

ORIGINAL

PROF-1326

NEONATAL RESUSCITATION; THE USE OF LARYNGEAL MASK AIRWAY



DR. FAHEEM FEROZE, MBBS, FCPS
PAC Hospital Kamra

DR. AMIN KHUWAJA, MBBS, FCPS
NICVD, Karachi

DR. NAVEED MASOOD, MBBS, FCPS
Classified Anaesthetist
CMH Quetta

Dr. Fakhar Ilyas Malik, MBBS, FCPS
Classified Surgeon
PAC Hospital Kamra

ABSTRACT... aminkhuwaja@yahoo.com. **Background:** The key to success in newborn resuscitation is the knowledge about the neonatal physiology and adequate preparation of the staff involved in the resuscitation process. The pulmonary part of the resuscitation can be accomplished with either Endotracheal Tube (ETT) or Face Mask (FM), both of these techniques require expertise and are associated with high rates of failure. Hence a third potential option has been suggested to overcome these problems. **Objectives:** To evaluate the efficacy of Laryngeal Mask Airway (LMA) in neonatal resuscitation and artificial ventilation and to compare it with that of ETT and FM. To evaluate LMA's efficiency in situation where endotracheal intubation and facemask ventilation is difficult or not possible. **Design:** A Non interventional, analytical / comparative study **Setting:** Combined Military Hospital Rawalpindi. **Period:** 20 weeks (1st January 2002 to 31 May 2002). **Subjects:** A group of 75 neonates born with C-Section were selected on the basis of non-probability convenience sampling. They were subdivided into three sub gps with 25 neonates in each sub gp. **Interventions;** 75 neonates born after C-Section, were divided into sub gps i.e. A, B, and C containing a no of 25 neonates in each gp. They were ventilated with ETT, FM and LMA respectively. These newborn babies had an Apgar score < 4. They were resuscitated using a fix protocol. The efficacy of ventilation with either technique was evaluated in terms of placement and ventilation. **Results:** The LMA emerged, as a valuable and better option in newborn resuscitation. Moreover, it was a successful tool in situations where endotracheal intubation and facemask ventilation was difficult or impossible. **Conclusion:** The LMA is a potential valuable adjunct for the management of neonatal airway.

Key words: Airway management, Apgar score, laryngeal mask airway, newborn resuscitation.

INTRODUCTION

Two percent of the neonates born after Caesarian section require active resuscitation¹. This can be done either with endotracheal tube or facemask. For

endotracheal intubation skill is required however, there are chances of trauma to upper respiratory tract. Similarly expertise is required for insertion. With facemask there is difficulty in ventilating the neonate

especially by obstetricians and other medical personnel who are not expert in managing airway. These difficulties have led to the idea of Laryngeal Mask Airway (LMA), a potential third option, for resuscitation of the newborn. Moreover tests on neonatal intubation training models have shown that midwives and junior doctors can obtain clear airway more rapidly with LMA than tracheal tube with fewer failures². Initially LMA was designed for use in adults, now we have size # 1 LMA, which is smaller but identical version of adult model^{3,4}.

Denny et al. first reported using the LMA to resuscitate a term newborn for emergency tracheotomy when ventilation of the lungs by bag and mask was inadequate and tracheal intubation proved impossible. Other case reports have shown the successful use of the LMA in resuscitation of newborns with congenital airway abnormality under the inadequate ventilation and difficult intubation scenario^{5,6,7,8,9}. Vincenzo, Z Alphonse et al. used LMA for resuscitation of neonates after elective C-Section¹⁰. Paterson et al. and Brimacombe published their data using size 1 LMA in neonatal resuscitation, in 21 and 40 neonates respectively. Both authors achieved a very high success rate in achieving a good clinical airway and positive pressure ventilation^{11,12}. Moreover, WA Ames, Stphaninie F. Fischier et. al, have used LMA for long term ventilation of neonates¹³.

MATERIALS AND METHODS

In our study a group of 75 neonates were selected, which was carried out at Combined Military Hospital Rawalpindi, after approval from the hospital ethics Committee. The neonates were divided into three main groups with a number of twenty-five in each group. Each group of neonates was ventilated by a different method of ventilation which is as follows:-

- Group A :** Neonates ventilated with ETT.
Group B: Neonates ventilated with FM
Group C: Neonates ventilated with size 1 LMA.

The task of resuscitation as assigned to second year residents in anaesthesia who were well conversant with the techniques of resuscitation and CPR of neonates.

This was done under the supervision of a consultant anaesthetist.

The following criteria were followed for inclusion of patients in this study;

1. Weight > 1.5 KG
2. APGAR Score less than 4/10 at birth
3. Newborn of mothers born with elective/emergency caesarean section with or without any systemic disease. (Hypertension, Diabetes etc)

The following patients were excluded from this study:

1. Weight < 1.5 Kg
2. Neonates with birth trauma

The following observations were made:

The efficiency of ventilation of newborn babies with LMA was evaluated in terms of ease of placement and ventilation.

The time required for each technique to provide effective ventilation was noted down.

The adequacy of ventilation was gauged by the color of the neonate and pulse oximetry.

Chest auscultation.
Heart beat auscultation.

This study was prospective, randomized study of twenty weeks duration. The data design in the study was presented in tabular and graphic forms. A Performa was filled in for each neonate resuscitated.

Values were expressed, as mean±SD. Proportion was represented as numbers and percentage. Continuous variables were analyzed by student't' test, discrete variables were analyzed by 'chi' square test.

RESULTS

The 75 neonates who were divided into three main groups namely A, B and C were resuscitated using ETT, FM and LMA respectively. Following results were achieved: -

The neonates of group C were successfully resuscitated using LMA i.e. out of 25 neonates 24 were successfully resuscitated using size 1 LMA and only one required ETT insertion. So a success rate of 95 %was achieved .In contrast the success rate in group A and B was 90% and 80% respectively. So resultantly, better results were achieved using size one LMA. (Table I).

Table-I.			
Patient's Characteristics	Group A	Group B	Group C
No of neonates resuscitated	25	25	25
Average time for insertion (in sec)	9.5	-	9
No of attempts	2-3	-	1-2
Pink up time (in sec)	35-40	45-50	30-35
Time for effective resuscitation (in min)	1.5-2.5	2.5-3	1-2

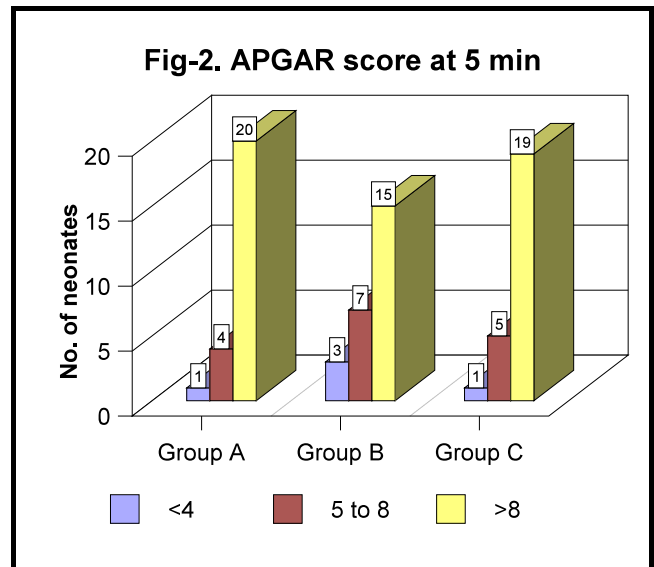
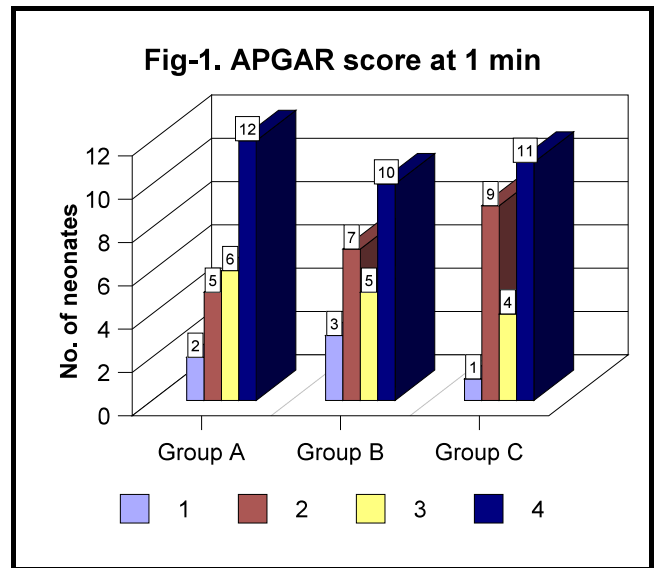
The insertion of LMA was considered easier and more successful. Moreover the insertion with LMA took less number of attempts as compared to ETT and FM. The average time for insertion of LMA was 9 sec. While for ETT insertion, it was 9.5 sec. (Table I).

The pink up time of Group C was 1-2 minutes. While for Group A and B, it was 1.5-2.5 minutes and 2.5-3 minutes respectively (Table I).

In cases where neonates could not be ventilated using ETT and FM, LMA was used to ventilate the new born i.e. The LMA emerged as a potential third option to resuscitate the newborn.

The time required for each to be effective in terms of

oxygenation and ventilation as shown by the Apgar score was noted after 1,5 and 10 minutes. (Figures 1, 2 & 3).



In 24 neonates of Group C it was noted that LMA provided clinically patent airway for Positive Pressure Ventilation (PPV), Continuous Positive Airway Pressure (CPAP) and spontaneous breathing. Gastric distention was not observed during the resuscitation process (Table II).

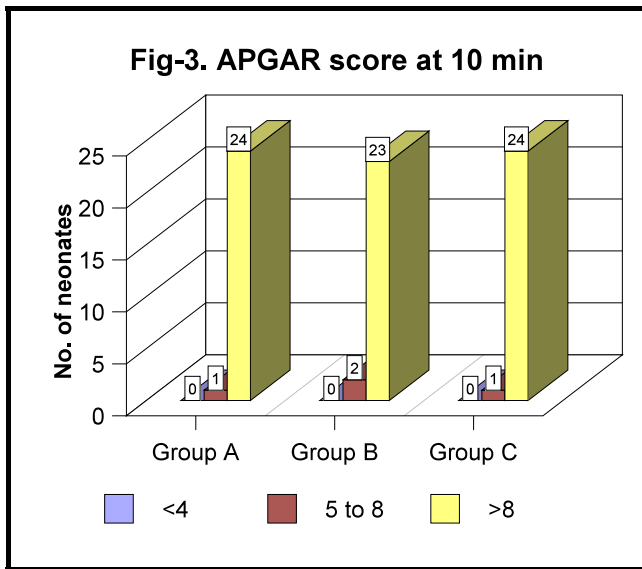


Table-II. Laryngeal Mask Airway: Measured Values

Parameters	Values
Time for LMA insertion (in sec)	9±1.4(8-12)
Duration of PPV (in sec)	80±61(30-300)
Duration of CPAP (in sec)	55±28(15-120)

DISCUSSION

The successful neonatal resuscitation requires an understanding of neonatal physiology and adequate preparation of personal and supplies. The Operation Theatre (OT)/Delivery room staff, Anaesthetist, Gynaecologist and mid wives must understand the neonatal adaptations to the extra uterine life, make provision for resuscitation, understand the predictors of need for resuscitation and respond appropriately.

In our 20 weeks duration prospective and randomized study, a group of 75 neonates born with C—section were selected and sub divided into three main gps namely Group A, B and C. Each of the above gp was resuscitated using ETT, FM and LMA respectively. The task of resuscitation was conducted under the supervision of a Consultant Anaesthetist.

The consent from the mothers of the neonates was taken before C—section. The neonate’s mother’s name, age,

and any co – existing disease was asked. Premeditation given was noted. Previous obstetrical and gynecological histories regarding stillbirth or depressed was asked. Pre operative fetal heart sound was noted. Whether the fetus was meconium stained or not was noted down. The new borns delivered after C—Section were resuscitated in a fixed protocol.

In Group C 24 out of 25 neonates were successfully resuscitated using LMA. Only one had a problem with LMA insertion so required intubation. So a success rate of 95 % was obtained during our study. While the study carried out by Paterson et al and Brimacombe^{14,15} showed the success rate of 95-100 % (Table 1). So LMA was used successfully as a tool in neonatal resuscitation.

The placement of LMA was considered easier and more successful by the trainees in anaesthesia. While the test on neonatal intubation trainee model have shown that mid wives and Junior Doctors can obtain a clear airway more rapidly with LMA than ETT and with fewer failures^{5,6}.

The number of attempts required for insertion of LMA was 1-2 with only one failure. Internationally the no of attempt is mostly one¹⁴, while the number of attempt ETT insertion were 2-3.

The average time for insertion for LMA was 9 sec, while Paterson showed an average time of 8.6 sec¹⁴, this is due to the fact that in our study the trainee in anaesthesia participated in the task of neonatal resuscitation while Paterson himself carried out the procedure. In all the published data most of the insertion was successful in less than 20 sec.

The pink up time (from insertion of LMA to the color of baby becomes pink) in our study was about 35 sec. While improvement of heart rate and pink up time in studies carried out by Paterson and Brimacombe was 30 sec approx^{14,15}.

The effective neonatal resuscitation time in our study was 1.25-2.25 minutes. While Paterson and Brimacombe

took 1-2 minutes^{14,15}.

In difficult cases where FM was unable to ventilate the baby and ETT insertion was not possible, LMA emerged as a successful alternate^{7,8,9}.

In 24 neonates of Group C it was noted that LMA provided clinically patent airway for PPV, CPAP and spontaneous breathing¹⁴. Gastric distention was not observed during the resuscitation process.

The time required for each to be effective in terms of oxygenation and ventilation as shown by the Apgar score was noted after 1,5 and 10 minutes (Figures 1, 2 & 3).

CONCLUSION

The LMA is a potential valuable adjunct for the management of neonatal airway. Further large multicentre studies are required to evaluate the precise role of LMA in neonatal resuscitation and to decide what level of initial and continued training is needed.

Finally it has been suggested that their use for the time being should be restricted to the staff that is familiar with and competent in their insertion.

So we recommend that after appropriate training in airway management and insertion of LMA especially in anaesthetized patient under the supervision of anaesthetist, the Gynaecologists, midwives and other personnel who are less experience in airway management can be trained in neonatal resuscitation.

REFERENCES

1. Emergency Cardiac Care Committee and Subcommittee, **American Heart Association Guidelines for Cardiopulmonary resuscitation and emergency cardiac care: VII. Neonatal resuscitation.** JAMA 268; 2276-2281, 1992.
2. Lavies NG: **Use of the laryngeal mask airway in neonatal resuscitation.** Anaesthesia 48: 352, 1993.
3. Brain AIJ: **The development of the laryngeal mask; A brief history of invention, early clinical studies and experimental work from which the laryngeal mask evolved.** Eur J Anaesthesiology: 5-17, 1997.
4. Brain AIJ; **The Intavent Laryngeal Mask Instruction Manual, 2nd edition.** Henley on Themes, Intavent Internation SA, 1992.
5. Mawer RJ: **Equipment for pediatric resuscitation,** Anaesthesia 50 (1): 87-88, 1995.
6. Baraka A: **Laryngeal mask airway for resuscitation of a new born with Pierre-Robin syndrome.** Anaesthesiology 83 (3): 645-6, 1995.
7. Yao CT, Wang JN, Tai YT et al, **Successful management of neonate with Pierre Robin Syndrome and severe airway obstruction by long term placement of LMA.** Resuscitation 2004, 61:97-9 (ISI) (Medline).
8. Bucx MJL, Grolman W, et al. **The prolong use of LMA in neonate with airway obstruction and Treacher Collins syndrome.** Paediatr anaesth. 2003;13:530-3.
9. Leal pavey YR, **use of LMA classic to secure the airway of premature neonate with Smith-lemli-Optz syndrome, a case report.** AANA J 2004;72:427-30 (Medline).
10. Vincenzo Z, Alphonse et al. **Neonatal resuscitation by LMA after elective cesarean section.** Fetal Diagnosis and therapy 2004;19:228-231.
11. Paterson SJ, Byrne PJ, Molesky MG, Seal RF, Finucane BT: **Neonatal resuscitation using the laryngeal mask airway.** Anaesthesiology 80; 1248-1253, 1994.
12. Brimacombe J, Gandini D: **Resuscitation of neonates with the laryngeal mask airway-a caution.** Pediatric 95 (3): 453-4, 1995.
13. WA. Ames, Stphanie F. Fischier et al, **long term use of LMA in neonate.** Anesth Analg. (letter) 2006;103:792.
14. Paterson SJ, Byrne PJ, Molesky MG, Seal RF, Finucane BT, **Neonatal resuscitation using Laryngeal mask airway,** Anaesthesiology, 1994;80: 1248-1253.
15. Brimacombe J, Gandini D, **Resuscitation of neonates with Laryngeal mask airway-a caution (letter).** Pediatric, 1995;95(3) : 453-4.