior to intravitreal injection

PURPOSE Pharmacologic ocular anesthesia is the only method for providing patient comfort and safety during intravitreal injection treatment (IVT), but is time consuming and contributes to corneal decompensation with post-injection pain. To improve patient experience, we evaluated ocular safety and clinical efficacy of a non-pharmacologic method for providing ultra-rapid anesthesia before antiVEGF IVT.

METHODS A handheld device was developed to provide anesthesia via cooling to a focal area on the surface of the eye immediately prior to intraocular injection. Patients receiving antiVEGF IVT for exudative macular degeneration (AMD) or diabetic macular edema (DME) in both eyes were recruited for the study. One eye was randomized to lidocaine-based anesthesia (SOC) while the fellow eye received ultra-rapid, non-pharmacologic anesthesia. Subjective injection and post injection pain were recorded

via visual analog scale (VAS). All eyes were assessed for subconjunctival hemorrhage (SCH), conjunctival hyperemia, conjunctival injection, and anterior segment toxicity.

RESULTS Ultra-rapid, non-pharmacologic anesthesia was well tolerated prior to anti-VEGF IVT. No ocular toxicity or patient-reported adverse events were seen in the treatment group. Subjective pain scores at the time of injection, as measured by VAS, were 2.9 ± 0.47 for subjects receiving SOC, and 2.7 ± 0.41 in the treatment group (P = 0.7, mean ± SEM). Post-injection pain scores were 1.7 ± 0.5 for SOC and 1.5 ± 0.43 in the treatment arm (P = 0.7, mean ± SEM).

CONCLUSION Ultra-rapid cooling of the eye for non-pharmacologic anesthesia was well tolerated. In addition, patient-reported pain was similar between eyes treated with ultra-rapid cooling and SOC. This first-in-human, proof-of-concept study indicates that ultra-rapid cooling may be useful for ocular anesthesia.

HUMAN RESEARCH This study involves human research.
IRB Approval Status: Approved by institutional review board

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Evolving Trends in Practice Patterns of North American Vitreoretinal Surgery Fellows From 2010-2016

- Robert Gizicki, MD, FRCSC, DABO
- David R. Chow, MD, FRCS(C)
- Michael YK Mak, BHSc

OBJECTIVE To investigate the evolution of self-reported practice patterns of vitreo-retinal fellows trained in North America between 2010 and 2016.

PURPOSE To investigate the evolution of self-reported practice patterns of vitreo-retinal fellows trained in North America between 2010 and 2016.

METHODS Retrospective analysis of responses submitted by vitreo-retinal fellows training in North America to an annual survey sent as part of the annual ASRS Fellows Forum meeting. The annual survey consists of 137 questions covering the topics of fellowship type, management of age-related macular degeneration, retinopathy of prematurity, diabetic retinopathy, retinal vein occlusion, trauma, as well as vitreo-retinal surgical techniques and employment patterns.

RESULTS A total of 71 fellows responded in 2010, 43 in 2011, 69 in 2012, 63 in 2013, 38 in 2014, 57 in 2015 and 58 in 2016. Fellows have reported an increasing number of surgical cases as primary surgeon. In the management of neovascular ARMD, anti-vegf treatment remains the primary treatment choice, endophthamitis remains infrequent and the use of fluorescein angiography (FA) declined steadily. In managing diabetic

macular edema, the use of anti-vegfs has increased sharply with decreases in focal laser treatment and FA use. Anti-vegf medication with PRP laser are increasingly used combination for proliferative retinopathy. Surgical techniques have incorporated novel technological platforms and improved instrumentation. Management of retinal detachment increasingly involves vitrectomy and with pneumatic retinopexy or scleral buckling in select cases. In evaluating employment opportunities, geographical location and personality of future colleagues continue to be the most important factors.

CONCLUSION Self reported practice patterns of graduating North American fellows show an increase in the surgical experience gained during training. They demonstrate an integration of novel technologies, medications and outcomes from major clinical trials in the field of vitreo-retinal surgery into their clinical activities.