ATTENUATION OF HAEMODYNAMIC RESPONSE DURING INTUBATION WITH GLIDESCOPE® VIDEOLARYNGOSCOPE USING EITHER LIGNOCAINE OR MAGNESIUM; A RANDOMIZED CLINICAL STUDY

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LIST OF ABBREVIATIONS

ASA	American Society of Anesthesiologists
BMI	Body mass index
BP	Blood pressure
bpm	beats per minute
DBP	Diastolic blood pressure
ECG	Electrocardiogram
GA	General anaesthesia
GSVL	Glidescope Videolaryngoscope
HR	Heart rate
IV	Intravenous
LETI	Laryngoscopy and endotracheal intubation
MAP	Mean arterial pressure
MDSL	Macintosh direct laryngoscope
min	minutes
OT	Operation theatre
SBP	Systolic blood pressure
Sec	Seconds
SD	Standard deviation
SpO_2	Pulse oximetry

DEFINITIONS

Glidescope® Videolaryngoscope

GlideScope® Video Laryngoscopes was first introduced in 2001 by Saturn Biomedical Systems which was later acquired by Verathon® in 2006. It offers significant benefits to Anesthesiology, Critical Care, and Emergency Medicine markets by providing a consistently clear view of the patient's airway, enabling quick intubation (Verathon™, 2006).

GlideScope® is designed for "1st Pass Success," as it provides a C/L Grade I or II view 99% of the time, even in difficult airways (Cooper *et al.*, 2005). It features a patented 50 to 60 degree blade angulation, integrated camera, and patented anti-fogging mechanism.

The clinical applications of GlideScope® as mentioned by its manufacturer, are listed below (Verathon™, 2006):

- First use intubations - replacing direct laryngoscope
- Challenging airways - direct laryngoscope grades I - IV
- Bariatric surgery
- Teaching the anatomy of the airway
- Cervical spine immobilization
- Reintubation in ICU setting
- Video-guided tube exchange in ICU
- Trauma airways

• Vocal cord visualization

ASA (American Society of Anaesthesiologists) Classification

Class 1	Healthy patient, no medical problems
Class 2	Mild systemic disease
Class 3	Severe systemic disease, but not incapaitating
Class 4	Severe systemic disease that is a constant threat to life
Class 5	Moribund, not expected to live 24 hours irrespective of operation
An **E** is added to the status number to designate an emergency operation. An organ donnor is usually designate as Class 6	

Haemodynamic Response

Haemodynamic response or pressor response during and following intubation is defined as the changes in Noninvasive Blood Pressure involving Systolic, Diastolic and Mean Arterial Pressure in mmHg taken by DINAMAP® as well as Heart Rate perminute by using Datex Ohmeda series monitor in operation theatre of Hospital USM during intubation and at 1, 3, 5 and 10 minutes following intubation (Yap *et al.*, 1994).

Lignocaine Hydrochloride

Intravenous Lignocaine will be used. As listed in the Ministry of Health Drug Formulary, **Lignocaine 2% (20 mg/ml) Injection** (C01BB01110P3001XX B)[NEDL APPL] or trade name **Xylocard** is used. The dosage is 1.5mg/kg Intravenous bolus given during induction. Lignocaine is contraindicated in hypersensitivity to lignocaine or amide type of local anaesthetics. It has to be used with cautions in Adams-Stokes syndrome, advanced heart failure, heart block, hepatic disease, hypovolaemia, renal disease, severe degrees of sinoatrial, atrioventricular or intraventricular block, shock, sinus bradycardia, spinal anaesthesia, severe haemorrhage, shock, heart block, local infection at injection site, septicaemia and Wolff-Parkinson-White syndrome. It can cause adverse reaction in the form of nervousness, dizziness, paraesthesia, drowsiness, tinnitus, disorientation, blurred vision, tremor, convulsions, respiratory depression, hypotension, bradycardia (Panel, 2004, Committee, 2004).

Magnesium Sulphate

Magnesium Sulphate 50% Injection (B05XA05183P3001XX C)[NEDL] which contains approximately 2 mmol/ml of Magnesium (1 gram of Magnesium is equivalent to approximately 4 mmol) can be given 20-40 mg/kg body wt as a 20% solution intravenous or intramuscular. It is contraindicated in heart block, myocardial damage, and should be used with caution in impaired renal function and those receiving digitalis glycosides. Magnesium sulphate can cause adverse reactions in the form of hypotension, flushing, sweating, depression of reflexes, flaccid paralysis, hypothermia, circulatory collapse, depression of cardiac function and CNS depression (Panel, 2004, Committee, 2004).

ABSTRAK

Pengurangan Tindakbalas Hemodinamik semasa Intubasi menggunakan Glidescope® Videolaryngoscope dengan cara suntikan Lignocaine atau Magnesium: Suatu Kajian Klinikal Rawak

Latar Belakang & Objektif: Intubasi menggunakan Glidescope Videolaryngoscope (GSVL) telah dikaitkan dengan tindakbalas tekanan darah yang lebih lama. Kajian ini melihat kepada kesan tindakbalas tekanan darah (sistolik, diastolik, mean) dan denyut nadi semasa laringoskopi dan intubasi menggunakan GSVL apabila ubat Lignocaine atau Magnesium digunakan.

Metodologi: 82 pesakit yang menerima bius umum melalui intubasi trakea disertakan dalam kajian. Mereka dibahagikan secara rawak kepada 2 kumpulan; Lignocaine (A) dan Magnesium (B). Ubat berkenaan diberikan 5min sebelum induksi dengan 1.5mg/kg Lignocaine atau 40mg/kg Magnesium, diberikan di dalam larutan 20ml . Bius umum dimulakan dengan IV Propofol 2mg/kg, IV Fentanyl 1mcg/kg and IV Rocuronium 1mg/kg. Seorang yang berpengalaman akan menjalankan intubasi. Bacaan hemodinamik diambil dari sebelum dan selepas mula, semasa intubasi, 1, 3, 5, 10 minit selepas intubasi. Interaksi hemodinamik diuji dengan 'repeated measure ANCOVA.

Keputusan: Interaksi penting dilihat antara masa sewaktu intubasi dengan anggaran tekanan diastolik, mean dan nadi di kedua-dua kumpulan ($p<0.05$). Perubahan anggaran tekanan diastolik dan mean sentiasa rendah dari asal. Tetapi nadi mengalami kenaikan 11% di kumpulan Magnesium dan turun semula selepas 5 minit ($p<0.05$). Interaksi tekanan sistolik tidak penting ($p>0.05$).

Kesimpulan: Magnesium 40mg/kg adalah kurang efektif berbanding Lignocaine dalam mengurangkan tindakbalas tekanan dan nadi semasa intubasi menggunakan GSVL.

ABSTRACT

Attenuation of haemodynamic response during intubation with Glidescope® Videolaryngoscope using either Lignocaine or Magnesium; A randomized clinical study

Background & Objective: Intubation with Glidescope Videolaryngoscope (GSVL) has been associated with longer period of pressor response. This study aimed to look at haemodynamic parameters (SBP, DBP, HR, MAP) during laryngoscopy and intubation using GSVL with either Lignocaine or Magnesium used to attenuate the pressor response.

Methodology: 82 patients planned for general anesthesia with endotracheal intubation were recruited. They were blinded, and randomized into 2 groups; Lignocaine (A) and Magnesium (B). The agents were given at 1.5mg/kg and 40mg/kg respectively in group A and B, and each diluted into 20ml syringe and given IV over 5min before induction. Inductions were standardized with IV Propofol 2mg/kg, IV Fentanyl 1mcg/kg and IV Rocuronium 1mg/kg. A single intubator with experience in GSVL performed the intubations. Haemodynamic parameters were collected at baseline, post induction, at intubation, 1, 3, 5 and 10 minutes post intubation. The interaction of haemodynamic parameters within and between groups were tested with repeated measure ANCOVA.

Result: There were significant interaction between time during intubation and estimated marginal mean of DBP, MAP and HR in both groups ($p<0.05$). The changes in estimated mean DBP and MAP were constantly less than baseline value post induction and intubation. However the rise in HR at 1min postintubation in Magnesium group was 11% above baseline and required 5 minutes to return to baseline ($p<0.05$). The interaction in SBP is not significant ($p>0.05$).

Conclusion: Magnesium at 40mg/kg is less effective than lignocaine in attenuating pressor response to intubation with GSVL.

1 INTRODUCTION

Video laryngoscope is the recent technology in assisting anaesthetist to improve the technique of intubation and accessability of airway. It has a digital camera incorporated into the blade which displays a view of the vocal cords on a monitor. This allows the placement of a tracheal tube to be visualised (Chivite Fernandez *et al.*, 2005).

Numerous studies have looked into the use of video laryngoscope compared with standard laryngoscope in facilitating the view of vocal cord or in other words improving the grade of vocal cord visibility. And the result has been mostly favourable with an initial difficulty of endotracheal tube advancement due to learning curve of intubator or anaesthetist.

The use of videolaryngoscope has been mostly confined to intubation in operation theatre, and among others, its use has been extended to assisting awake fibreoptic intubation (Vitin and Erdman, 2007) and intubation of difficult airway (Benjamin *et al.*, 2006). Case reports have also mentioned on the successful use of video laryngoscope in awake intubation of cervical injury or instability patients (Turkstra *et al.*, 2005, Agro *et al.*, 2003).

Glidescope® Videolaryngoscope

The Glidescope® Videolaryngoscope (Saturn Biomedical System Inc., Burnaby, BC, Canada) is made of medical grade plastic and is reusable. The device consists of a handle and a blade. The handle is similar to that of a standard laryngoscope. The blade however, has an embedded digital video camera at the tip and there are two light emitting diodes on either side of the camera which provide continuous illumination (Figure 1). The camera has a wide angle lens and is equipped with an antifogging device. The captured image is displayed on a 7-inch LCD black and white monitor screen (Figure 2). The blade design differs from a standard laryngoscope blade in that it is not detachable, has a maximum width of 18 mm at any point and has a 60° curvature in the midline. It is available in a single size for adult patients. A smaller version, suitable for paediatric use, is also available (Verathon™, 2006, Chivite Fernandez *et al.*, 2005).

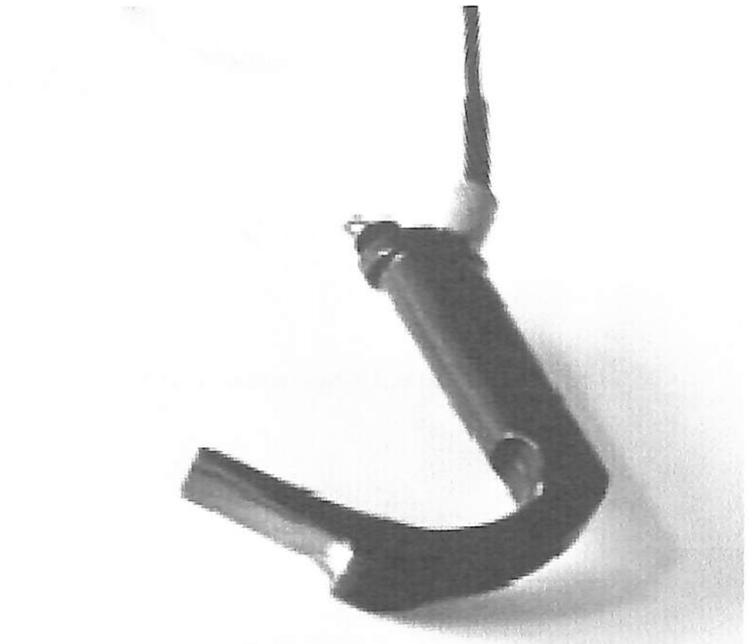

Figure 1 The Glidescope Videolaryngoscope handle and blade.

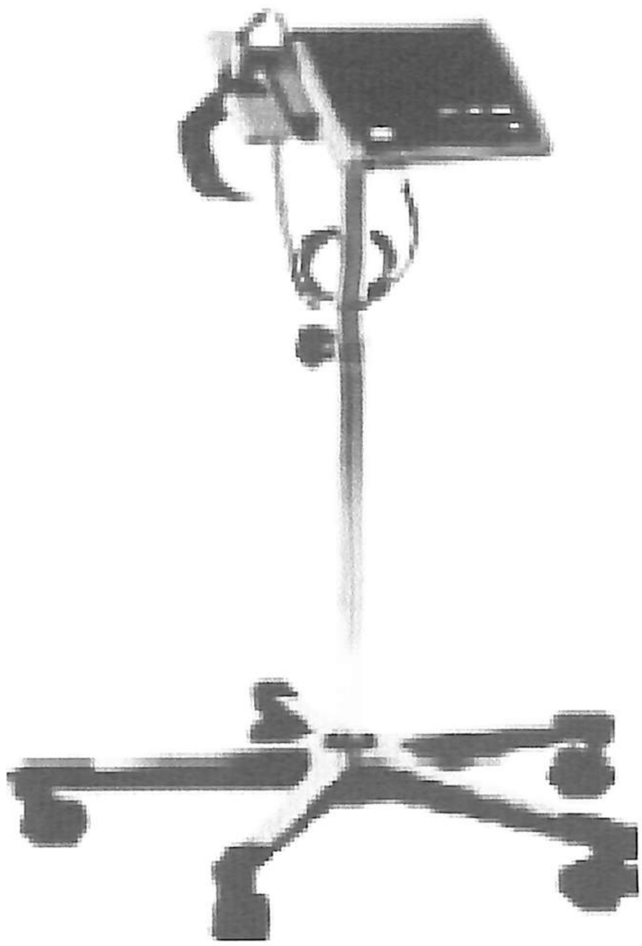

Figure 2 The Glidescope Videolaryngoscope

Haemodynamic Response Following Intubation with Glidesope® Videolaryngoscope

Xue et al compared the haemodynamic response to intubation using Glidescope (GSVL) and Macintosh direct laryngoscope (MDLS) for orotracheal intubation involving 57 randomly assigned patients who were intubated by a single anesthesiologist. Intubation time was significantly longer in the GSVL group than in the MDLS group ($P < 0.01$). In the GSVL group, heart rate and rate pressure product (RPP) at intubation were significantly higher than their baseline values, and heart rate increases lasted for 4 minutes. Whereas in the MDLS group, heart rate at intubation was also significantly higher than its baseline value, but the tachycardic response lasted only for 1 minute (Xue *et al.*, 2006a).

In a different study by the same author, he concluded that the orotracheal intubation using a GlideScope had advantages of easy and simple operation, excellent laryngeal view, and the ability to provide an improved laryngeal view in the patients with a difficult laryngoscopy. The general anesthesia of clinical standard depth was able to suppress the pressor response, but not temporary tachycardiac response to the orotracheal intubation using a GlideScope (Xue *et al.*, 2007b).

For this reason, the study attempts to explore on the aspect of controlling the BP and HR responses during intubation with Glidescope Videolaryngoscope by using either Lignocaine or Magnesium Sulphate. Lignocaine is a standard agent which has stand the test of time. It can be given by spray or intravenously. The efficacy of each administration method will be discussed in the next section. However for the purpose of blinding, intravenous administration of lignocaine is prefered in the study. On the other hand, Magnesium is an emerging agent which, in recent decade, has grabbed the interest of anaesthetist and intensivist worldwide for its significant role in managing various conditions such as an emergency unstable arrhythmia, a complex case like pheochromocytoma resection or a simple case of hypokalaemia.

2 LITERATURE REVIEW

2.1 Glidescope Videolaryngoscope

2.1.1 History

Glidescope Videolaryngoscope was first developed by a Canadian surgeon, Dr. John Pacey MD. It was then commercialized in 2001 by Saturn Biomedical. However the company was later acquired by Verathon® in 2006 and Glidescope underwent several improvement involving introduction of colour monitor and thinner laryngoscope blade.

Dr. J. Pacey who is a vascular surgeon invented the Glidescope videolaryngoscope to provide a better access for endotracheal intubation and reliable visualization especially in handling difficult airway.

2.1.2 Features

Glidescope is essentially formed of a handle and plastic laryngoscope blade which incorporated a video camera, LED and anti-fogging mechanism. The particular features that set it apart from conventional laryngoscope are 60 degree angulated blade and intubation visualized by a video camera (Hawkyard *et al.*, 1992). It eliminates the necessity to obtain 'line of sight' for intubation using conventional laryngoscope, thus providing a better unobstructed view of the larynx.

A Light Emitting Diode (LED) is a solid state light source mounted beside the camera to provide illumination. The resulting monochrome video image is magnified and displayed on a supplied 7" Liquid Crystal Display (LCD) monitor, but can also be displayed externally or recorded electronically. The unit is commercially available and FDA approved. It is easily cleaned using cold sterilization solution.

The Glidescope® is designed to be inserted along the midline of the tongue and advanced until the glottis is visible on the monitor. The tracheal tube can be mounted onto a flexible stylet and the distal tip is angulated upwards by about 60° to match the angulation of the blade. The preformed shape resembles that of an icehockey stick. The tracheal tube is then passed by the side of the blade into the trachea while viewing the entire process on the monitor (Figure 4). Any resistance to advancement of the tube is managed by withdrawing the stylet approximately 4 cm and withdrawing the Glidescope® by 1–2 cm. This allows the glottis to drop down, making the angle of approach of the tracheal tube more favourable (Verathon™, 2006, Chivite Fernandez *et al.*, 2005).

2.1.3 Comparison with Direct Laryngoscope

Direct laryngoscope with either curved or straight blade was designed to be inserted into the far right corner of the mouth and the tongue needed to be pushed away to the left to get the 'line of sight' for intubation (Figure 3). This sometimes required maneuvers which induces neck flexion, head extension, laryngeal depression and other stress-related movements.

All videolaryngoscopes that is available now used a curved blade which is not similar to conventional laryngoscope. The blades are specifically designed to enable videolaryngoscope to 'look around the corner' without excessively manipulating the oropharyngeal cavity and cervival segments mobility (Cooper *et al.*, 2005). Besides Glidescope, the V-mac Storz Beci, Mcgrath Videolaryngoscope and Pentax Airwayscope are videolaryngoscopes which shared this principle (van Zundert *et al.*, 2009)

However, the peculiar design of videolaryngoscope blade requires an intubator to use a styletted endotracheal tube to ensure a better intubation success. Normal flexible stylet as described earlier, can be difficult to manipulate inside the oropharynx. It can be bent, disfigured and failed to guide endotracheal tube for intubation. Hence, Glidescope has invented Glidescope Rigid Stylet that compliment the intubation process using videolaryngoscope. This is a rigid stainless steel stylet with a 60 degree curve conforming to the shape of Glidescope blade. It has a plastic hook at the proximal end for easy removal following passage of tip of endotracheal tube through the vocal cords.

A recent study by Van Zundert et al found that among the 3 videolaryngoscope available in the market, Glidescope necessitates the use of styletted endotracheal tube 50% of the time. He also concluded that good laryngoscopic view does not correlate with ease of intubation (van Zundert *et al.*, 2009).

Nevertheless, a study comparing rigid and standard malleable stylet on 80 intubations using Glidescope failed to see any significant difference in the time to intubation success and the ease of intubation score using VAS (Turkstra *et al.*, 2007).