Clinical Communication

Comparison between C-MAC D-blade video laryngoscope and McCoy laryngoscope for nasotracheal intubation in traumatic cervical spine surgery – A randomised controlled trial

INTRODUCTION

Airway management is challenging in patients with cervical spine instability because of the risk of neurological deterioration due to neck manipulations. With its unique design, McCoy laryngoscope has been shown to provide better glottic visualisation than the conventional Macintosh blade.[1] In recent years, video laryngoscope has been a remarkably safe and better alternative for tracheal intubation in these patients.[2] In the C-MAC video laryngoscope system, the C-MAC-D blade has inbuilt angulation. The superiority of the C-MAC-D blade over other laryngoscopes in simulated cervical spine instability patients or manikin has been reported.[3,4]

We hypothesised that the C-MAC-D blade would make tracheal intubation faster with better glottic visualisation in patients with cervical spine injury compared to McCoy Laryngoscope. The study's primary objective was to compare the time required for nasotracheal intubation (NTI) with both laryngoscopes. The secondary objectives were the comparison of the visualisation of glottic opening and haemodynamic parameters.

METHODS

This single-blinded, randomised controlled trial was conducted between September 2021 and August 2022 after ethical clearance from the Institutional Ethics Committee (vide approval number No. 1979/IEC/IGIMS/2020 dated 18 December 2020) and registering the trial with Clinical Trials Registry-India (CTRI/2021/09/036745, www.ctri.nic.in). Written informed consent was obtained from all the participants for participation and publication of this research after explaining the research protocol to them. The study was carried out in accordance with the principles of the Declaration of Helsinki, 2013.

Fifty patients of the American Society of Anesthesiologists (ASA) physical status I–II, of either gender, 18–60 years of age, posted for cervical spine surgery were included. Patients with a body mass index above 24.9 kg/m^2 and patients with a difficult airway for any other reason apart from cervical spine instability, upper respiratory or upper alimentary tract pathology or increased risk of aspiration were excluded.

The enrolled subjects were randomised in two groups using a computer-generated random number table (www.randomizer.org) by a research assistant who was not involved in the data analysis. Allocation concealment was made using serially numbered, opaque, sealed envelope technique. McCoy laryngoscope was used in Group M, and C-MAC video laryngoscope with a D blade was used in Group C for NTI. All subjects were blinded to their group assignment. The nasal preparation was done with two drops of oxymetazoline hydrochloride 0.05%, and 2% xylocaine jelly was used for lubrication. Standard monitors were attached. Preoxygenation and anaesthesia induction were done according to the institute's protocol. The NTI time (defined as the time from insertion of the endotracheal tube past the selected nostril to the removal of intubation devices from the oral cavity after inserting the tube through the glottic opening) was subdivided into three steps according to the endotracheal tube passage as: 1) nose to the oropharynx, 2) oropharynx into the glottic inlet and 3) glottic inlet to the trachea. The time taken was assessed for each of these three steps. If additional assistance was required, Magill forceps were used. Intubation failure was defined as a drop in the patient's peripheral oxygen saturation (SpO_2) below 92% and inability to intubate within 120 s or three intubation attempts. Based on the observed laryngoscopy view, the Cormack–Lehane classification score[5] or the percentage of glottic opening (POGO) scale[6] was noted. Mean arterial pressure (MAP), heart rate (HR) and SpO_2 were recorded just before NTI and 1 and 3 min after intubation.

A pilot study revealed that the time taken for NTI in the McCoy group was approximately 48 s. In a previous study, the time taken for NTI with C-MAC was 38.56 ± 15.65 s.[4] A 10 s difference in the time taken for NTI between the C-MAC and McCoy groups

was considered clinically significant. We determined that 22 patients were required in each group with 80% power, a significance level of 5%, and two-sided testing. Given a drop-out rate of 10%, we determined that in total 50 patients were required. All quantitative data were analysed using descriptive statistics and summarised as mean [standard deviation (SD)] or median (interquartile range). The normality was tested with the Shapiro–Wilk test and was assessed by a Student's *t*-test or the Mann–Whitney U test for independent groups, as appropriate. All qualitative variables were presented as frequencies and percentages and were assessed via the Chi-square or Fisher's exact test. A repeated measure analysis of variance (ANOVA) with adjustment for multiple comparisons via the Bonferroni *post hoc* correction was used for repeated measures, including MAP and HR. All statistical analyses were two-tailed and performed using Statistical Package for Social Science (SPSS 20.0 Armonk, NY: IBM Corp.) software. *P* values < 0.05 were considered statistically significant for all parameters.

RESULTS

Seventy-nine subjects were screened, and 50 were recruited in the study [Figure 1]. Patients' demographic, preoperative data and glottic view on laryngoscopy are presented in Table 1. There was significantly less time for intubation in the Group C than in the Group M [Figure 2]. In total intubation duration, the time taken for the first step was comparable in both the groups and the time taken in the second step, and the third step was significantly less in the Group C [Figure 2]. Magill

Table 1: Comparison of demographic data, preoperative data and glottic view on laryngoscopy

Parameters	Group C (*n*=25)	Group M (*n*=25)	*P*
Age (years)	43.6 (17.07)	41.92 (13.71)	0.70
Gender M/F, *n*	20/5	21/4	0.71
BMI (kg/m^2)	22.8 (3.5)	24.4 (3.8)	0.12
ASA class, *n*			
I/II	18/7	19/6	0.74
Mallampati class, *n* I/II/III/IV	5/6/11/3	6/5/10/4	0.94
Thyromental distance (cm)	8.0 (8.0–9.0)	8.0 (8.0–9.0)	0.45
Neck circumference (cm)	37.2 (34.1–39.5)	38.0 (36.0–40.0)	0.54
Inter-incisor distance (cm)			
Without collar	4.0 (3.5–5.0)	4.0 (3.0–5.0)	0.52
With collar	2.0 (2.0–3.5)	2.0 (2.0–3.0)	0.54
Cormack–Lehane grade (I/IIa/IIb/III/IV)	16/10/4/0/0	4/5/12/8/1	<0.001
POGO score (%)	84.1 (10.4)	78.1 (10.4)	0.047

Values are expressed as mean (SD), median (interquartile range) or number (*n*). ASA=American Society of Anesthesiologists; BMI=Body Mass Index; POGO=Percentage of glottic opening; SD=Standard deviation

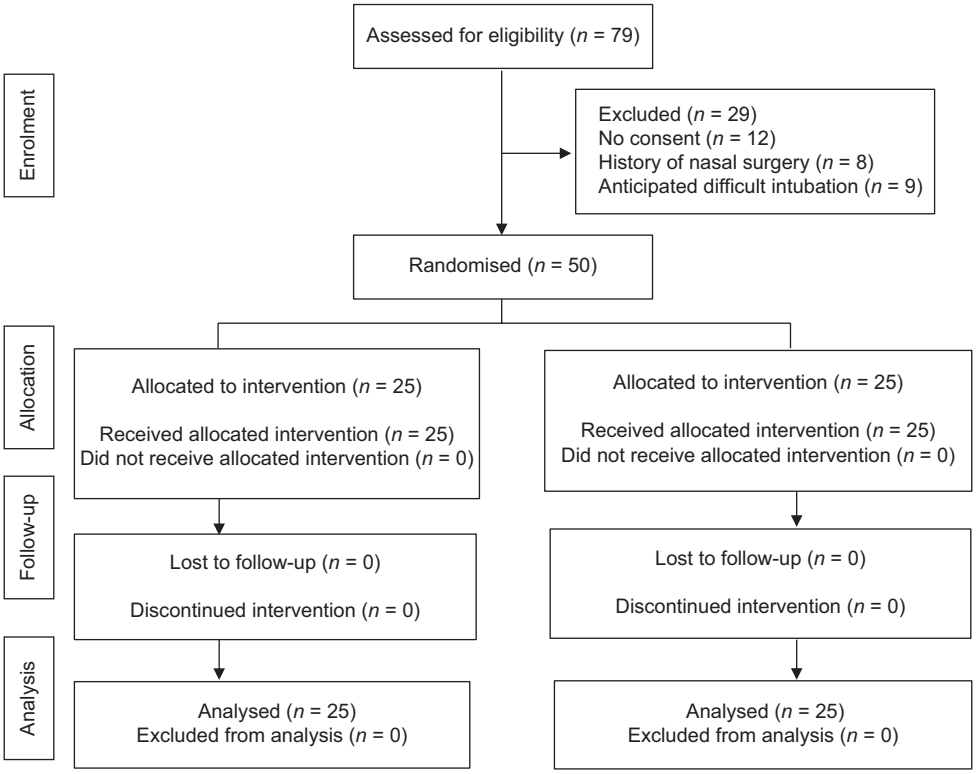
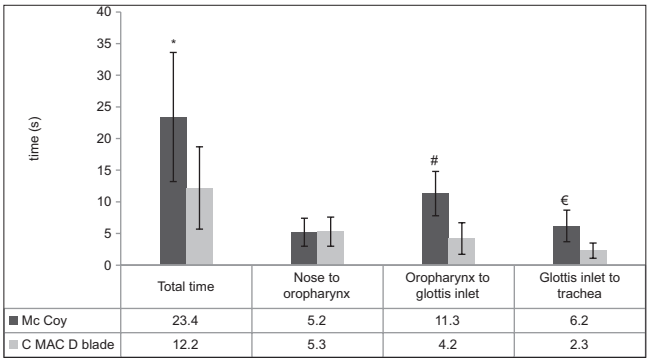


Figure 1: Consolidated standard of reporting trial (CONSORT) flow diagram



	Total time	Nose to oropharynx	Oropharynx to glottis inlet	Glottis inlet to trachea
Mc Coy	23.4	5.2	11.3	6.2
C MAC D blade	12.2	5.3	4.2	2.3

Figure 2: Comparison of the total time taken (sum of the time taken for individual steps) for nasotracheal intubation and the time taken at individual steps in both groups. *MD 95% CI 6.33–16.06, $P < 0.0001$; #MD 95% CI 5.37–8.83, $P < 0.0001$; € MD 95% CI 2.78–5.01, $P < 0.0001$.CI = confidence interval, MD = median difference

forceps were used in all patients in Group M while it was required in only three patients in Group C. MAP and HR at 1 and 3 min after NTI were significantly increased in both groups compared to their pre-NTI values ($P < 0.001$). No intergroup differences were observed in MAP or HR ($P = 0.257$ and $P = 0.632$, respectively).

DISCUSSION

In the present study, the group in which a C-MAC D-blade video laryngoscope was used took less time for intubation than the group in which the McCoy laryngoscope was used.

This is in accordance with an earlier study on patients with a simulated cervical spine injury.[3] The exaggerated curvature of the D-blade significantly decreased the required alignment of the oropharyngeal–laryngeal axis. This blade also reduced the requirement of any additional force application during laryngoscopy.[7] With other laryngoscopes, the requirement of additional supporting manoeuvres increases the time taken to secure the airway.[8,9] Compared to similar studies, our research used Magill forceps more with McCoy laryngoscope.[4]

The limitation of the study was the inability to blind the operator and the investigator who recorded the time taken for intubation. It is practically impossible to objectively assess fine neck movement during laryngoscopy with both devices, which adds to the limitations. Laryngoscopies were done by anaesthesiologist with an experience of more than 3 years of using both scopes to minimise observer bias, but this could be the confounding factor in intubation time calculation.

CONCLUSION

C-MAC D-blade video laryngoscope takes lesser time for NTI in patients with cervical spine pathology than the McCoy laryngoscope.

Study data availability

De-identified data may be requested with reasonable justification from the authors (email to the corresponding author) and shall be shared after approval as per the authors' Institution policy.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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