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Retrospective study: The impact of BUHE positioning and video laryngoscopy on intubation success rates in the emergency department

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Abstract
Aim: To analyze whether the bed-up head-elevated (BUHE) position and video laryngoscopy improve the first-pass success rate for physiologically difficult airways in the Emergency Department (ED).
Objectives
- **Primary Outcome:** First-pass success rate.
- **Secondary Outcomes**

1. Peri-intubation hypoxia.
2. Need for alternative airway methods for intubation.
3. Need for senior personnel to intubate.

Keywords: Intubation success rates, video laryngoscopy, BUHE positioning

Introduction
Intubating patients in the ED presents significant challenges due to the critical condition of most patients. Predicting a difficult airway using various scores isn't always feasible, necessitating preparation for potential difficulties in every case. Our ED employs Rapid Sequence Intubation (RSI) for all intubations, ensuring the availability of all necessary equipment.
Our academic program involves trainees performing intubations under the supervision of a consultant, fostering their competence in airway management - a critical skill for emergency physicians. The COVID-19 pandemic led to adaptations in our RSI procedures, particularly for hypoxic patients, where we employed apneic oxygenation and the BUHE position to ensure adequate pre-oxygenation. Video laryngoscopy (VL) was utilized for better visualization in the BUHE position, enhancing first-pass success rates among trainees.

Methodology
This multi-centric retrospective observational study was conducted at three Apollo hospitals: Apollo Hospitals Main, Vanagaram, and OMR. We reviewed medical records of patients who presented to our tertiary care academic teaching EDs needing definitive airway management over a period of five months (January 2024 to May 2024).
We analyzed 70 intubation cases, with approximately 65 conducted using the BUHE position and VL. Consultants performed five intubations after an initial attempt, either maintaining the same position or switching to supine based on their expertise. Trauma patients with facial bleeding were excluded from the study to avoid confounding factors.

Results
Statistical analysis
Descriptive statistics was presented with frequency (percentage) and Mean ± SD for the categorical and continuous factors respectively. The basic descriptive statistics was carried out by using SPSS (IBM, 28.0)

Study participants: Totally, 70 participants have enrolled the study after attains the eligibility criteria. The Mean ± SD of age was 59.1 ± 17.8 years and it ranged from 16 to 87

years. Of these 70 participants, 44 (62.9%) and 26 (37.1%) were male and female respectively. There was no significant differences found between demographic factors and first pass success.

Table 1: Demographic factors

Parameters	(n=70), n (%)
Age in years	
Mean ± SD	59.1 ± 17.8
Range	16 - 87
Gender	
Male	44 (62.9)
Female	26 (37.1)

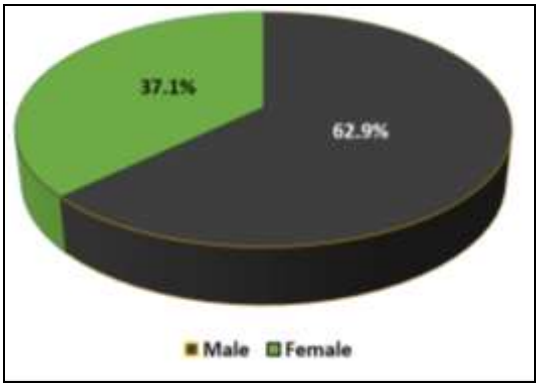

Fig 1: Gender

Table 2: Demographic factors

Parameters	(n=70), n (%)
Methods	
Modified RSI	63 (90)
Delayed Sequence	3 (4.3)
Crash intubation in cardiac arrest	2 (2.9)
Classical RSI	1 (1.4)
First Pass Success	
Success	63 (90)
Failure	7 (10)
Reason for failure	
Bougie wasn't stiff/Grade-IV	1 (14.3)
Failed due to resistance of big size tube	1 (14.3)
Not able to pass scope	1 (14.3)
Unable to see cords	1 (14.3)
Unable to visualize cords due to secretions	1 (14.3)
Unable to visualize cords due to thick secretions	1 (14.3)
Vocal cords not visualized	1 (14.3)

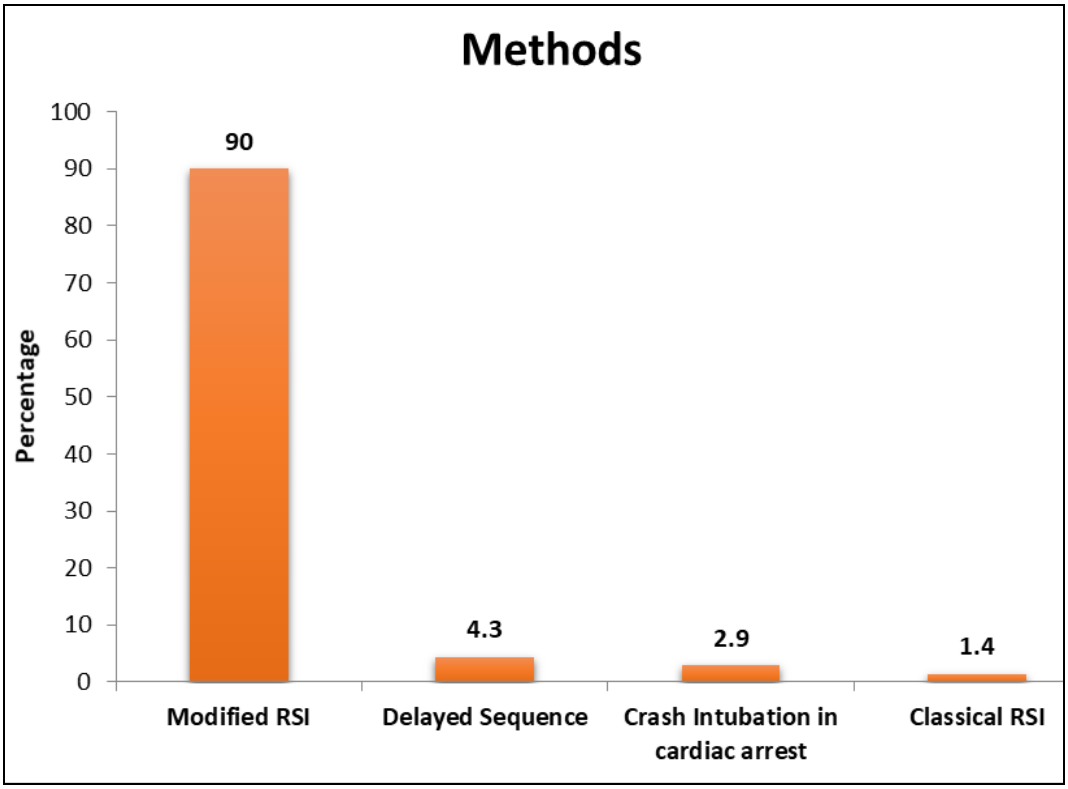

Fig 2: Method

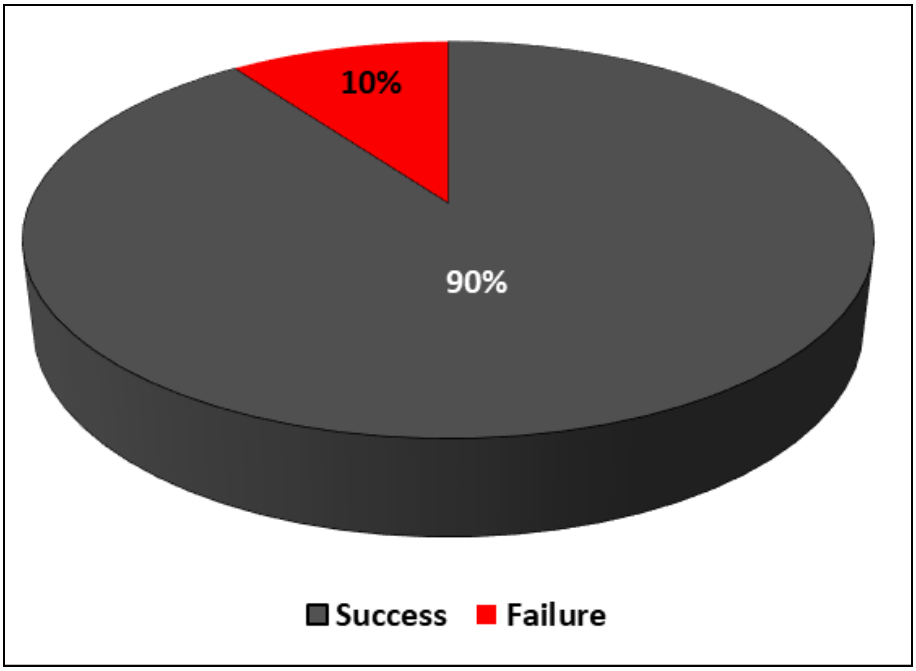

Fig 3: First pass success

Results

The study demonstrated the following outcomes

Primary Outcome

- The majority of intubations (63 out of 70) were successful on the first attempt using BUHE positioning and VL.

Secondary Outcomes

- No incidents of peri-intubation hypoxia were recorded.
- Alternative airway methods were not required for the majority of cases.
- Consultants successfully intubated the remaining seven patients after an initial attempt, demonstrating the technique's adaptability.
- Two obese patients required ramp positioning with pillows and sheets, and one patient classified as Cormack-Lehane (CL) grade 2 had a large tube selected.

Discussion

The BUHE positioning, combined with VL, provided several benefits

- Enhanced preoxygenation through apneic oxygenation.
- Minimization of functional residual capacity (FRC) reduction compared to the supine position.
- Improved oxygenation and ventilation by leveraging gravity to reduce compressive effects on the lungs, maintaining better FRC.

Given the higher first-pass success rates observed with BUHE positioning and VL, these methods are now standard practice in our ED. This approach has proven especially beneficial for hypoxic patients, allowing additional time to secure the endotracheal tube without compromising safety. Despite theoretical concerns about passive aspiration in the head-up position, no incidents were recorded.

Conclusion

The implementation of BUHE positioning and VL in our ED has markedly improved first-pass success rates for intubations, demonstrating significant benefits in managing physiologically difficult airways. This retrospective analysis supports the continued use of these techniques to enhance airway management outcomes in emergency settings.

Review of Literature

1. **Lee *et al.* (2015) [1]:** In a randomized controlled trial, the researchers found that BUHE positioning significantly improved the percentage of glottic opening (POGO) score compared to the traditional supine position. The improved glottic view facilitated easier and quicker intubation attempts, thereby reducing the overall intubation time.
2. **Turner *et al.* (2017) [2]:** This study compared glottic visualization in patients positioned in BUHE versus those in a standard supine position. The results indicated that BUHE positioning provided a better view of the vocal cords, with a higher POGO score and less need for external laryngeal manipulation
3. **Driver *et al.* (2018) [3]:** This study highlighted that patients in the BUHE position experienced a longer safe apnea time. The extended apnea period allowed for a more controlled and less rushed intubation process, reducing the likelihood of hypoxic events
4. **Khandelwal *et al.* (2016) [4]:** The researchers demonstrated that the head-elevated laryngoscopy position (HELP), a variant of BUHE, increased the safe apnea time significantly compared to the supine position. This positioning was particularly beneficial in obese patients and those with difficult airways.
5. **Rampersad *et al.* (2019) [5]:** The study reported a significant reduction in the incidence of pulmonary aspiration when BUHE positioning was used. The improved glottic view and quicker intubation reduced the time the airway was unprotected, lowering aspiration risk.

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Conflict of Interest: Nil

Reference

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