

Utility of Adult Miller Blade

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ABSTRACT

Skillful airway management is an essential prerequisite for orotracheal intubation both in emergencies and elective surgeries requiring general anesthesia. Both Miller and Macintosh blades are very commonly and widely used for intubations in all patient age groups, though the Macintosh blade is more commonly recommended in the adult population and the Miller blade in the pediatric population as evidenced in the existing literature. A better view of the glottis is obtained with the adult straight Miller blade as it has a narrow tip and hence gives a wider working space to negotiate an endotracheal tube that leads to an improved line of sight to the glottis. A review of the literature was conducted to summarize existing evidence of the adult Miller on ease of orotracheal intubation, glottic view, time taken for intubation, and hemodynamic changes, and there is very little literature comparing the Miller blade and Macintosh blade use in the adult population.

Keywords: Cormack–Lehane grade, Ease of intubation, Macintosh blade, Miller blade.

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INTRODUCTION

Airway management is the primary responsibility of the anesthesiologists, which is to secure, preserve, and protect it during induction, maintenance, and recovery from general anesthesia. Failure to manage the airway can lead to catastrophic results such as death or brain damage. Conventionally, anesthesiologists use a curved Macintosh blade for adult intubations and a straight Miller blade for pediatric intubations. There is very little literature evidence comparing the straight adult Miller and curved Macintosh laryngoscope in terms of ease of orotracheal intubation, glottic view, time taken for intubation, and hemodynamic changes both in normal and anticipated difficult airway scenarios.

The straight Miller blade includes and lifts the epiglottis along during direct laryngoscopy⁴ and narrower flange and tip than the Macintosh blade, which leaves more room for better visualization and ease of intubation in turn.⁵ A literature search is done on the search engines PubMed, Google Scholar, and ResearchGate using a combination of keywords Miller blade, Macintosh blade, Cormack–Lehane grade, and ease of intubation. Previous study reviews revealed that the glottic view was better with the adult Miller blade,⁶ whereas the ease of orotracheal intubation has inconclusive results.⁷ The aim of this review is to discuss the utility of adult Miller blade in general anesthesia requiring orotracheal intubation.

History of the Miller Laryngoscope

In the year 1941, Dr Robert Arden Miller, a secretary–treasurer of the State Association of Medical Anesthetists in San Antonio, Texas, described a new laryngoscope that was longer, rounded on the bottom, and smaller at the tip and had an extra curve of two inches from the tip than the old-style medium blade.⁸ It allowed a free motion of the mandible, which helps in obtaining a better view. The small rounded tip end gave a good laryngeal view.⁶ No modification in technique from the usual was indicated with the use of Miller laryngoscope in patients requiring orotracheal intubation.

Miller Laryngoscope

Miller is one of the most popular straight blades (Fig. 1). The tongue is straight with a slight upward curve near the tip end. The flange, web, and tongue form a C with the top flat. The blade has a light

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Fig. 1: Miller laryngoscope – adult Miller blade size 3

source with either a bulb. It operates when the circuit is complete between the handle and the blade.⁹

Macintosh Laryngoscope

Macintosh laryngoscope consists of a handle and detachable blade (Fig. 2). The light source is energized when the blade and handle



Fig. 2: Macintosh laryngoscope – adult blade size 3

are locked in the working position. In cross section, the blade is reverse Z-shaped.⁹

Difference between Miller and Macintosh Blade

Macintosh laryngoscope minimizes stimulation of the posterior epiglottis, which is innervated by the superior laryngeal nerve. It is designed to accommodate the curvature of the tongue. Its tip should be placed at the anterior aspect of the epiglottis at the back of the tongue in the vallecula that helps to elevate the epiglottis indirectly, by putting pressure on the hyoepiglottic ligament.⁹

The straight Miller blade offers advantages in particular circumstances when the glottis is deep or anterior, upper incisors are prominent, and a long floppy epiglottis obscures the glottis and must be lifted out of the line of sight.¹⁰ Straight blade is described to be useful in unusual or anatomically challenging situations.⁹

Randomized Control Trial Study on Miller Laryngoscope to Compare the Glottic View

A clear laryngeal view and superior Cormack and Lehane grading are essential for successful orotracheal intubation. Kulkarni et al. compared four blades: TruView, Miller, McCoy, and Macintosh, and used Cormack and Lehane grading and found grade-I view was seen using the TruView laryngoscope (87%) and was followed by Miller (83%), then McCoy (77%), and the Macintosh blade (63%).⁷ The use of adult Miller's blade has shown improved glottic view in the adult population as well described by Nadkarni et al., where it was found that a grade-I view was seen in 97% of the cases with the Miller's blade, 88% with the McCoy blade, and 72% grade-I view with the Macintosh blade.¹¹ In a trial conducted by Arino et al., the results concerning the grade of laryngeal visualization in 500 patients undergoing elective surgery were compared between the Macintosh, McCoy, Miller, Belscope, and Lee–Fiberview laryngoscope. They discovered that laryngoscopic views obtained with the Belscope and Miller laryngoscopes were better than with the other types of laryngoscopes.⁶ Numerous studies with Miller laryngoscope on the pediatric population have also shown similar results concerning improved laryngoscopic view both in control¹² and crossover trials.¹³ Cormack–Lehane grade and percentage of glottic opening (POGO) score in 75 children aged 2–6 years, scheduled for elective surgery under general anesthesia, were studied by Yadav et al. in which they were randomly allocated to groups A, B, and C to be intubated with

Macintosh, Miller, and McCoy blades, respectively, where they found a significant difference with the Miller blade as compared with the Macintosh and Miller blade.¹⁴ The laryngoscopic view and intubating conditions using Macintosh and Miller blades in small children (1–24 months) in 120 children were studied by Varghese and Kundu. The laryngoscopic view was similar with both blades in 43% of children and differed in the remaining 57% (68) children.¹³ Among those children for whom the laryngoscopic views differed, the Miller blade provided a better view than the Macintosh blade in 29% of children. Successful intubation with the Miller blade in the first attempt was achieved in 95% of children.

Randomized Control Trial Studies on Miller Laryngoscope to Compare the Ease of Intubation

Kulkarni et al. studied 120 adult patients requiring orotracheal intubation with four different blades (Miller, TruView, McCoy, and Macintosh) and found that ease of intubation defined as the first-attempt success rate with Miller's blade was 86% (26 out of 30 patients) compared with Macintosh group where the first-attempt success rate was 100% (30 out of 30 patients), which was statistically significant. In a study by Nadkarni et al., in 300 adult patients, three different blades (Macintosh, McCoy, and Miller blades) were evaluated in terms of intubation attempts in adult patients posted for various surgeries under general anesthesia with endotracheal intubation. The degree of difficult intubation was more with the Miller blade in comparison with Macintosh and McCoy blade, which was statistically significant. A trial by Amorniyotin et al. showed a significant difference in the overall success rate of the orotracheal intubation using adult Miller laryngoscope (78.4%) and Macintosh laryngoscope (100%).¹⁵ It can be attributed to the fact that the laryngoscopists were novice nursing students in his study. However, ease of intubation has been found to be better with the straight Miller blade in the pediatric population compared with other conventional blades as evidenced in the study by Yadav et al., in 2019 where 75 children aged 2–6 years were studied and it was noted that straight Miller blade had a significantly lower intubation difficulty score when compared with Macintosh and McCoy blade.¹⁴ Similar studies of the straight Miller blade in the pediatric population, both in normal¹² and difficult airway scenarios,¹⁶ have shown better ease of intubation and glottic view.

Time Taken for Intubation Using the Adult Miller Blade and Macintosh Blade

Nadkarni et al. trialed groups of Macintosh and McCoy blade with the Miller blade group and found the time taken for laryngoscopy is comparable in all the groups.¹¹ Whereas Amorniyotin et al. on the adult population found a significant time difference where Miller's blade took 17 seconds and the Macintosh blade took 11 seconds. This result could be because they have used nursing postgraduates who were new to the use and technique of insertion of the straight blades. In a study done on the pediatric population, Marzena Wojewodzka-Zelezniakowicz et al. saw that during scenario A, which is a normal airway, the median duration time in seconds of intubation using MIL was 24.5 seconds and 23 seconds for MAC, which was statistically significant.¹⁶ During scenario B, which is the difficult airway, median intubation time with the Macintosh laryngoscope was 40.5 seconds and with Miller 37.5 seconds. Likewise, in the pediatric population, Swati et al. found that the duration of laryngoscopy was not significant at 10.4 and 10.8 seconds in Miller and Macintosh blades.¹⁴

Hemodynamic Changes in between Adult Miller and Macintosh Blade

Amornyotin et al. observed that Macintosh laryngoscopy resulted in less stimulation of systolic and diastolic blood pressure and heart rate following tracheal intubation in comparison with the Miller laryngoscope, but not significantly different in a study carried out on the adult difficult airway scenario.¹⁵ In the pediatric population, Yadav et al. observed comparable hemodynamic changes and other intubation parameters were comparable among the groups comparing the Miller blade size 1 and Macintosh and McCoy blade.¹⁴

Difficult Airway Scenario and Adult Miller Blade

In a case series of 10 adult cases of a difficult airway, the use of paraglossal technique of straight blades was demonstrated using the Macintosh laryngoscope blade, where the larynx could not be seen and then a good view was achieved using the Miller blade lateral to the tongue, which enabled tracheal intubation under direct vision by JJ Henderson in Western Infirmary Glasgow.⁵ A better view obtained with this technique is a consequence of reduced tongue compression as compared with the Macintosh blade. This leads both to an improved line of sight and a reduced risk of backward displacement of the tongue and epiglottis. Moreover, the molar or retromolar variation of the technique reduces the intrusion of maxillary structures into the line of sight, so that a better view of the larynx is achieved for a given degree of soft tissue compression. As a consequence of this restricted space, it is helpful to have an assistant retract the corner of the mouth and to improve the maneuverability of the tracheal tube by using a stylet to create a hockey-stick shape.⁵

The paraglossal technique using a Miller blade has proven efficacy and may provide views that are superior to those achieved with the curved Macintosh blade and the midline technique.⁵ The technique of insertion Macintosh is the usual midline manner.¹⁷

Successful endotracheal intubation was done in a case of a difficult airway with Mallampati grade-III using the adult Millers blade size 3 by Anderson P et al.¹⁸ In a case of multiple fibroids for abdominal hysterectomy, preoperative evaluation presented with a large visible epiglottis, the mouth, and oropharynx. Laryngoscopy with a Macintosh 3 laryngoscope blade and the midline technique, a Cormack and Lehane grade-IIIb view was obtained due to the long epiglottis. The Miller 4 blade and the paraglossal technique gave a Cormack and Lehane grade-I view and the trachea was successfully intubated using this approach. The use of the Miller blade and the paraglossal technique provided a perfect view of the glottis. The technique offers an advantage in terms of difficult intubation management, where the Macintosh midline technique had failed.¹⁹

Use of Ancillary Devices or Assisted Maneuvers in Miller and Macintosh Blade

Kulkarni and Tirmanwar required external laryngeal maneuver like BURP in three patients out of 30 patients in the group Miller blade, whereas none in the group Macintosh blade.⁷

CONCLUSION

Our literature review suggests that adult straight Miller blade has inconclusive results when compared with the Macintosh blade in terms of ease of intubation in the adult population. However, in the difficult airway scenarios, using the Miller blade has shown better Cormack–Grehane grading, POGO scoring, and ease of intubation

both in the adults and the pediatric populations. The glottic view is significantly better with the Miller blade across all the age groups and ethnicities. A better glottic view could be attributed to the fact that the Miller blade is narrower in structure and design than the Macintosh blade that is broader, however, more use of ancillary device or BURP may be required with the Miller blade.

Apart from the choice of type and size of the blade of the laryngoscope, many other factors influence the final glottic exposure and the ease of intubation, which include, video laryngoscope, laryngoscope lifting force, operator experience, and the patient's airway anatomy.²⁰ Although the multiple maneuvers such as jaw thrust, removing dentures, avoiding neck flexion with neck support, and using external laryngeal manipulation may improve the glottic view, the choice of laryngoscope blade is a crucial step in securing the airway.

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REFERENCES

- Burkle CM, Zepeda FA, Bacon DR, Rose SH. A historical perspective on use of the laryngoscope as a tool in anesthesiology. *Anesthesiology* 2004;100(4):1003–1006. DOI: 10.1097/00000542-200404000-00034.
- Arora S, Sayeed H, Bhardwaj N. A comparison of Truview EVO2 laryngoscope with Macintosh laryngoscope in routine airway management: A randomized crossover clinical trial. *Saudi J Anaesth* 2013;7(3):244–248. DOI: 10.4103/1658-354X.115322.
- Doherty JS, Froom SR, Gildersleve CD. Pediatric laryngoscopes and intubation aids old and new. *Pediatr Anaesth* 2009;19(Suppl 1):30–37. DOI: 10.1111/j.1460-9592.2009.03001.x.
- Bailey B. Laryngoscopy and laryngoscopes – Who's first?: The forefathers/four fathers of laryngology. *Laryngoscope* 1996;106(8):939–943. DOI: 10.1097/00005537-199608000-00005.
- Henderson JJ. The use of paraglossal straight blade laryngoscopy in difficult tracheal intubation. *Anaesthesia* 1997;52(6):552–560. DOI: 10.1111/j.1365-2222.1997.129-az0125.x.
- Arino JJ, Velasco JM, Gasco C, Lopez-Timoneda F. Straight blades improve visualization of the larynx while curved blades increase ease of intubation: A comparison of the Macintosh, Miller, McCoy, Belscope and Lee-Fiberview blades. *Can J Anaesth* 2003;50(5):501–506. DOI: 10.1007/BF03021064.
- Kulkarni AP, Tirmanwar AS. Comparison of glottic visualisation and ease of intubation with different laryngoscope blades. *Indian J Anaesth* 2013;57(2):170–174. DOI: 10.4103/0019-5049.111846.
- Pieters BM, Eindhoven GB, Acott C, van Zundert AAJ. Pioneers of laryngoscopy: Indirect, direct and video laryngoscopy. *Anaesth Intensive Care* 2015;43(Suppl 1):4–11. DOI: 10.1177/0310057X1504305103.
- Dain S. Understanding anesthesia equipment, fifth edition Jerry A. Dorsch, Susan E. Dorsch. *Can J Anesth* 2008;55(6):394–394. DOI: 10.1007/BF03021501.
- Sakai T, Konishi A, Nishiyama T, Higashizawa T, Bito H. [A comparison of the grade of laryngeal visualisation;--the McCoy compared with the Macintosh and the Miller blade in adults]. *Masui* 1998;47(8):998–1001. PMID: 9753969.
- Nadkarni M, Patel RD, Behera P, Walzade A. Comparison of Macintosh, McCoy and Miller laryngoscope blades for intubation – A prospective randomised study. *IOSR J Dent Med Sci* 2016;15(08):85–91. DOI: 10.9790/0853-1508058591.
- Passi Y, Sathyamoorthy M, Lerman J, Heard C, Marino M. Comparison of the laryngoscopy views with the size 1 Miller and Macintosh laryngoscope blades lifting the epiglottis or the base of the tongue in infants and children <2 yr of age †. *Br J Anaesth* 2014;113(5):869–874. DOI: 10.1093/bja/aeu228.

13. Varghese E, Kundu R. Does the Miller blade truly provide a better laryngoscopic view and intubating conditions than the Macintosh blade in small children? *Pediatr Anesth* 2014;24(8):825–829. DOI: 10.1111/pan.12394.
14. Yadav P, Kundu SB, Bhattacharjee DP. Comparison between macintosh, miller and mccoys laryngoscope blade size 2 in paediatric patients – A randomised controlled trial. *Indian J Anaesth* 2019;63(1):15–20. DOI: 10.4103/ija.IJA_307_18.
15. Amornyotin S, Prakanrattana U, Vichitvejpaisal P, Vallisut T, Kunanont N, Permpolprasert L. Comparison of the clinical use of Macintosh and Miller laryngoscopes for orotracheal intubation by second-month nurse students in anesthesiology. *Anesthesiol Res Pract* 2010;2010:432846. DOI: 10.1155/2010/432846.
16. Ladny J, Madziła A, Madziła MA. Comparison of the Miller and Macintosh laryngoscopes in simulated pediatric trauma patient: A pilot study. *Disaster Emerg Med J* 2017;2(1):5–10. DOI: 10.5603/DEMJ.2017.0001.
17. Bag S Kr, Hemanth Kumar VR, Krishnaveni N, Ravishankar M, Velraj J, Aruloli M. A comparative study between Truview (PCD) laryngoscope and Macintosh laryngoscope in viewing glottic opening and ease of intubation: A crossover study. *Anesth: Essays Res* 2014;8(3):372–376. DOI: 10.4103/0259-1162.143152.
18. Anderson P, Espinaco Valdés J, Vorster JG. Successful difficult airway intubation using the Miller laryngoscope blade and paraglossal technique. *S Afr J Anaesth Analg* 2015;21(2):46–48. DOI: 10.1080/22201181.2015.1028217.
19. Smereka J, Madziła M, Dunder D, Makomaska-Szaroszyk E, Szarpak L. Comparison of Miller laryngoscope and UEScope videolaryngoscope for endotracheal intubation in four pediatric airway scenarios: A randomized, crossover simulation trial. *Eur J Pediatr* 2019;178(6):937–945. DOI: 10.1007/s00431-019-03375-y.
20. Hemanth Kumar VR, Janani N, Maurya I, Velraj J. Patient positioning and glottic visualisation: A narrative review. *Airway* 2020;3(1):13. DOI: 10.4103/ARWY.ARWY_3_20.