

# Influence of GlideScope assisted endotracheal intubation on intraocular pressure in ophthalmic patients

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## ABSTRACT

**Background:** Traditional Macintosh laryngoscopy is known to cause a rise in intraocular pressure (IOP), tachycardia and hypertension. These changes are not desirable in patients with glaucoma and open globe injury. GlideScope is a video laryngoscope that functions independent of the line of sight, reduces upward lifting forces for glottic exposure and requires less cervical neck movement for intubation, making it less stimulating than Macintosh laryngoscopy. **Aim:** The aim was to assess the variations in IOP and hemodynamic changes after GlideScope assisted intubation. **Materials and Methods:** After approval of the local Institutional Research and Ethical Board and informed patient consent, 50 adult American Society of Anesthesiologist I and II patients with normal IOP were enrolled in a prospective, randomized study for ophthalmic surgery requiring tracheal intubation. In all patients, trachea was intubated using either GlideScope or Macintosh laryngoscope. IOP of nonoperated eye, heart rate and blood pressure were measured as baseline, 1 min after induction, 1 min and 5 min after tracheal intubation. **Results:** IOP was not significantly different between groups before and after anesthetic induction and 5 min after tracheal intubation ( $P = 0.217$ ,  $0.726$ , and  $0.110$  respectively). The only significant difference in IOP was at 1 min after intubation ( $P = 0.041$ ). No significant difference noted between groups in mean arterial pressure ( $P = 0.899$ ,  $0.62$ ,  $0.47$ ,  $0.82$  respectively) and heart rate ( $P = 0.21$ ,  $0.72$ ,  $0.07$ ,  $0.29$ , respectively) at all measurements. **Conclusion:** GlideScope assisted tracheal intubation shown lesser rise in IOP at 1 min after intubation in comparison to Macintosh laryngoscope, suggesting that GlideScope may be preferable to Macintosh laryngoscope.

**Key words:** *GlideScope, hemodynamic response, intraocular pressure, intubation*

## INTRODUCTION

Macintosh laryngoscopy has been traditionally used to facilitate tracheal intubation. This maneuver is associated with increased intraocular pressure (IOP), tachycardia and hypertension.<sup>[1]</sup>

These changes are not suitable for patients with glaucoma and open globe injury. Conventional intubation by Macintosh laryngoscope need to bring

Oropharyngeal and laryngeal axis into line of sight that can develop stress response in patients. GlideScope video laryngoscope functions independently of the line of sight, reduces upward lifting forces to expose the glottis and requires less cervical neck movement for intubation, making it potentially less stimulating than Macintosh laryngoscope.<sup>[2]</sup> There is also a significant increase in the percentage of glottic opening visibility when using the GlideScope with cervical spine immobilization.<sup>[3]</sup>

To the best of our knowledge changes in IOP in ophthalmic patients while performing endotracheal intubation using Glidoscope have not been studied. The aim of this study was to compare the variations in IOP and hemodynamics, associated with GlideScope versus conventional Macintosh laryngoscope assisted intubation.

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## MATERIALS AND METHODS

We obtained approval of Institutional Research and Ethical Board and informed written patient consent. This was a prospective, randomized study for ophthalmic surgery requiring tracheal intubation. Power analysis indicated that 25 patients were required in each arm to detect a difference of 30% in the IOP with 80% power and alpha error was set to 0.050 two-sided. Fifty adults patients with normal IOP and having American Society of Anesthesiologist (ASA) I and II were enrolled. Any patients with the previous history of raised IOP, cardiovascular hypertensive disease or renal, respiratory and neurological involvement were excluded from the study.

During preoperative visits all patients were assessed by a co-investigator for difficulty in laryngoscopy or visualization of the glottis by Mallampati grading, measuring thyromental distance and extension at the atlanto-occipital joint. Patients with predicted difficult intubation were excluded from this study. All patients were premedicated with midazolam (0.1 mg/kg) 1 h before surgery. Usual monitoring was applied to all patients. General anesthesia was induced with propofol, followed by rocuronium in a standardized manner in all patients. Patients were randomly assigned to either GlideScope (group 1) or Macintosh laryngoscope (group 2) for intubation. All intubations were performed by a single anesthesiologist who was experienced in both techniques. Baseline IOP (nonoperated eye), heart rate, mean blood pressure and duration of intubation were measured 1 min after induction, followed by 1 and 5 min after tracheal intubation.

Data analysis was performed using Statistical Package for Social Studies (SPSS 19) (IBM, Boston, USA). Differences between the two groups with regard to intubation time, IOP, heart rate and mean arterial pressure (MAP) were

tested by Mann–Whitney U-test.  $P < 0.05$  were considered as statistically significant.

## RESULTS

Demographic and clinical data were similar for age, sex, weight, height, Mallampati/ASA classifications and duration of surgery among both groups. All tracheal intubations were successful at first attempt. GlideScope, generally provided a laryngoscopic view equal or better than that of direct laryngoscopy. IOP was not significantly different between groups before and after induction and 5 min after tracheal intubation ( $P = 0.217, 0.726, 0.110$  respectively). The only significant difference was lesser rise in IOP at 1 min after intubation ( $P = 0.041$ ) in GlideScope group in comparison with Macintosh group. No significant difference was found between the groups in MAP ( $P = 0.899, 0.62, 0.47, 0.82$  respectively) and in the heart rate ( $P = 0.21, 0.72, 0.07, 0.29$  respectively) at all measurements. Duration of intubation was slightly longer in group 1 in comparison to group 2 ( $20.12 \pm 8.05$  and  $16.12 \pm 5.67$  s respectively), but was not significant statistically ( $P = 0.079$ ) [Table 1 and Figures 1-3].

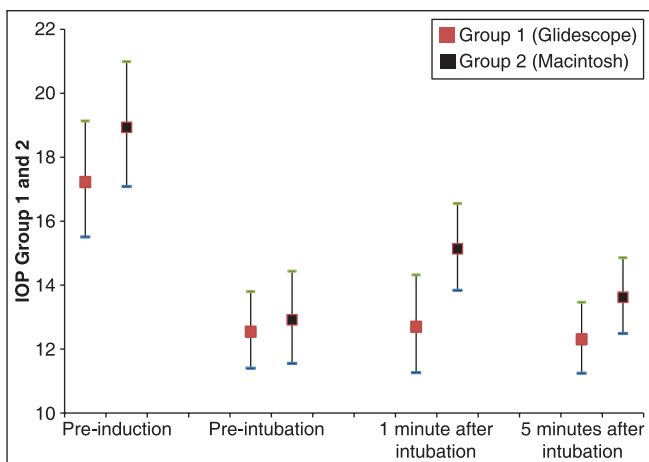
## DISCUSSION

Laryngoscopy and endotracheal intubation is likely to produce tachycardia and hypertension and an increase in IOP.<sup>[4]</sup> IOP is elevated secondary to increased sympathetic activity that causes vasoconstriction leading to a rise in central venous pressure, which determines episcleral venous pressure. A raised episcleral venous pressure could lead to vitreous chamber venous engorgement and a reduction in aqueous humour drainage, both of which lead to a rise in IOP. Therefore, prevention from acute rise in IOP becomes important during laryngoscopy and

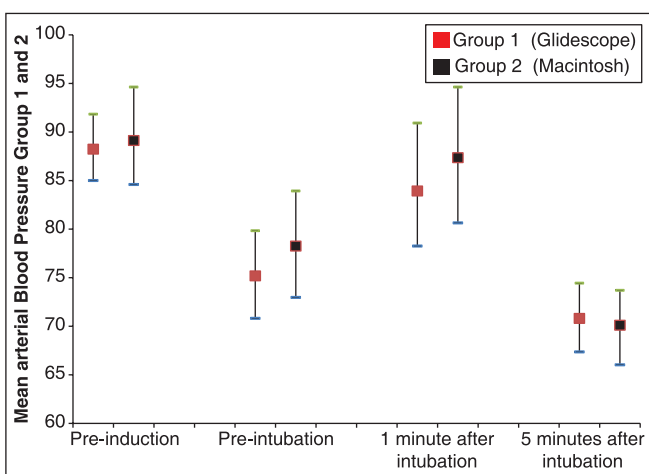
**Table 1: Comparison of participant's characteristics**

Variable	GlideScope assisted endotracheal intubation (n = 25)		Conventional method of intubation (n = 25)		Validation	
	Mean	SDV	Mean	SDV	Difference of mean	95%CI
Age	27.12	9.33	25.96	7.96	1.16	-6.1 to 3.8
Height	162.57	10.35	163.52	10.79	0.95	-5.1 to 7.0
Weight	73.43	20.05	68.91	16.51	4.52	-15.0 to 5.9
Intubation time	16.12	5.67	20.12	8.05	-4.0	-8.0 to -0.03
		Percentage		Percentage		Odds ratio
Gender						
Male	14	56	18	72	0.49	0.15 to 1.61
Female	11	44	7	28		
ASA						
I	16	64	19	76	0.56	0.16 to 1.92
II	9	36	6	24		

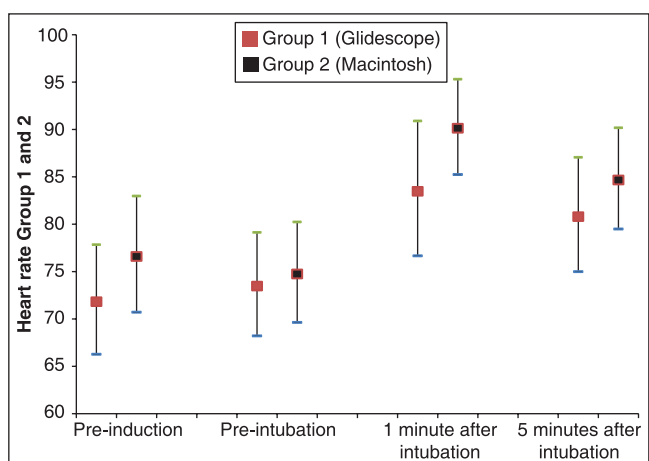
CI = Confidence interval; ASA = American Society of Anesthesiologist; SDV = Standard deviation



**Figure 1:** Intraocular pressure in nonoperated eye after Glidescope assisted endotracheal intubation versus conventional method



**Figure 2:** Mean arterial blood pressure after Glidescope assisted endotracheal intubation versus conventional method



**Figure 3:** Heart rate in after Glidescope assisted endotracheal intubation versus conventional method

endotracheal intubation in patients with acute glaucoma and open globe injuries. An acutely raised IOP may cause expulsion of the globe contents through a surgical wound

or traumatic perforation, or may lead to retinal artery occlusion with change from critical disc perfusion into disc ischemia.<sup>[5]</sup>

Intubation with GlideScope provides a clear view of glottis without alignment of the oral, pharyngeal, and laryngeal axes and less manipulation of airway, which may cause less stimulation of the sympathetic system and resulting in less increase in the IOP and other hemodynamic parameters.

Different approaches have been used to limit the intubation responses and a rise in IOP associated with endotracheal intubation. Brain's laryngeal mask airway and intubating laryngeal mask airway have shown a clear advantage over direct laryngoscopy for tracheal intubation in minimizing increase in IOP with lesser sympathetic stimulation than endotracheal tube insertion.<sup>[1,6]</sup> Takahashi *et al.*<sup>[7]</sup> compared conventional laryngoscope with Lightwand intubating device (Trachlight) for hemodynamic changes, but could not find any difference in response. On contrary, Kihara *et al.*<sup>[8]</sup> has shown that intubating laryngeal mask airway Fastrach and the Trachlight Lightwand attenuated the hemodynamic stress response to tracheal intubation in comparison with Macintosh laryngoscope in hypertensive patients. Suresh *et al.*<sup>[9]</sup> concluded that McCoy laryngoscope in comparison to Macintosh laryngoscope resulted in significantly less rise in IOP and clinically less marked increase in hemodynamic response to laryngoscopy and intubation. This is also similar to a reduction in hemodynamic responses to tracheal intubation by the Bonfils retromolar fiberscope.<sup>[10]</sup>

In another study by Turkstra C-spine motion was reduced 50% at the C2-5 segment using the GlideScope.<sup>[11]</sup> Li *et al.*<sup>[12]</sup> showed that the hemodynamic responses caused by nasotracheal intubation were more severe than Fiber optic bronchoscope, followed by Macintosh direct laryngoscope, and least to GlideScope video-laryngoscope. In a recent report Pournajafian *et al.*<sup>[13]</sup> noted no significant variations in hemodynamic values while comparing between the GlideScope video laryngoscope and Macintosh laryngoscope during orotracheal intubation.

Most of the above mentioned studies have measured the hemodynamic responses instead of IOP using different tools for intubation but our study is unique in a way that we measured the direct changes in IOP when comparing GlideScope with conventional Macintosh laryngoscope. The baseline IOP was similar in both groups in our study. IOP significantly decreased in both the groups following induction (preintubation), [Figure 1], which was more likely due to the effect of anesthetic agents<sup>[14]</sup> but 1 min

after intubation, GlideScope assisted tracheal intubation caused less rise in the IOP in comparison to Macintosh laryngoscope. GlideScope videolaryngoscopy took slightly longer time to intubate the trachea compared with the Macintosh blade despite the improved glottic view. This finding is well reported in the literature.<sup>[13,15]</sup> All tracheal intubations were successful on the first attempt. In most patients, the GlideScope provided a laryngoscopic view equal to or better than that of direct laryngoscopy. It has potential advantages over standard direct laryngoscopy for difficult intubations.<sup>[16]</sup>

## CONCLUSION

GlideScope may be preferable for use in ophthalmic patients in whom a rise in IOP is undesirable. However, further clinical trials are needed in patients with glaucoma to further evaluate the benefits of GlideScope.

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