

A comparison of four methods of endotracheal tube passage in simulated airways – Is there room for improved techniques?



Kirsten Kingma - University of Stellenbosch, South Africa
Ross Hofmeyr - Department of Anaesthesia, University of Cape Town, South Africa
Irene Zeng - Counties Manukau Health, New Zealand
Christin Coomarasamy - Counties Manukau Health, New Zealand
Andrew Brainard - Department of Emergency Medicine, University of Auckland, New Zealand



Naked ETT



Stylet ETT



Railroaded Bougie



Preloaded Bougie

Introduction

Passage of an endotracheal tube (ETT) into the trachea is an essential portion of airway management. The use of a tracheal tube introducer (bougie) is part of the airway strategy in multiple guidelines.

These recommendations have predominantly been made on the basis of expert consensus opinion. There is currently minimal evidence to support their use to improve first pass success rate (FPS). Poor FPS has been associated with peri-intubation adverse events and is a commonly used airway management quality index.

Four different methods to aid in ETT are frequently advocated: a 'naked' ETT without adjuncts, a preformed stylet inside an ETT, a bougie followed by a railroaded ETT, and an ETT with preloaded bougie (Kiwi-D grip).

We aimed to demonstrate which method has the highest FPS and shortest time to intubation in a manikin model.

Methods

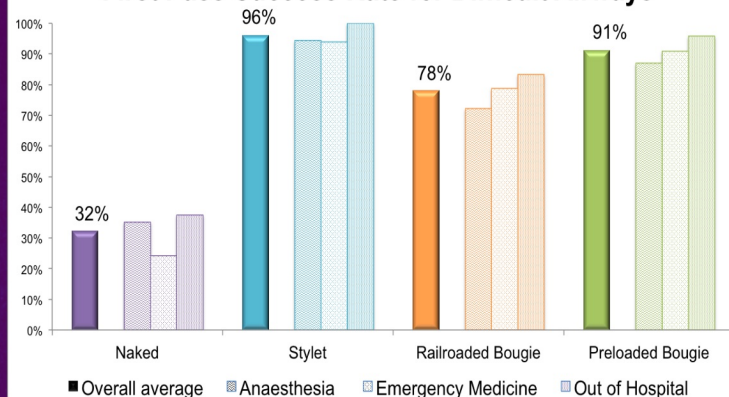
This is a cross-sectional, prospective, cross-over manikin study design.

Participants performed timed endotracheal intubations (ETI) on "easy" and "difficult" airway models using each of the four methods of tube passage. A difficult airway was simulated by placement of a cervical collar, allowing the participant to obtain a Cormack-Lehane grade 2B view under optimal laryngoscopy. Without the cervical collar a grade 1 view was attainable, and this was defined as an easy airway.

Primary outcome was defined as FPS. Power analysis indicated that more than 96 participants were required to detect a clinically significant difference.

Secondary outcomes include time taken for ETI and participants' preferred technique. ETI times were measured from commencement of laryngoscopy until first ventilation. Any time greater than 60 seconds, esophageal placement, or practitioner-declared withdrawal was deemed an unsuccessful attempt. Pre- and post-tests surveys recorded participant experience and perceptions of the four methods.

First Pass Success Rate for Difficult Airways



Results

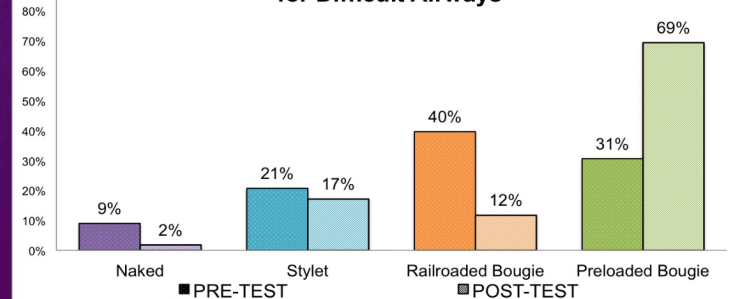
Data was collected on a 111 participants (888 ETI attempts). Of these participants, 54 worked in anaesthesia, 33 in emergency medicine, and 24 in out-of-hospital environments. Participants averaged 7 years of experience, with an average of 56 ETI's being performed per year.

In the "difficult" airway, FPS was 32% using the naked ETT. Stylet, railroaded bougie, and preloaded bougie had 96%, 78% and 91% respectively. For easy airways, the naked ETT had a failure rate of 21%.

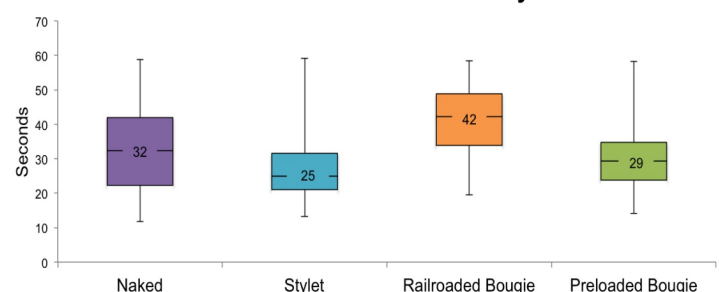
Mean time to ETI was faster in the stylet technique (25 seconds) with the railroaded bougie technique being the slowest (42 seconds). ETI with the naked ETT had the largest interquartile range in time (20 seconds).

Based on experiences in the study, 79% of participants stated that they would change their practice. A significant increase in preference of 38% towards the preloaded technique overall by practitioners for ETI in the difficult airway was noted.

Pre- and Post-test Preferred Technique for Difficult Airways



Median, IQR & Range of Times for Intubation in Difficult Airways



Discussion

All three groups of participants performed worst using the naked ETT. Based on the low FPS, continued use of a naked ETT for ETI in the potentially difficult airway is not recommended.

ETI was most rapid using a stylet or preloaded bougie. This has clinical significance in critically ill patients by reducing apnoeic time. The railroad technique took longer to perform in this study due to the additional steps required.

Prior to the test, the railroaded technique was preferred by most participants. However, after training and practice, most participants changed their preference to the preloaded bougie technique.

This study shows that ETI with adjuncts such as a stylet or a bougie is both superior in achieving FPS and faster in a difficult airway model.

The above mentioned techniques video by James DuCanto, study protocol, and references is available by accessing the QR code

