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"Comparison of intubating laryngeal mask airway (ILMA) and Mc Coy laryngoscope for tracheal intubation in patients with simulated cervical spine injury"

Anaesthesiology

KEYWORDS: ILMA, McCOY laryngoscope,cervical immobilization

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ABSTRACT

Cervical immobilization may prevent neuronal injury in cervical spine trauma. Literature recommends ILMA or McCoy laryngoscope for intubation in this situation. We compared these devices in patients where cervical spine was immobilized using hard collar.

Results: Fifty adults were randomised into 2 groups of 25 each: ILMA group (group A, mean age 35.2± 8.4 year, 10 males) and Mc Coy group (group B, mean age 33.7 ± 10.2 year, 12 males). All cases had successful intubation. Device could be inserted in first attempt all cases in group B and in 16 patients of group A (p=0.03). Insertion and intubation times were significantly shorter in group B. Group A had significantly more mucosal injury (p 0.07). The hemodynamic parameters were comparable in both the groups.

Conclusions: Our study shows that in patients with immobilised cervical spine tracheal intubation with McCoy Laryngoscope was quicker than ILMA and caused fewer complications

Introduction:

Airway management is one of the most important aspects of anaesthesia care. Secure airway means half battle won. Endotracheal intubation has been the method of choice for securing airway during anaesthesia and in critical care. In blunt trauma, primary and secondary cervical spine injury occurs in 2% and 2-10% of patients respectively.[1] Cervical spine movements during intubation may either induce or aggravate such injury while to reduce or prevent it, cervical immobilization remains the standard of care. Managing airway with immobilized neck is challenging as there are reports of conversion of grade 3 views to grade 1 or 2. Airway management of cervical injury patients has remained controversial and has been an area of research in last decade.

Best intubating device with cervical immobilization would permit sufficient laryngeal exposure with the least cervical spine movement. There is paucity of data comparing different intubation devices in this situation making clear choice of device difficult.[1] Several reports recommend tracheal intubation via ILMA or McCoy laryngoscope in patients with immobilized cervical spines.[2-3]

So this study was done to evaluate and compare the use of ILMA or McCoy laryngoscope for tracheal intubation in patients whose cervical spine was immobilized by hard collar. To the best of our knowledge there has been no head to head clinical trial of these two devices in this setting.

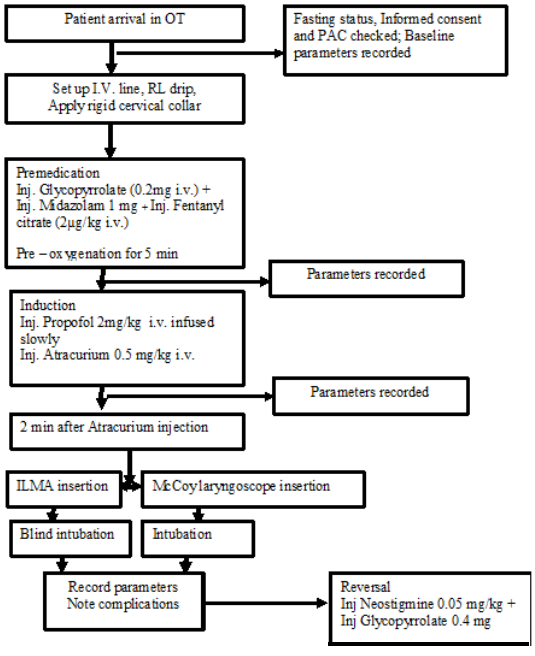
Methodology:

This prospective randomized observational Study was conducted by department of Anaesthesiology from May 2014 till August 2015 in the operation theatres of SMS medical college and attached hospitals, Jaipur after obtaining permission from the institutional review board. At alpha error 0.05 and power 80% we calculated a sample size of 23 subjects assuming the proportion of intubation in first attempt among groups 54% and 94% respectively (as per the available literature), so we enrolled 25 subjects each in ILMA group and McCoy group randomized by chit in box method.

Subjects undergoing elective surgery under general anaesthesia were included in the study if they fulfilled the following inclusion criteria: age 20 to 50 years, ASA grade 1 and 2 and willing to give written and informed consent while exclusion criteria were: refusal to consent, age <18 or >50 years , ASA grade 2, anticipated difficult intubation, restricted mouth opening, history of reactive airway disease, gastro-oesophageal reflux, hypertension, cardiac disease, morbid obesity, major organ dysfunction or sore throat in last ten days.

All patients were examined a day before surgery and informed consent was taken. Preanaesthetic checkup included detailed history and physical examination, recording of BP, Pulse/ Respiratory rate, airway assessment, Mallampatti scoring, mouth opening; thyromental, sternomental and inter-incisor distances. Routine investigations like Hemoglobin, leucocyte and platelet counts, liver and renal function tests, ECG, Chest X-ray, fasting or random blood glucose were done. Standard procedure of anaesthesia technique as per the prevailing institutional protocol was followed as outlined in the flow chart and in addition, rigid cervical collar was applied (flow chart 1)

Figue 1: Flow chart of Anaesthsia technique



ILMA insertion

A device of suitable size according to patient's body weight (Size 4 for adult 50–70 kg, and size 5 for adult 70–100 kg) was selected and inserted by standard midline technique as recommended by manufacturer and was connected to anaesthesia circuit. Insertion of ILMA was regarded as successful once optimal ventilation with a classical carbon dioxide waveform on capnography was achieved otherwise the procedure was repeated with different mask size. Time for successful insertion of the ILMA was defined as the time from removal of the facemask to adequate ventilation.

Intubation through ILMA

Trachea was intubated though ILMA using an appropriate method, with an appropriate sized straight, cuffed, silicone-wire-reinforced, reusable ET tube and correct placement was confirmed by obtaining classical carbon dioxide waveform on capnography. Time from disconnection of breathing circuit from ILMA tube connector for tracheal intubation to reappearance of the classical carbon dioxide waveform from the trachecal tube was taken as intubation time. After tracheal intubation, ILMA was removed using a stabilising rod and the tracheal tube was connected to the anaesthesia circuit.

Intubation using McCOY laryngoscope

The McCoy laryngoscope was introduced using standard method. Successful insertion time was defined as the time between removal of facemask and obtaining a Cormack-Lehane grade 1–3 glottic view under direct laryngoscopy while intubation time was defined as the time from obtaining a good glottic view with direct McCoy laryngoscope to appearance of the classical carbon dioxide waveform from the tracheal tube.

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In both of the groups more than three attempts were regarded as a failed insertion. Total intubation time was calculated by the addition of insertion and intubation times.

Capnography waveform, VT and clinically chest excursion were noted in both the groups. Systolic and diastolic blood pressure, heart rate, SpO2 and ETCO2 values were recorded before induction (baseline), preintubation and immediately following intubation and then at 1, 2, 3, 5, 7 and 10 min intervals after intubation.

Airway complications were defined as lip or dental injury, mucosal injury (blood detected on airway device), desaturation (SpO2 < 94% for more than 10 seconds).

Data Analysis:

The data collected by independent investigator was entered in a predesigned pretested proforma from which master chart was prepared on Microsoft excel 2007 worksheet. Mean and standard deviation were calculated for quantitative data while proportions for qualitative data. For significance of difference CHI SQUARE TEST was used for proportions and unpaired T test for means. A P-value of <0.05 has been taken as significant.

Results (table 1):

Total of 50 adult patient were divided into 2 subgroups of 25 each based on the type of device used: ILMA group (group A, mean age 35.2± 8.4 year, 10 males) and Mc Coy group (group B, mean age 33.7 ± 10.2 year, 12 males), p = 0.57. Both the groups were comparable in terms of weight (66.3± 8.6 ILMA Vs 63.5 ± 7.9 kg McCoy, P>0.5) and ASA grade (Gr I 48% Vs 44% and Gr II 52% Vs 56% in ILMA Vs McCoy groups P=0.77). Diagnoses of the patients and type of surgery have been shown in table 2

Table 1. Baseline characteristics and results

S.No.	Parameter		Group A (ILMA) N=25	Group B McCoy N=25	P value
1	Age (years)		35.2 ±8.4	33.7±10.2	0.57
2	Sex	Male	10 (40%)	12 (48%)	0.5
		Female	15 (60%)	13 (52%)	
3	Weight (Kg)		66.3 ±8.6	63.3 ±7.9	>0.5
4	ASA grade	Grade I	12 (48%)	11(44%)	0.77
		Grade II	13 (52%)	14 (56%)	
5	Success in insertion of device	Total success	25	25	NS
		1st attempt	16 (64%)	25 (100%)	0.0009
		2nd attempt	9 (36%)	0	
6	Success in intubation	Total success	25	25	NS
		1st attempt	17 (68%)	23 (92%)	0.03
		2nd attempt	8 (32%)	2 (8%)	
7	Time taken in device insertion and intubation (sec)	A. Time to insert airway	24.7 (± 7.3)	13 (±3)	<0.0001
		B. Intubation time	19.9 (±4.3)	16.6 (±3.9)	0.01
		C. Total intubation time (=A+B)	44.6 (±29.1)	29.6 (±4.7)	<0.001

TABLE 2. DIAGNOSIS OF THE PATIENTS AND TYPE OF SURGERY

ILMA group	Mc Coy group
• cholelithiasis 11 (laparoscopic cholecystectomy 10, open cholecystectomy 1), • appendicitis 1 (appendectomy 1), • carcinoma breast 4 (modified radical mastectomy 4), • hernia 4 (hernioplasty 4), • ileostomy 1 (ileostomy closure 1), • infertility 1 (diagnostic laparoscopy 1), • accessory breast with obesity 1 (excision of accessory breast with liposuction 1), • abdominal tuberculosis (diagnostic laparoscopy 1) and • undescended testis (orchidopexy 1)	• appendicitis 2, appendicular lump 1 (appendectomy 3), • cholelithiasis 11, gall bladder polyp 1 (laparpscopic cholecystectomy 12), • carcinoma breast 2 (modified radical mastectomy 2), • ovarian cyst 1 (diagnostic laparoscopy 1), • umbilical sinus 1 (excision of umbilical sinus 1), • hernia 2 (hernioplasty 2), • Blunt abdominal trauma with loop ileostomy 1, enteric perforation 1 (ileostomy closure 2), • gynaecomastia 2 (excision of gynaecomastia with liposuction2).

Insertion of device and intubation was successful in all 50 cases. In group A, device insertion was done in first attempt in 16 and in two attempts in 9 patients while in first attempt in all cases in group B (p=0.03). Mean (SD) time in seconds to insert airway, intubate and total intubation time 24.7 (7.3), 19.9 (4.3), 44.6 (9.1) in group A and 13.0 (3.0), 16.6 (3.9), 29.6 (4.7) in group B (p <0.0001, 0.01 and <0.001 respectively).

Complications like esophageal intubation (n), mucosal injury (n), airway complication (n), sore throat (n) were seen in 3/25, 6/25, 0/25, 5/25 patients in group A and 0/25, 1/25, 0/25, 5/25 in group B (p 0.07, 0.04, NS, NS respectively). Mucosal injury was significantly more common in ILMA group as compared to McCoy group (P<0.05) while rest of the complications like oesophageal intubation and sore throat were comparable in both the groups. None of patients in either group had airway complications.

The patients hemodynamic parameters like heart rate, systolic BP, diastolic BP, mean arterial BP, EtCO2 and SpO2 at Baseline, Preintubation, Postintubation, at 1 min, 2 min, 3 min, 5 min, 7 min and 10 min postintubation were comparable in both groups (figure

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Figure 2: charts showing trend of vital parameters

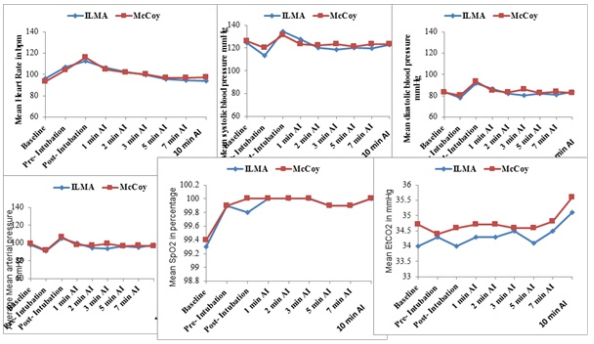


Chart 1 Trend of various parameters at different time intervals

Discussion:

The present study is unique as there are no reports of randomized controlled clinical trial of ILMA and Mc Coy laryngoscope in patients with immobilized cervical spine. In this section we would compare available literature on use of these two devices with the results of our study. In our study, intubation was successful in all 50 cases and it was much easier in McCoy group as evident by 100% success in first attempt as compared to 64% in ILMA group (p = 0.03). In previous studies, success rate for intubation with ILMA in first attempt were 79.8%, 66% and 54% while in second attempt were 12.4%, 22% and 3%.[4,8,9] Results of most of the studies are comparable to our results though first attempt success as high as 90% has been reported.[10]

For McCoy, intubation success rate in first and second attempts have been reported as 94% and 6% respectively which is comparable to our study. [9] We found intubation to be easier with McCoy than ILMA, similar to a manikin study on intubation in difficult intubation scenario i.e. immobilized cervical spine wherein success rates for intubation in first, second and third attempts were reported as 76.7 %, 20% and 3.3% respectively for ILMA and, 93.4%, 3.3% and 3.3% respectively for McCoy.[12] In various studies with McCoy laryngoscope, intubation times (seconds) were reported as 22.8 (±4.1)[13], 40(±14)[14], 22.9[15], 33.27 (±13.25)[16] and 23(±5)[17]. Our results are almost similar to all but one study.

We found that time taken for insertion of the device, intubation time and total intubation time in Group B (McCoy) were significantly lesser (*p - value < 0.05*) than Group A (ILMA), comparable to study by C. H. Maharaj et al[12] (19 sec McCoy Vs 30 sec ILMA for first attempt) and to the study by Bilgin H and Bozkurt M[9] (30±7.4 sec McCoy Vs 63±36.5 sec ILMA). Intubation time in our study is in contrast with a study by Sherren PB, Kong ML, Chang S[18] where intubation with ILMA was faster than McCoy (39.3, 22.8 s, respectively, P < 0.0001). This variation can be explained by the fact that our study setting was different from theirs.

The present study demonstrates that intubation can be performed faster with McCoy laryngoscope as compared to ILMA which is useful to avoid further hypoxia in emergent situations.

Among complications, we observed that mucosal injury was significantly more common in ILMA group as compared to McCoy group (p<0.05) while rest of the complications like esophageal intubation and mucosal injury were comparable (p=NS). We had a lower rate of sore throat as a complication of ILMA insertion i.e. 56% as compared 67% reported by Shung J et al.[7].

Conclusions: *In this study, insertion and intubation with Mc Coy laryngoscope was significantly quicker and could significantly more often be done first attempt in comparison with ILMA with without significant differences in hemodynamic parameters. Rate of complication was also less with McCoy laryngoscope as compared to ILMA. So we recommend McCoy laryngoscope over ILMA for intubation with immobilized cervical spine in emergent situation to avoid delay in securing airway.*

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