Post-occlusion surge performance of a new phacoemulsification system with small-bore, dual-durometer aspiration tubing

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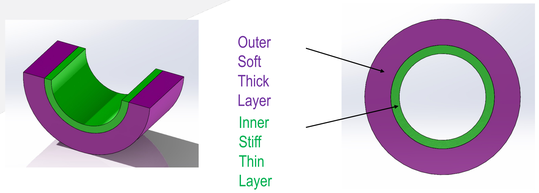
PURPOSE

Internal diameter and compliance of aspiration tubing affect the post-occlusion surge (POS) performance. A new design of the fluidics packs with a small-bore, dual-durometer aspiration tubing was created. This study evaluates POS performance of the new packs with a new phacoemulsification console in a laboratory setup.

METHODS

New Aspiration Tubing Design

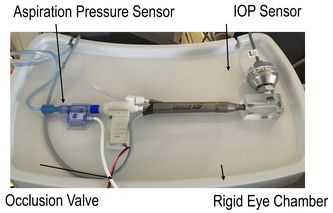


Fluidics Pack Samples

Test Samples (N=6)	New Fluidics Packs: Johnson & Johnson Vision VERITAS™ Fluidics	Small-Bore, Dual-Durometer Aspiration Tubing 1.27 mm Inner Diameter
Control Samples (N=3)	Existing Fluidics Packs: Johnson & Johnson Vison OPO73 FUSION® Fluidics	Single Layer Aspiration Tubing 1.42 mm Inner Diameter

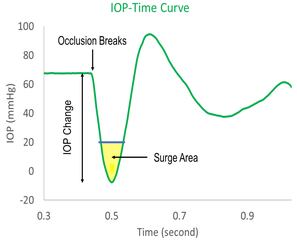
Test Setup

- New Phaco Console: J&J Vision VERITAS™ Vision System, in Peristaltic Mode
- ELLIPS® FX Phaco Handpiece
- Straight 20-Gauge Phaco Tip/Sleeve
- Bottle Height to generate 65 mmHg static intraocular pressure (IOP)
- Aspiration Flow: 30 cc/min
- Vacuum Settings: 200, 300, 400, 500, and 600 mmHg

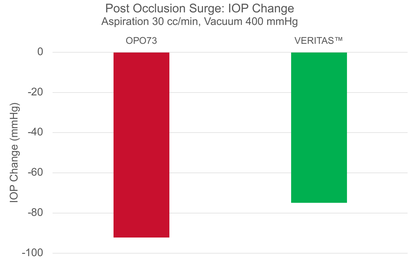


DATA ANALYSIS

- Intra-ocular pressure (IOP) recorded continuously during occlusion and post-occlusion surge.
- IOP Change: the pressure drop from the static value during occlusion to the trough of the IOP curve post occlusion.
- Surge Area: the calculated area between the +20mmHg line and the IOP curve below this line. The surge area accounts for both amplitude and duration of the post-occlusion surge.
- Smaller numbers in IOP Change and Surge Area indicate better POS performance and chamber stability.



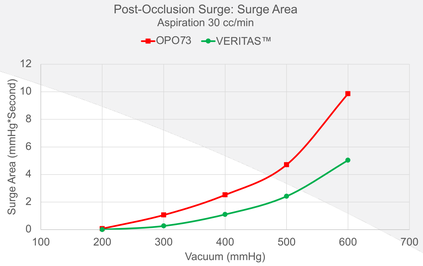
COMPARISON OF IOP CHANGES



RESULTS ON SURGE AREAS

Vacuum (mmHg)	Surge Area (mmHg*second)			
	OPO73 (N=3)		VERITAS™ (N=6)	
	Mean	S.D.	Mean	S.D
200	0.07	0.02	0.00	0.00
300	1.06	0.03	0.27	0.18
400	2.52	0.23	1.10	0.42
500	4.71	0.68	2.42	0.50
600	9.85	1.93	5.03	1.09

COMPARISON SURGE AREAS



SUMMARY

- At the aspiration flow of 30 cc/min and vacuum setting of 400 mmHg, **VERITAS™** fluidics packs performed about 20% better in IOP Change than OPO73 packs.
- For the vacuum settings from 300 to 600 mmHg, **VERITAS™** fluidics packs performed at least 45% better in Surge Area than OPO73 packs. The Surge Area was essentially zero at 200 mmHg vacuum for both types of fluidics packs.
- Statistically significant differences were observed between the OPO73 and **VERITAS™** pack groups in IOP change and surge area in all vacuum settings, by performing T-Test on experimental data.

CONCLUSIONS

This study demonstrated that the new fluidics pack with small-bore, dual-durometer aspiration tubing performed much better than the existing fluidics pack in post-occlusion surge in a new phacoemulsification machine in terms of the IOP change and the surge area in a laboratory setup, providing improved chamber stability.

References:

1. *Sharif-Kashani et al.: Comparison of occlusion break responses and vacuum rise times of phacoemulsification systems. BMC Ophthalmology 2014 14:96.*
2. *Zacharias J, Zacharias S: Volume-based characterization of postocclusion surge. J Cataract Refract Surg 2005; 31:1976–1982*

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