A COMPARATIVE STUDY TO ASSESS EASE OF INTUBATION WITH C-MAC VS DIRECT LARYNGOSCOPE, WHEN USED FOR INTUBATION WITH CLEAR PLASTIC DRAPES OVER MAYO STAND FOR IN COVID NEGATIVE PATIENTS DURING A PANDEMIC IN RESOURCE-LIMITED SETTING

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ABSTRACT
The study aimed to assess the time to endotracheal intubation, First pass success when intubating with C-MAC, and Direct laryngoscope with clear plastic drapes over mayo stand.

The mean duration of intubation in secs was longer in Group B compared to group A (27.47 sec vs 21.4 sec). Furthermore, based on the intubation difficulty scale score, Group B had more second attempts needed (26.67%) than Group A (6.67%) and also the second operator was required in (16.67% vs 3.33%) Group B compared to Group A (p<0.05).

Based on CL grades among Group B vs Group A, a statistically significant association was observed concerning grade 1 (63.33% vs 93.34%), Grade2a (23.34% vs 3.33%) and grade 2b (13.33% vs 3.33%).

We conclude that intubation with a C-MAC laryngoscope has a better glottis view, and takes a lesser duration, lesser number of attempts required for successful intubation when compared to that of the Macintosh laryngoscopy with a plastic drape on a mayo trolley.

KEYWORDS Airway, containment setup, laryngoscopes
Introduction

Severe acute respiratory syndrome-Corona virus-2 (SARS-CoV-2), which causes COVID-19, is highly contagious (1). It is a single strand ribonucleic acid (RNA) encapsulated virus (1) of the Orthocoronavirinae subfamily (2). The highest viral load appears in the sputum and the upper airway secretions (3). It is mainly transmitted by droplet and direct contact (1,3), while controversy remains about its faecal-oral transmission (4). Health care providers (HCPs) performing aerosol-generating procedures such as endotracheal intubation (ETI) in patients with the disease are considered at a greater risk for contracting the disease (5). Although the use of personal protective equipment (PPE) reduces the transmission, using other barrier techniques to limit aerosolisation and protect against contamination may also be helpful (6-8). One such barrier method is the aerosol box, first invented by a doctor in Taiwan (9) and approved by United States food and drug administration (10). Since then, the aerosol box has gained popularity as a cost-effective barrier technique. However, many anesthesiologists and intensivists soon found its disadvantages outweigh the benefits proposed. They even recommended against the use of aerosol boxes for intubation in most clinical settings. (11)

Many doctors tried various readily available barrier methods using plastic sheets in simulation-based mannequins (12). One such barrier method readily available in most operating rooms is Mayo stand draped with clear plastic sheets suspended over the patient’s head (13). The plastic sheets are placed over the Mayo stand and secured with clips to create a barrier covering the patient’s head. A plastic bag is used to cover the stand legs, and the Mayo tray is omitted for visualization from various angles. Two vertical 10 cm slits, separated at least 30 cm apart, are cut in the plastic sheet for hand placement (13). After use, the plastic drapes are discarded by inward rolling of the contaminated surfaces.

This study is the first of its kind. We will compare the use of C-Mac laryngoscope with Direct laryngoscope using the Mayo trolley containment setup in actual covid negative patients. The study’s results can be extrapolated to use the containment setup with a Direct laryngoscope in resource-limited clinical settings. The comparison will be made to assess the parameters like ease of intubation, time taken for intubation, restriction of hand movement, difficulty in accessing the equipment, difficulty in the railroading of the endotracheal tube over a bougie, general satisfaction of the operator during the procedure and rate of complications during intubation when performed by an anesthesiologist with more than two years of experience in airway management.

Methodology

A prospective observational, randomized, single-blind comparative study was done in the Department of Anaesthesiology at Dr. D Y Patil Medical College, Pune, during a study period of one year among 60 patients after obtaining institute ethics committee clearance and obtaining informed written consent from all patients. The sample size was calculated by assuming a significance level of 5%, alpha power of 0.8, which comes to 22 patients in each group. Assuming a 10% non-response, the total sample size comes to 30 patients in each group. The statistical package used is WINPEPI. All the 60 patients were divided into two groups, 30 each, by randomly sealed envelopes according to a computer-generated sequence of a random number in group A or group B.

30 in group A- Intubation with C-Mac laryngoscope with Mayo trolley with a plastic sheet.
30 in group B- Intubation with direct laryngoscope with Mayo trolley with a plastic sheet.

Inclusion criteria

1. Age between 20 to 60 years of either gender.
2. ASA grade I and II patients.
3. Patients with MPC grade I and II.
4. Under general anaesthesia, patients undergoing elective or emergency abdominal, obstetric, gynaecological, orthopaedic, or urology.
5. Patients who give informed consent and willing to be a part of the study.

Exclusion criteria

1. Nasotracheal intubation.
2. ASA grade III and IV.
3. Patients with MPC grade III and IV.
4. Patients with difficult airway.
5. Patients undergoing thoracic or head, neck or oromaxillary surgery.
6. COVID 19 positive patients.

Comparison of age distribution among the study groups (N=60).

In the present study, majority of the study participants belonged to the age group of 21-30 years, while the Mean age being 38±12.28 in group A and 36.2±10.68 in group B with no statistically significance (P value 0.547).

Comparison of gender distribution among the study groups (N=60).

There is no significant difference between gender distributions among the study groups.

Comparison of mean weight among the study groups (N=60).

The mean weight of patients among group A was 61.93±8.65kgs and group B was 61.1±6.79kgs with no statistically significance (P value 0.68).

Comparison of BMI distribution among the study groups (N=60).

Majority of patients in group A (76.67%) and group B (43.33%) had BMI between 18.5 to 24.9 with statistically significance (P value 0.03).

Comparison of ASA among the study groups (N=60).

Around 90% of patients in group A had ASA 1 and 63.33% in group B with statistically significance (P value 0.015).
Table 1

| IDS score                  | Group A          | Group B          | Chi square | P value |
|----------------------------|------------------|------------------|------------|---------|
| N1 (attempts)              |                  |                  |            |         |
| 1st – Score 0              | 28 (93.33%)      | 22 (73.33%)      | 4.32       | 0.037   |
| 2nd – Score 1              | 2 (6.67%)        | 8 (26.67%)       |            |         |
| N2 (operators)             |                  |                  |            |         |
| 1 – Score 0                | 29 (96.67%)      | 25 (83.33%)      | 2.96       | 0.085   |
| 2 – Score 1                | 1 (3.33%)        | 5 (16.67%)       |            |         |
| N3 (alternative techniques)|                  |                  |            |         |
| Not used – Score 0         | 30 (100%)        | 30 (100%)        |            |         |
| N4 (CL grade)              |                  |                  |            |         |
| 1 – Score 0                | 28 (93.34%)      | 19 (63.33%)      | 8.02       | 0.018   |
| 2a – Score 1               | 1 (3.33%)        | 7 (23.4%)        |            |         |
| 2b – Score 2               | 1 (3.33%)        | 4 (13.33%)       |            |         |
| N5 (lifting force)         |                  |                  |            |         |
| Normal – Score 0           | 26 (86.67%)      | 18 (60%)         | 5.45       | 0.019   |
| Increased – Score 1        | 4 (13.33%)       | 12 (40%)         |            |         |
| N6 (laryngeal pressure)    |                  |                  |            |         |
| Not applied – Score 0      | 26 (86.67%)      | 19 (63.33%)      | 4.35       | 0.036   |
| Applied – Score 1          | 4 (13.33%)       | 11 (36.67%)      |            |         |
| N7 (vocal cord position)   |                  |                  |            |         |
| Abducted – Score 0         | 30 (100%)        | (100%)           |            |         |

6. Comparison of thyromental distance among the study groups (N=60).
   73.33% of patients in group A had thyromental distance of >6.5cm and 86.67% in group B had >6.5cm thyromental distance with no statistically significance (P value 0.197).

7. Comparison of inter-incisor distance among the study groups (N=60).
   Majority of patients in group A (90%) and group B (56.67%) had inter-incisor distance of <4.5cm with statistically significance (P value 0.004).

8. Comparison of MPC among the study groups (N=60).
   Around 46.67% of patients in group A and 56.67% in group B had MPC grading 1 with no statistically significance (P value 0.69).

9. Comparison of Intubation difficulty scale score among the study groups (N=60).

10. Comparison of mean POGO score among the study groups (N=60).
    The mean POGO score of patients in group A was 86.83±16.03 and in group B was 72.63±26.00 with statistically significance (P value 0.013).

11. Comparison of mean duration of intubation among the study groups (N=60).
    The mean duration of intubation among patients of group A was 21.4±5.11 secs and in group B was 27.47±7.08 sec with statistically significance (P value 0.0003).

Hemodynamics

1. Comparison of mean heart rate among the study groups (N=60).
   The mean heart rate in group A was 77.83±2.29 per minute and in group B was 84.68±1.58 per minute with statistically significance (P value <0.0001).

2. Comparison of mean systolic blood pressure among the study group (N=60).
   The mean systolic blood pressure in group A was 120.36±6.22mm of hg and in group B was 127.8±5.49mm of hg with statistically significance (P value <0.0001).

3. Comparison of mean diastolic blood pressure among the study groups (N=60).
   The mean diastolic blood pressure in group A was 77.37±1.72mm of hg, and in group B was 81.52±2.38mm of hg with statistically significance (P value <0.0001).

4. Comparison of mean arterial pressure among the study groups (N=60).
   The mean arterial pressure in group A was 78.57±3.06and in group B was 81.72±1.97 with statistically significance (P value <0.0001).

5. Comparison of mean SPO2 among the study groups (N=60).
   The mean SPO2 in group A was 98.75±0.09%, and in group B was 98.69±0.38% with no statistically significance (P value 0.403).
**Table 2**

| Parameter                | Group A    | Group B    | P value |
|--------------------------|------------|------------|---------|
| Mean POGO score          | 86.83      | 72.63      | 0.013   |
| SD                       | 16.03      | 26.00      |         |

**Table 3**

| Parameter                          | Group A    | Group B    | P value |
|------------------------------------|------------|------------|---------|
| Mean Duration of intubation (sec)  | 21.4       | 27.47      | 0.0003  |
| SD                                 | 5.11       | 7.05       |         |

**Discussion**

A prospective observational randomized single blind comparative study was done in the department of Anaesthesiology at Dr. D Y Patil Medical College, Pune during a study period of one year among 60 patients after obtaining institute ethics committee clearance and obtaining informed written consent from all patients. All the 60 patients were divided into two groups, 30 each in group A- Intubation with C-Mac laryngoscope with Mayo trolley with a plastic sheet. 30 in group B- Intubation with direct laryngoscope with Mayo trolley with a plastic sheet.

In the present study, most of the study participants were in the age group of 21-30 years. In our study, no statistically significant association was observed in relation to Age, gender, and weight between the groups hence Patients in both the groups had comparable preoperative demographics.

In our study, the BMI for group B was significantly larger than that for group A (P = 0.030), but it was probably not practically/clinically significant.

No significant difference was observed in terms of thyromental distance between the groups.

The majority, i.e. 90% in Group A, had a significantly inter incisor distance of <4.5 (p<0.05).

Around 46.67% of patients in group A and 56.67% in group B had MPC grading 1 with no statistical significance (P-value 0.69).

Based on the incubation difficulty scale score, Group B had more attempts (26.67%) needed and also more operators (3.33% vs 16.67%) needed compared to Group A (p<0.05).

A study done by Kilicaslan et al. reported that Tracheal intubation with CMAC was successful on the first attempt in 36 patients (86%) and the second attempt in 6 patients (14%). A similar study by Puthenveettil N et al. reported that 10% of patients required more than one intubation attempt in group D compared to none in group C.

Based on the distributions of the Cormack-Lehane laryngoscopic view (LV) among group A vs Group B, a statistically significant association was observed in relation to grade 1 (93.34% vs 63.33%), grade 2a (3.33% vs 23.34%) and grade 2b (3.33% vs 13.33%) as p-value calculated to be <0.05. In addition, the Cormack Lehane (C-L) grade views were significantly higher in patients in Group B than in Group A.

A statistically significant Increased lifting score was needed in group B (40%) compared to group A (13.33%).

A higher proportion (36.67%) in Group B needed laryngeal pressure compared to group A (13.33%).

A higher mean POGO score was observed in group A (86.63) compared to group B (72.63) and was statistically significant (p<0.05). Kwon Hui et al. showed a POGO score (79.6 ± 20.6% vs. 50.6 ± 25.9%, P < 0.001) that indicated significantly greater glottic visualization with the C-MAC D-Blade videolaryngoscope than with the McCoy laryngoscope.

The mean duration of intubation in sec was shorter in Group A compared to group B (27.47 sec vs 21.4 sec). This finding was observed to be statistically significant (p<0.05). Similar findings were reported by Aziz M et al. where Laryngoscopy time averaged 46 s (95% CI, 40-51) for the C-MAC group and were shorter in the direct laryngoscopy group, 33 s (95% CI, 29-36).

Similarly, Puthenveettil N et al. reported the ease of intubation was better (grade 1) in group C-MAC than in Direct laryngoscopy (68.6% vs. 31.4% respectively) with a P-value of < 0.001.

In our study, it was observed that Group B showed significantly higher values concerning Heart rate, systolic blood pressure, diastolic blood pressure and mean arterial blood pressure during intubation, after 1 min, 3 min, and 5 min.

The mean SPO2 in group A was 98.75±0.09%, and in the group, B was 98.69±0.38%, with no statistical significance (P-value 0.403).

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**Conflict of interest**

There are no conflicts of interest to declare by any of the authors of this study.

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