

A NOVEL ADJUSTABLE BOUGIE COMPARED WITH COOK'S AIRWAY EXCHANGE CATHETER FOR INTUBATION USING C-MAC VIDEO LARYNGOSCOPY: A RANDOMIZED COMPARATIVE STUDY

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Abstract

Background: Endotracheal intubation remains a cornerstone of airway management. While video laryngoscopes such as the C-MAC improve glottic visualization, adjuncts like bougies and airway exchange catheters play a key role in facilitating tube passage.

Aim: To compare the performance of a novel adjustable bougie with Cook's Airway Exchange Catheter (CAEC) in patients undergoing elective intubation using C-MAC video laryngoscopy.

Methods: A prospective, randomized comparative study was conducted on 60 ASA I–III patients (30–60 years) scheduled for elective surgery under general anaesthesia. Patients were randomized into two groups: Group A (n=30, adjustable bougie) and Group B (n=30, CAEC). Primary outcome was first-pass success rate. Secondary outcomes included intubation time, ease of intubation, complications, and number of attempts.

Results: The bougie group demonstrated significantly shorter mean intubation time (23.23 ± 2.6 vs 26.50 ± 5.0 sec; $p=0.001$), higher first-pass success (60% vs 33.3%; $p=0.03$), and fewer complications (36.7% vs 76.7%; $p=0.04$) compared to the CAEC group. Overall success was 100% in both groups.

Conclusion: The novel adjustable bougie offers superior intubation efficiency and higher first-pass success compared to CAEC when used with C-MAC video laryngoscopy, making it a valuable adjunct for elective airway management.

Keywords: Adjustable bougie, Cook's Airway Exchange Catheter, video laryngoscopy, C-MAC, intubation, airway management.

INTRODUCTION

Securing the airway through endotracheal intubation is a fundamental skill in anaesthetic and critical care practice. Video laryngoscopes (VLs), such as the C-MAC, have improved glottic visualization and intubation success, particularly in predicted or unanticipated difficult airways. However, despite enhanced visualization, advancing the endotracheal tube (ETT) may remain challenging, necessitating adjuncts like bougies and airway exchange catheters (AECs).

Cook's Airway Exchange Catheter (CAEC) is widely used, with the advantage of oxygen insufflation and reintubation capabilities. Yet, its rigidity and lack of dynamic maneuverability may limit effectiveness in anatomically complex airways. In contrast, a novel adjustable bougie allows real-time tip angulation and directional control, potentially improving first-pass success rates and reducing intubation time under VL guidance.

This study aims to compare the novel adjustable bougie with the CAEC for elective intubation using the C-MAC video laryngoscope, focusing on first-pass success, intubation time, ease of use, and complications.

MATERIALS AND METHODS

Study Design and Setting: A prospective, randomized, comparative study was conducted in the operation theatres of Saveetha Medical College and Hospital, Chennai, between September 2022 and April 2024.

Participants: Sixty adult patients (30–60 years), ASA I–III, scheduled for elective surgery requiring endotracheal intubation under general anaesthesia, were enrolled. Exclusion criteria included ASA IV, pregnancy, severe upper airway trauma, or contraindications to VL.

Randomization: Patients were allocated by simple random sampling into two groups:

Group A (n=30): Intubation using the adjustable bougie.

Group B (n=30): Intubation using CAEC.

Anaesthetic Technique: All patients received standard ASA monitoring. Premedication included glycopyrrolate (0.2 mg), induction with IV propofol (2–2.5 mg/kg), fentanyl (1–2 µg/kg), and muscle relaxation with atracurium (0.5 mg/kg). Intubation was performed using a C-MAC video laryngoscope with an appropriately sized blade.

Outcomes Measured:

Primary Outcome: First-pass intubation success.

Secondary Outcomes: Intubation time (laryngoscope insertion to confirmed ETT placement), ease of intubation (5-point Likert scale), complications (trauma, desaturation <92%, oesophageal intubation), and number of attempts.

Ethical Approval and Registration: Approved by the Institutional Ethics Committee (090/09/2024/IEC/SMCH) and registered with CTRI (CTRI/2025/04/103428).

Statistical Analysis: Data were analyzed using SPSS v26.0. Independent t-test was used for continuous variables, chi-square for categorical variables. $p < 0.05$ was considered significant.

RESULTS

Demographics: Both groups were comparable in age (Bougie 48.0 ± 7.8 vs CAEC 46.7 ± 8.4 years, $p=0.69$), weight, height, Mallampati, and Cormack–Lehane grading. Gender distribution was more balanced in the bougie group, while the CAEC group had more males.

Intubation Time: Mean intubation time was significantly shorter in the bougie group (23.2 ± 2.6 sec) compared to CAEC (26.5 ± 5.0 sec; $p=0.001$).

First-Pass Success: Achieved in 60% with bougie vs 33.3% with CAEC ($p=0.03$).

Complications: Complications were lower in the bougie group (36.7%) compared to CAEC (76.7%; $p=0.04$). Reported complications included minor bleeding, sore throat, cough, and trauma.

Overall Success: Both groups achieved 100% overall intubation success.

DISCUSSION

This study demonstrates that the novel adjustable bougie provides superior performance compared with CAEC in elective intubation using C-MAC VL. The significantly shorter intubation time and higher first-pass success highlight its clinical utility.

The importance of first-pass success cannot be overstated, as multiple attempts are associated with increased complications including hypoxemia, airway trauma, and aspiration. The flexible, angulated tip of the adjustable bougie facilitates smoother passage through the vocal cords, explaining the improved efficiency.

Previous studies have shown that bougie use with videolaryngoscopes improves intubation success, particularly in difficult airways. Our findings align with these, while also demonstrating reduced complication rates compared to CAEC. The CAEC remains valuable for reintubation and oxygen insufflation but may be less practical as a primary adjunct in routine intubation.

Limitations: The study was limited to elective surgical patients in a single centre with a relatively small sample size. It did not include patients with severely difficult airways or emergencies, where results may differ.

CONCLUSION

The novel adjustable bougie is more effective and user-friendly than Cook's Airway Exchange Catheter for elective intubation using C-MAC video laryngoscopy. It offers shorter intubation times, higher first-pass success, and fewer complications, making it a preferable adjunct in routine airway management.

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