

A Prospective Randomized Comparative Study on Tracheal Intubation using Airtraq versus McCoy Laryngoscope in Elective Surgical Patients

Kali Kapoor¹, Rohit Kumar Varshney², Rakshit Sethi³, Amber Kumar⁴, Yashovardhan Singh⁵, Ravi Keshri⁶, Swati Soni⁷

^{1,4,5,6}Junior Resident ²Associate Professor, Department of Anaesthesia, Teerthankar Mahaveer Medical College, Teerthankar Mahaveer Medical College, Delhi Road, Moradabad, Uttar Pradesh 244001, India. ³Medical Officer, Armed Medical Core, Delhi. ⁷Intern, Department of Anaesthesia Civil Hospital, Sirsa, Haryana 125055, India.

Abstract

Background: Airtraq and Mc Coy laryngoscopes have been commonly used in difficult airway scenarios. In the present study, the study aims to evaluate the comparison of Airtraq from McCoy Laryngoscope in view of laryngoscopic time and ease of insertion in elective surgical patients. **Methods:** A prospective randomized prospective study was undertaken in 60 ASA I and II patients, 18-60 years of age scheduled for elective surgical procedures. Patients were randomly divided into two group Group M (30 patients) and Group A (30 patients). Following induction and adequate muscle relaxation, they were intubated using either of the techniques first, followed by the other. Laryngoscopy time, haemodynamic parameters, maneuvers required were recorded between Airtraq and Mc Coy group. **Results:** The mean intubation time of laryngoscopy in Airtraq group was 19.20 seconds whereas in McCoy group was 35.33 seconds. There was statistically significant difference between both the group on basis of number of attempts required for intubation (p-value=0.019). However there was no difference between two groups on the basis of ease of intubation, maneuvers required and complication. **Conclusion:** In terms of visualization of glottic area Airtraq laryngoscope is better in comparison to McCoy laryngoscope.

Keywords: Difficult Airway; Endotracheal Intubation; Laryngoscopy.

Introduction

Tracheal intubation is considered to be the "Gold standard" of airway management during administration of general anaesthesia/critical care setting because of its advantages of Isolation of the respiratory tract from the gastro-intestinal system thereby minimizing the risk of gastric content aspiration, allowing delivery of anaesthetic gases and oxygen via positive pressure ventilation without inflation of the stomach [1,2].

The incidence of difficult intubation reported in various studies is 23% [3]. Various conditions that can lead to difficult intubation are obesity, foreign body, anatomic (micrognathia, arched palate, short neck, large tongue and prominent upper incisors),

traumatic factors (laryngeal fracture, maxillary fracture cervical spine injury), congenital anomalies and infectious leading to poor laryngeal view and thereby difficulty in laryngoscopy and intubation [4-6]. Thus several options have been mentioned in literature in case of difficult laryngoscopy/intubation like direct laryngoscopy with aid of airway scope gum elastic bougie, Bullard laryngoscope, McCoy laryngoscope, C- trach, Intubating laryngeal mask airway, Flexible Fiberoptic bronchoscope with different success rate [7-9].

The Airtraq is a new disposable intubating device developed to facilitate tracheal intubation in normal or difficult airways [1]. The basic advantage of this device is to provide a view of glottis without alignment of oral, pharyngeal and tracheal axis. All this is possible because of the exaggerated curvature

Corresponding Author: Rohit Kumar Varshney, Associate Professor, Department of Anaesthesia, Teerthankar Mahaveer Medical College, Delhi Road, Moradabad, Uttar Pradesh 244001, India.
E-mail: rohitmaxy@gmail.com

Received on 24.01.2018, Accepted on 26.02.2018

of the blade & a series of lenses, prism & mirrors that transfer image from the illuminated tip to a proximal viewfinder [2]. Airtraq requires lower cervical spine movement as compared to Macintosh laryngoscope, and hence, can be used for cervical spine trauma cases. Some reports have shown that Airtraq also has been used in normal airways as well as patients with clinically/simulated difficult airways.

McCoy laryngoscope is designed to elevate the epiglottis with its hinged tip & require less neck movement during laryngoscopy [4]. It is frequently used to facilitate tracheal intubation when the view of the glottis opening is restricted [10].

Based on above advantageous role of Airtraq and McCoy laryngoscopes in difficult airway scenarios we designed a prospective randomized study to compare the time taken and ease of insertion for successful intubation using Airtraq and McCoy (primary outcome) laryngoscope in elective surgical patients.

Material and Methods

This prospective randomized study was organized in Department of Anaesthesia, Teerthankar Mahaveer Medical College and Research Centre between January–December 2016 including 60 ASA I/II patients, 18-60 years of age, BMI 18-24 kg/m² scheduled for elective surgical procedures with due written informed consent. The patients with morbid obesity, predicted difficult intubation, any chronic renal/liver or cardio-respiratory disease were excluded from our study.

Randomization was performed using chit and box. Blinding of the attending operator was not possible as the two airway devices are conspicuously different. The patients were divided into two groups; Group M (30 patients): Intubation was facilitated by using McCoy blade during laryngoscopy and Group A (30 patients): Intubation was facilitated by using Airtraq optical laryngoscope.

Standard monitors (Pulse Oximeter, Non-Invasive Blood Pressure, ECG, End-Tidal Carbon-dioxide) were applied. Premedication was done with Inj. Midazolam (0.02 mg/kg IV), Inj. Glycopyrrolate (0.2 mg IV), Inj. Fentanyl (1-1.5 mg/kg IV) and Inj. Ondansetron (4 mg IV). After proper preoxygenation of all the patients with 100% oxygen for 3 minutes, induction was performed by Inj. Propofol (1-2 mg/kg IV) and Inj. Succinylcholine (1-1.5 mg/kg IV) and tracheal intubation was

performed using McCoy or Airtraq laryngoscope as per the group allotment. Maintenance of anaesthesia was done using Nitrous oxide, Oxygen, Isoflurane (1%) and intermittent doses of Vecuronium.

After recording the demographic parameters of all the patients, the intubation time (from termination of manual ventilation with a facemask to initiation of ventilation through the endotracheal tube), anatomic parameters (including Mallampatti criteria), number of maneuvers required for optimization of laryngeal opening during intubation (use of magill forceps/repositioning of head/need of second assistant, use of intubating stylet/bougie; 1=head extension, 2=magill forceps, 3= use of intubating stylet/bougie, 4= use of second assistant), number of intubation attempts, ease of intubation attempt for each device using a linear scale (1= easy, 10 = difficult) [1] was recorded.

We classified tracheal intubation as failed if the anaesthetist failed to intubate within 120 seconds. Haemodynamic parameters (heart rate, systolic/diastolic/mean blood pressure) were recorded at baseline and at 1, 3, and 5 min after tracheal intubation.

Statistical Analysis

Data was analysed using latest version of SPSS (SPSS Inc., Chicago, IL, USA). Power analysis indicated that 25 subjects per group will be required based on a 25s (50%) reduction in the intubation time comparing Airtraq to McCoy laryngoscope. We have taken 30 patients per group considering the drop-out rate. The alpha error was set at 0.05 and type II error was set at 0.20. Students' T-Test was used for parametric data and Chi-square/Fisher test for non-parametric data, whichever is applicable. A *P* value less than 0.05 was considered statistically significant.

Result

Total 60 patients were enrolled but one patient from Group M was not intubated with McCoy laryngoscope and hence excluded from the study.

Table 1 depicts the demographic data and airway baseline data between the two groups (*p*>0.05).

Figure 1, Table 2: Grade 1 (Easy ease of intubation) was observed in 26 and 23 patients between Airtraq and McCoy groups (*p*=0.052).

All patients in Airtraq group and 23 patients in McCoy group were intubated in single attempt.

Table 1: Demographic Data

Parameters	Airtraq	Mc Coy	P-value
Age (yrs)	34.70±14.38	34.10±13.90	0.87
Gender (M/F)	15/15	16/14	0.73
ASA (I/II)	27/3	23/7	0.15
MPG (I/II)	16/14	18/12	0.074

Table 2: Distribution of patients according to Ease of intubation

Ease of intubation	Airtraq	McCoy
1	26	23
2	1	0
3	2	0
4	1	2
5	0	1
6	0	0
7	0	1
8	0	1
9	0	1
10	0	0

P = 0.052

Chi-square test

*Non-significant difference

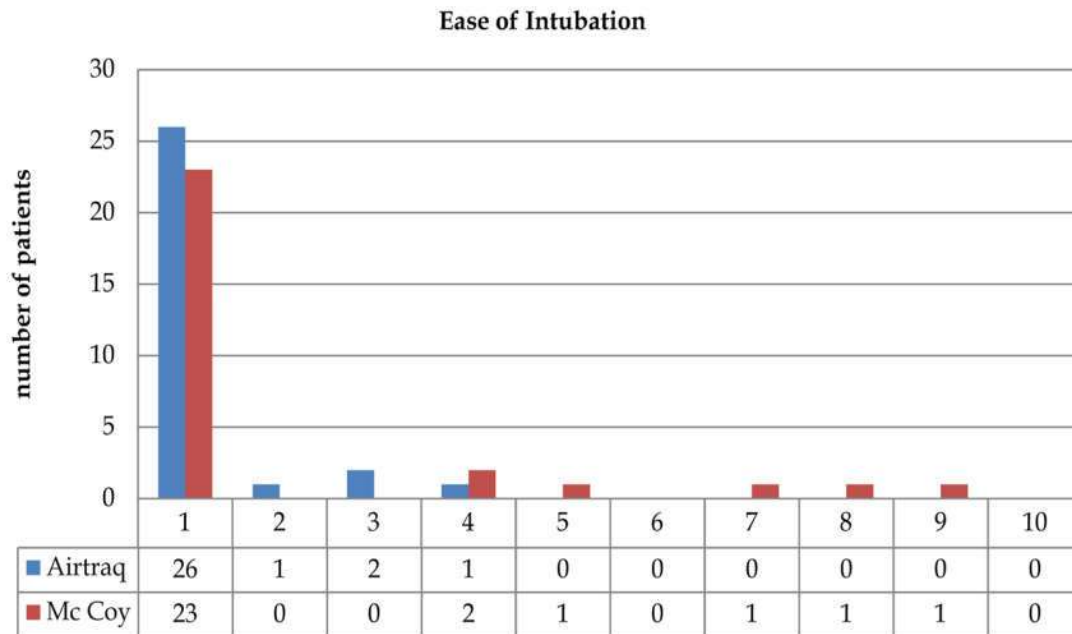


Fig. 1: Graph showing distribution of patients according to Ease of Intubation in both groups

However 4 patients and 2 patients required second and third attempt using McCoy laryngoscope blade (p=0.019) [Table 3].

In Airtraq group and Mc Coy group 27 patients and 24 patient respectively were intubated without using any maneuver. In Airtraq and McCoy group 3 patients and 4 patients required head extension for facilitation of endotracheal intubation. Magill forceps was used for assistance in endotracheal

intubation in one patient of McCoy group (p=0.076) [Table 4].

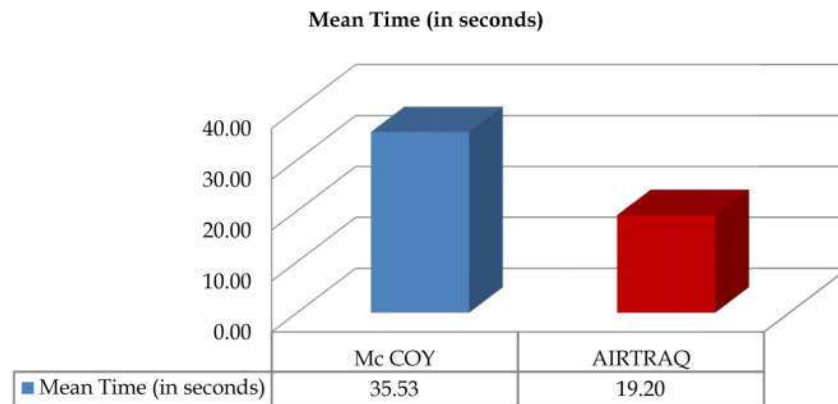
Table 5 depicts insignificant difference in haemodynamic parameters (heart rate ,Systolic Blood pressure, Diastolic Blood pressure and mean arterial Blood pressure) at baseline, 1minute,3 minute and 5 minutes respectively while comparing both groups (p>0.05).

Table 3: Distribution of patients according to number of attempts in intubation in both groups

Attempts	Groups		Total
	Airtraq	Mc Coy	
1	30 100.0%	23 79.3%	53 88.3%
2	0 0.0%	4 13.7%	4 6.7%
3	0 0.0%	2 6.8%	3 5.0%
Total	30 100.0%	29 98%	59 98.3%

p-value = 0.019*
Chi-square test

* Significant difference

**Fig. 2:** Graph showing distribution of patients according to laryngoscopy time in both groups**Table 4:** Distribution of patients according to Maneuvers required in intubation in both groups

Maneuvers	Groups		Total
	Airtraq	Mc Coy	
Magill forceps	0 0.0%	1 10.0%	1 1.6 %
Head extension	3 10.0%	4 40.0%	7 11.67%
No	27 90.0%	24 79.0%	51 86.44%
Total	30 100.0%	29 98.0%	59 98.3%

p-value = 0.076#
Chi-square test

Non-significant difference

Table 5: Distribution of patients according to heart rate variation in both groups

Variables	Time taken	Groups	Mean \pm Std. Deviation	P-value
Heart rate	Baseline	AIRTRAQ	87.50 \pm 13.35	0.973
		Mc Coy	87.63 \pm 16.59	
	AT 1 minute	AIRTRAQ	88.77 \pm 13.88	0.526
		Mc Coy	91.40 \pm 17.81	
AT 3 minutes	AIRTRAQ	85.93 \pm 11.07	0.613	
	Mc Coy	87.93 \pm 18.50		
AT 5 minutes	AIRTRAQ	81.53 \pm 10.74	0.444	
	Mc Coy	84.23 \pm 15.92		
SBP	Baseline	AIRTRAQ	122.37 \pm 13.30	0.148
		Mc Coy	126.93 \pm 10.70	

	AT 1 minute	AIRTRAQ	121.77±13.50	0.952
		Mc Coy	121.57±12.10	
	AT 3 minutes	AIRTRAQ	116.93±16.50	0.542
		Mc Coy	114.67±11.75	
	AT 5 minutes	AIRTRAQ	113.90±10.57	0.761
		Mc Coy	113.03±11.38	
DBP	Baseline	AIRTRAQ	74.07±8.58	0.059
		Mc Coy	79.57±9.10	
	AT 1 minute	AIRTRAQ	74.77±12.77	0.434
		Mc Coy	77.50±14.08	
	AT 3 minutes	AIRTRAQ	73.43±15.94	0.674
		Mc Coy	75.00±12.56	
	AT 5 minutes	AIRTRAQ	71.10±7.69	0.950
		Mc Coy	70.93±12.44	
MAP	Baseline	AIRTRAQ	91.93±9.46	0.210
		Mc Coy	94.77±7.75	
	AT 1 minute	AIRTRAQ	91.90±10.86	0.930
		Mc Coy	92.17±12.45	
	AT 3 minutes	AIRTRAQ	88.73±16.22	0.395
		Mc Coy	84.87±18.65	
	AT 5 minutes	AIRTRAQ	86.43±7.69	0.886
		Mc Coy	86.07±11.71	

Unpaired t-test

Non-significant difference

Table 6: Distribution of patients according to complications in both groups

Complications	AIRTRAQ	Mc Coy
None	28 93.3%	24 82.7%
Dental trauma	1 3.3%	2 6.7%
Airway trauma	1 3.3%	3 10.0%
Total	30 100.0%	29 98.0%

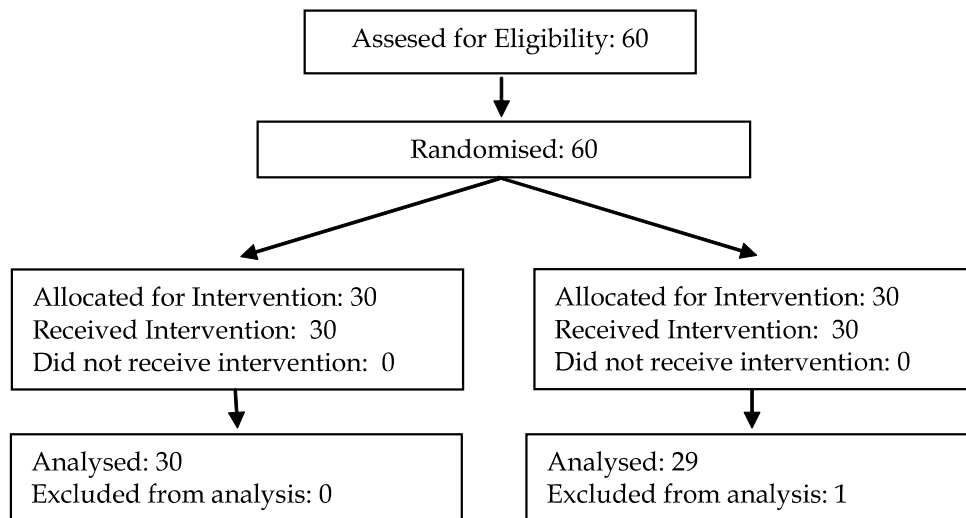
Chi-square test

#Non-significant difference

In group A and group M dental trauma was observed in 1 and 2 patients. Airway trauma was seen in three and one patient in Mc Coy group and Airtraq group (p= 0.584)[Table 6].

Figure 2 reveals a significant difference on

comparing laryngoscopy time between Group A and Group M. A time for laryngoscopy time Airtraq group (time taken was 19.20 seconds) whereas in McCoy group (time taken to intubate was 35.33 seconds) (p= < 0.001).



Discussion

Some studies have shown increased use of newer laryngoscope blades and equipment for minimizing the cervical motion and improving the glottis vision during airway management of such cases [11,12]. McCoy laryngoscope with levering mechanism is commonly used in both emergency and elective scenarios, especially for comparatively easy grades of intubation. Others include light wand stylet, intubating laryngeal mask airway (ILMA), Airtraq, video laryngoscope, fiber optic bronchoscope, etc. The previous findings have shown wide use and comparison of these techniques with their various advantages and complications.

Arshad et al conducted a study comparing Laryngoscopic View and Hemodynamic Changes with Flexi tip McCoy and Macintosh Laryngoscope Blade in Predicted Easy and Difficult Airway and they concluded that McCoy blade laryngoscope can be the answer to Macintosh blade in difficult cases, however Mc Coy blade improved laryngoscopic view in patients with limited neck movement [13]. Thus, keeping in mind the above beneficiary roles of Airtraq and McCoy in facilitating endotracheal intubation together with the supporting data from other studies we compared Airtraq laryngoscope with McCoy blade laryngoscope .

There was no significant difference in the ease of intubation scores obtained between Airtraq and Mc COY groups. In the study by Samal et al. [14], the ease of tracheal intubation was graded to be grade I, II, III and IV. In Airtraq group, no external aid was required for intubation whereas 68% patients required no external aid for intubation among Mc CoY group. A significant difference in the degree of success of intubation attempts was found between groups with a significantly higher number of attempts required among Mc coy group, in Airtraq group all 30 patients were intubated in 1st attempt however in Mc coy group 23 patients were intubated in first attempt, 4 patients in second attempt and 2 patients were intubated in third attempt (p=0.019). This was similar to the study by Vijaya kumar et al [15], in which, Intubation as rated by IDS score which was easier among Airtraq group (84.44%) with slight difficulty in the Macintosh group (77.78%); Numerical Rating Scale score was easy in both the groups (Airtraq-91.12%; Macintosh-93.34%). This was contrasting to the study by Maharaj et al., in which, there was no difference in the number of attempts required for intubation [16]. There was no significant difference in requirement of maneuvers between Airtraq and Mc Coy groups

in the present study though the Airtraq required lesser maneuvers as compared to the Mc coy group. Similar results were reported in the study by Maharaj et al. [16], in which, a substantially lesser number of patients required additional maneuvers to improve glottic exposure with the use of Airtraq device. The investigating anaesthetists also subjectively rated the Airtraq as easier to use than the Macintosh laryngoscope.

In the present study, the Airtraq resulted in lesser stimulation of the heart rate following tracheal intubation in comparison with the Mc Coy laryngoscope. In the study by Maharaj et al. [16], the Airtraq resulted in less stimulation of heart rate and blood pressure after tracheal intubation in comparison with the Macintosh laryngoscope. In the current study, both groups showed statistical significant changes in pulse rate, systolic and diastolic blood pressure during the intubation with more variation in the Mc Coy group. This was contrasting to the study by Sarvaiya et al. [17], there were no statistically significant changes in the haemodynamic parameters of both Airtraq and Mc Coy groups.

In the study by Samal et al. [14], it was found that there was increase in the heart rate and blood pressure among both Macintosh and Airtraq Laryngoscopes following laryngoscopy and intubation but the increase in heart rate was lesser among Airtraq group as compared to Mc COY group at 1, 3, 5, 10 minutes respectively after the endotracheal intubation. Also, the rise in blood pressure was lesser among Airtraq group. In the study by Arslan et al. [18], the insertion of the Airtraq device was associated with no change in heart rate, while insertion of the CTrach was associated with an increase in heart rate. This finding probably reflects the fact that the Airtraq provides a vision of the glottis without the need to align the oral, pharyngeal and tracheal axes, and therefore needs lesser force to be applied while laryngoscopy. The haemodynamic findings for direct laryngoscopy in our study were similar to those described in the other studies by Tan et al., Nathan et al. and Montes et al. [19,20]. The potential of the Airtraq to produce lesser stimulation of heart rate may be particularly beneficial in the clinical situations such as coronary artery disease or arrhythmias. In the study by Bhandari et al. [21], Hemodynamic response to laryngoscopy and intubation was less with Airtraq as compared to Macintosh laryngoscope. Pulse rate and mean arterial pressure remained significantly lesser up to 3 minutes and 1 minute after intubation with Airtraq laryngoscope.

Complication in the form of airway trauma and dental trauma during laryngoscopy in both the groups were insignificant in present study. Airway trauma in Airtraq and Mc Coy groups were 1 and 3 cases respectively. Cases of Dental trauma in Airtraq and Mc Coy groups were 1 and 2 respectively. However similar to our study Savoldelli et al. [22] reported less cases of airway trauma with Airtraq in comparison to Macintosh laryngoscope. In contrasting to our study, Bikramjit et al. [23] reported incidence of airway trauma more in Airtraq group. In present study there was bleeding from the base of tooth which was treated with tincture soaked gauze piece and patient who had bleeding from airway suctioning was done. However in Mc Coy group one patient could not be intubated by respective instrument hence patients airway was secured with intubating laryngeal mask airway and surgery was continued on this laryngeal mask airway with no events. There were certain limitations to our study as double blinding was not possible as both the devices. A rapid learning curve was required for Airtraq laryngoscope in comparison with Mc Coy laryngoscope when used in a clinical setting .

Conclusion

In conclusion, we found that in terms of visualization of glottic area Airtraq laryngoscope is better in comparison to Mc Coy laryngoscope. Laryngoscopy time is less in Airtraq group in comparison with Mc Coy group. The Airtraq can be a promising device in managing unpredicted difficult airway scenario because in such a situation a laryngoscope that provides a better view of the glottic plane and requires lesser time would be desirable.

References

- Durga P, Kaur J, Ahmed SY, Kaniti G, Ramachandran G. Comparison of tracheal intubation using the Airtraq and Mc Coy laryngoscope in the presence of rigid cervical collar simulating cervical immobilisation for traumatic cervical spine injury. *Indian J Anaesth* 2012;56:529-34.
- Teena B, Sarla H. Awake intubation – A viable approach for preventing aspiration in patients undergoing emergency surgery after administration of oral contrast material. *Egypt J Anaesth* 2013;29:179-80.
- Rich JM. Recognition and management of the difficult airway with special emphasis on the intubating LMA-Fastrach/whistle technique: a brief review with case reports. *Proc (Bayl Univ Med Cent)*. 2005;18(3):220-27.
- Heuer JF, Barwing TA, Barwing J, Russo SG, Bleckmann E, Quintel M, Moerer O. Incidence of difficult intubation in intensive care patients: analysis of contributing factors. *Anaesth Intensive Care*. 2012;40(1):120-7.
- Goutcher CM, Lochhead V. Reduction in mouth opening with semi-rigid cervical collars. *Br J Anaesth* 2005;95:344-8.
- Heath KJ. The effect of laryngoscopy of different cervical spine immobilisation techniques. *Anesthesia* 1994;49:843-5.
- Komatsu R, Kamata K, Hoshi I, Sessler DI, Ozaki M. Airway Scope and gum elastic bougie with Macintosh laryngoscope for tracheal intubation in patients with simulated restricted neck mobility. *Br J Anaesth* 2008;101:863-9.
- Bilgin H, Bozkurt M. Tracheal intubation using the ILMA, C-Trach or McCoy laryngoscope in patients with simulated cervical spine injury. *Anesthesia* 2006;61:685-91.
- Watts AD, Gelb AW, Bach DB, Pelz DM. Comparison of the Bullard and Macintosh laryngoscopes for endotracheal intubation of patients with a potential cervical spine injury. *Anesthesiology* 1997;87:1335-42.
- Uchida T, Hikawa Y, Saito Y, Yasuda K. The McCoy levering laryngoscope in patients with limited neck extension. *Can J Anesth* 1997;44:674-6.
- Aziz M. Use of video-assisted intubation devices in the management of patients with trauma. *Anesthesiol Clin* 2013;31:157-66.
- Smith CE, Pinchak AB, Sidhu TS, Radesic BP, Pinchak AC, Hagen JF. Evaluation of tracheal intubation difficulty in patients with cervical spine immobilization: Fiberoptic (WuScope) versus conventional laryngoscopy. *Anesthesiology* 1999;91:1253-9.
- Arshad Z, Abbas H, Bogra J, Saxena S. Comparison of Laryngoscopic View and Hemodynamic Changes with Flexitip Mc Coy and Macintosh Laryngoscope Blade in Predicted Easy and Difficult Airway Open *Journal of Anesthesiology* 2013;3:278-82.
- Samal RK, Kundu R, Ghosh M, Singha S. A comparative study of tracheal intubation characteristics using Macintosh and Airtraq laryngoscope. *Int J Med Dent Sci* 2014; 3(2):460-70.
- Vijayakumar V, Rao S, Shetty N. A Comparison of Macintosh and Airtraq Laryngoscopes for Endotracheal Intubation in Adult Patients With Cervical Spine Immobilization Using Manual In Line Axial Stabilization: A Prospective Randomized Study. *J Neurosurg Anesthesiol*. 2016;28(4):296-02.
- Maharaj CH, O’Croinin D, Curley G, Harte BH, Laffey JG. A comparison of tracheal intubation using the Airtraq or the Macintosh laryngoscope in routine

- airway management: a randomised, controlled clinical trial. *Anaesthesia*. 2006;61(11):1093-9.
17. Sarvaiya N, Thakur DP, Tendolkar BA. A comparative study of endotracheal intubation as per intubation difficulty score, using Airtraq and Mc Coy laryngoscopes with manual-inline axial stabilization of cervical spine in adult patients. *Int J Res Med Sci* 2016;4:3211-8.
 18. Arslan ZI, Yildiz T, Baykara ZN, Solak M , Toker K. Tracheal intubation in patients with rigid collar immobilization of the cervical spine: a comparison of Airtraq® and LMA CTrach TM devices. *Anaesthesia* 2009;64:1332-6.
 19. Nathan N, Vandroux D, Benrhaiem M , Marquet P, Preux PM, Feiss P. Low alfentanil target-concentrations improve hemodynamic and intubating conditions during induction with sevoflurane. *Can J Anaesth* 2004;51:382-7.
 20. Montes FR, Giraldo JC, Betancur LA, et al. Endotracheal intubation with a lightwand or a laryngoscope results in similar hemodynamic variations in patients with coronary artery disease. *Can J Anaesth* 2003;50:824-8.
 21. Das B, Bhandari G, Shahi KS, Mitra S, Kumar A. A Comparison of Tracheal Intubation with the Macintosh, Mc Coy or the Airtraq Laryngoscope in Simulated Difficult Laryngoscopy using Rigid Neck Collar: A Randomized, Controlled Clinical Trial. *Jol Anesth Criti Cre* 2015;1:10048.
 22. Savoldelli GL, Schiffer E, Abegg C, Baeriswyl V, Clergue F, Waeber JL. Comparison of the Glidescope, the McGrath, the Airtraq and the Macintosh laryngoscopes in simulated difficult airways. *Anaesthesia*. 2008;63:1358-64.
 23. Das B, Bhandari G, Shahi KS, Mitra S, Kumar A. Comparison of Tracheal intubation with Macintosh , Mc Coy or Airtraq laryngoscope in simulated difficult laryngoscopy using rigid collar: A Randomized Controlled Clinical trial. *Jol Anesth Criti Cre* 2015;1:10048.
-