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Perioperative Cosopt intervention for rising intraocular pressure during steep trendelenburg position surgery

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Background: The purpose of the study was to evaluate an intervention during laparoscopic surgery in steep Trendelenburg position (Lap ST). Increased intraocular pressure (IOP) and decreases in ocular perfusion pressure have been monitored during Lap ST procedures. Peri-orbital swelling and venous congestion in addition to IOP may produce a low perfusion state in the eye, via a compartment syndrome mechanism potentially exacerbated by trabecular meshwork dysregulated pressure dependent outflow. Research in rodent models has confirmed that in the ST position IOP can increase to critical thresholds of >40 mmHg and studies have determined that even brief 30-40 minute episodes of acute IOP elevations can result in retinal cell ganglion (RCG) dysfunction. Dorozolamide/Timolol ophthalmic solution (Cosopt™) eye drops have been administered at 30 minute time points when IOP has approached 40 mmHg and were hypothesized to normalize IOP.

Methods: A quasi-experimental study design was used. The fixed-drug combination dorozolamide/timolol ophthalmic solution (Cosopt™) [DT] was administered topically to both eyes at any time point when IOP approached or exceeded 40 mmHg. We followed each subject's IOP at 30 minute intervals in comparison with a supine, anesthetized baseline and final post-procedure supine measurements. The repeated measures analysis of variance (RM-ANVOA) was conducted to examine the effect of cosopt intervention on reducing IOP rising during the surgery.

Results: A total of 194 patients, 84 (43%) males and 110 females (57%) were recruited in the study. Mean age was 55±12 years old and mean BMI was 31±7. A total of 63 patients received cosopt treatment during the surgery when their IOP levels reached 35-40 mmHg, at 30 min (n=1), at 60 min (n=20), at 90 min (n=21), at 120 min (n=13), and at 150 min (n=7), and at 180 min (n=1), respectively. There was no significant difference of mean baseline IOP between the cosopt treatment group (IOP: 13.05±4.20 mmHg) and non-cosopt treatment group (IOP: 12.27±4.85 mmHg) before the surgery. The patients' BMI was significantly correlated with the baseline IOP ($r=0.23$, $p<0.01$) and the final IOP ($r=0.18$, $p<0.5$) when the surgery was finished. Descriptive analyses showed the pattern that IOP values decreased after the treatment in patients who received the cosopt and the IOP levels were within the safe threshold during the rest of the surgery. Repeated measures of ANOVA showed that IOP values dropped significantly after given cosopt intervention at 60 min, 90 min, and 120 min time points, $p<0.001$ respectively. Effect sizes of cosopt intervention on IOP were strong, partial Eta squared of 0.60 to 0.66 when cosopt given during the surgery.

Conclusion/Implication: From preliminary data analysis treatment with Cosopt™ administration significantly decreases IOP from critical threshold and maintains IOP within safe levels throughout the surgical timeframe. In the untreated control group IOP continued to increase. Treatment at any time point during the procedure in ST position arrested the IOP escalating trend. There was a strong treatment effect. We conclude that, when IOP increases >40, this drug combination effectively lowers IOP in the operating room. Since conjunctival edema (chemosis) has reliably predicted IOP elevation 3.4 times above baseline IOP, we suggest treatment whenever chemosis is observed.

Final conclusion: Cosopt™ drops significantly reduce elevated IOP of patients who undergo lengthy laparoscopic surgery in the ST position. Repeated measures analysis of covariatance (RM-ANCOVA) using time as repeated factor and BMI as covariate: Significant results: $p<0.001$

Biography

Bonnie Molloy PhD, CRNA is a Quality/Risk Manager and Research Director of Bridgeport Anesthesia Associates at Bridgeport Hospital of the Yale network. She earned her PhD from the University of Connecticut-Storrs. She presently is the Chief Certified Registered Nurse Anesthetist (CRNA) in the Bridgeport Anesthesia Associates practice as well as a clinical faculty member for the Fairfield University Doctor of Nursing Practice Program. She has received the Discovery of Distinction Award for her research in Postoperative Visual Loss (POVL) and Intraocular Pressure (IOP) Monitoring and has presented her findings at the ASA, PGA, IARS, AANA assemblies as well as Harvard and Yale grand round forums. She has published in the American Journal of Nurse Anesthesia and Journal of Anesthesiology and Clinical Science .

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