Laryngeal Mask Airway for the Interhospital Transport of Neonates

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ABSTRACT. Airway control during interhospital transport may present enormous management difficulties, even for experienced personnel. The laryngeal mask airway is an airway management device that has been established as a safe reliable tool in adult and pediatric practice. We describe 2 cases of successful interhospital transfer of infants with congenital airway malformations with the use of the laryngeal mask airway, and we review the literature. Pediatrics 2005;115:e109–e111. URL: www.pediatrics.org/cgi/doi/10.1542/peds.2004-1468; laryngeal mask airway, transport, neonates.

ABBREVIATION. LMA, laryngeal mask airway.

The laryngeal mask airway (LMA) is a supraglottic device developed by Dr Archie Brain in 1981.1 Since its introduction into clinical practice, the LMA has gained increasing popularity among medical and paramedical staff members, for anesthesia and resuscitation of adult and pediatric patients.2

For neonates, although education of personnel, competence, and use of this device remain low,3 the LMA has been used successfully for resuscitation,4,5 intrapulmonary administration of therapeutic agents,6,7 management of difficult airways8, and respiratory support for prolonged periods.9 In addition, 2 previous reports showed that the LMA may be useful for neonatal transportation if other forms of airway management fail.10,11 We report the use of the LMA for 2 neonates during interhospital transfer, and we review the literature.

CASE REPORTS

Case 1

A male infant weighing 2.61 kg was born through elective caesarean section, performed because of polyhydramnios, at 36 weeks of gestation. Shortly after delivery, the patient developed signs of severe respiratory distress and required positive-pressure ventilation, but bag-and-mask ventilation was ineffective and tracheal intubation failed. External cardiac massage was performed and epinephrine and sodium bicarbonate were administered. Apgar scores were 3 and 3 at 1 and 5 minutes, respectively. Because temporary respiratory improvement was noted when the child crying, the diagnosis of choanal atresia was suspected. Therefore, an oral airway was positioned and bag-and-mask ventilation was initiated. Despite this attempt, ventilation of the patient remained unsatisfactory. Ten minutes after birth, the transport service was alerted by the referring physician and, on the basis of clinical and laboratory data (pH 7.03; arterial carbon dioxide pressure: 88 mm Hg; arterial oxygen pressure: 71 mm Hg; HCO3 concentration: 12 mmol/L), use of the LMA was suggested. A size 1 LMA was inserted, and effective ventilation was obtained. One hour later, at the time of transport team arrival, the infant was undergoing manual ventilation with the LMA, transcutaneous saturation was 98%, and the venous blood gas analysis indicated equilibration (pH 7.28; carbon dioxide pressure: 52 mm Hg; oxygen pressure: 54 mm Hg; HCO3 concentration: 21 mmol/L). Orotracheal intubation was performed by the transport team physician, and the patient was transferred to our hospital for additional treatment. The diagnosis of isolated choanal atresia was confirmed; the patient underwent surgical treatment, after which he was discharged in good clinical condition.

Case 2

A female infant weighing 2.37 kg was born through emergency caesarean section, performed because of poor beat-to-beat variability, late decelerations, and meconium-stained amniotic fluid, at 41 weeks of gestation. The pregnancy had been complicated by intrauterine growth retardation and polyhydramnios. At birth, the infant presented with bradycardia (heart rate: 80–90 beats per minute), hypotonia, and respiratory distress associated with severe hypoplasia of the mandible (Fig 1). Resuscitation was initiated immediately (Apgar scores of 3 and 7 at 1 and 5 minutes, respectively.

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Accepted for publication Sep 13, 2004.

doi:10.1542/peds.2004-1468

No conflict of interest declared.

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PEDIATRICS (ISSN 0031-4005). Copyright © 2005 by the American Academy of Pediatrics.

Fig 1. LMA placement in case 2.
was cerebrocostomandibular syndrome. The patient was dis-ventral cartilaginous segments, bilaterally. The genetic diagnosis.

The time of treatment was 4 weeks. Chest radiographs also

day, the patient underwent a mandibular distraction intervention.

through the nose of the patient, in the operating room. The next

dotracheal tube (size 3.5) over a fiber-optic bronchoscope and

previously alerted pediatric otorhinolaryngologist passed an en-

48–51 mm Hg). After the patient’s arrival at the tertiary center, the

beats per minute; respiratory rate: 52–60 breaths per minute;

transfer. The clinical parameters were stable (heart rate: 124–132

laryngotracheoesophageal clefts and 1 infected neo-

intubation attempts. Because of the ease of LMA placement

tion, 21 mmol/L. No difficulties were encountered during the

airway malformation. In this situation, the LMA al-

port team personnel, because of a severe congenital

essed by either the referring physicians or the trans-

airway for transfer but tracheal intubation was impossible because

additional treatment. Eighty-five minutes later, after the arrival of

patient was referred to our institution at 20 minutes of age, for

respectively) but, after nasal and oropharyngeal suction, both

bag-and-mask ventilation and tracheal intubation failed in addi-

placement of a nasopharyngeal tube was unsuccessful. Therefore, a size 1 LMA was inserted at postnatal age of 5 minutes. This procedure allowed effective oxygenation and ventilation of the patient (pH 7.29; arterial carbon dioxide pressure: 67 mm Hg; oxygen pressure: 179 mm Hg; HCO₃ concentration: 24 mmol/L). The patient was referred to our institution at 20 minutes of age, for additional treatment. Eighty-five minutes later, after the arrival of the transport team, attempts were made to secure the infant’s airway for transfer but tracheal intubation was impossible because of severe micrognathia and glossoptosis. In addition, an attempt at blind intubation through the LMA failed. Instead, the LMA was effective in allowing positive-pressure ventilation during the 3 intubation attempts. Because of the ease of LMA placement and the efficacy of positive-pressure ventilation, ground ambulance transfer (52 minutes) of the patient was successfully undertaken.

Arterial blood gas analysis performed immediately before the 

transport indicated the following: pH 7.28; carbon dioxide pres-

ure, 43 mm Hg; oxygen pressure, 244 mm Hg; HCO₃ concentra-

ion, 21 mmol/L. No difficulties were encountered during the

transfer. The clinical parameters were stable (heart rate: 124–132 beats per minute; respiratory rate: 52–60 breaths per minute; transcutaneous saturation: 94–98%; mean arterial blood pressure: 48–51 mm Hg). After the patient’s arrival at the tertiary center, the previously alerted pediatric otorhinolaryngologist passed an en-

dontracheal tube (size 3.5) over a fiber-optic bronchoscope and

through the nose of the patient, in the operating room. The next

day, the patient underwent a mandibular distraction intervention.

The time of treatment was 4 weeks. Chest radiographs also

showed 10 ribs with gap defects between the dorsal ossified and

ventral cartilaginous segments, bilaterally. The genetic diagnosis

cerebrocostomandibular syndrome. The patient was dis-

charged 2.5 months later, in good clinical condition.

DISCUSSION

Previously, 3 case reports (2 infants with type 3 laryngotracheoesophageal clefts and 1 infected neo-

ate) highlighted the use of the LMA during in-

terhospital transport.¹⁰,¹¹ Airway control during

interhospital transport may present enormous man-

agement difficulties, even for experienced person-

nel.¹²

The transport process begins with telephone com-

munication between the referring physicians and the

transport team personnel. The receiving center is

responsible for providing referring physicians with

any information that may enhance understanding of

the patient’s needs.¹² In the first case, the suggestion

for using the LMA was as a rescue device for venti-

lation of the patient in the period between the tele-

phone call and the arrival of the transport team.

Interestingly, the LMA was correctly positioned in

the first attempt by a pediatrician inexperienced in its use, confirming the ease of placement by inexpe-

cienced personnel that was reported previously.²,⁴,⁵

Case 2 involved an infant who could not be intu-

bated by either the referring physicians or the trans-

port team personnel, because of a severe congenital

airway malformation. In this situation, the LMA al-

lowed effective ventilation and oxygenation and per-

mitted transfer to a safe setting.

In the literature, 5 cases (including these 2 cases) of

LMA use during neonatal transport have been re-

ported.¹⁰,¹¹ Interestingly, in 4 of the 5 cases, the his-

tory was positive for polyhydramnios, which sug-

ests that accurate prenatal diagnoses could facilitate

the prediction of difficult airways in this group of

patients. For these treated patients, the gestational

age was ≥35 weeks and the birth weight was ≥2.37

kg. However, the LMA is effective in the resuscita-

tion of smaller infants.⁵,⁶ Four patients required neo-

natal resuscitation, and the LMA provided an effec-

tive airway in a wide range of postnatal times (5 

minutes to 24 hours). For all 5 patients, LMA use was

determined by the failure of conventional modes of

ventilation (facial mask and tracheal intubation). The

size 1 LMA was effective in all cases; for 1 patient, 

size 2 LMA insertion failed. In 3 of 5 cases, no sed-

ative and/or paralytic drugs were used for LMA

insertion and placement, which suggests acceptance

device for relatively long periods of time.

The LMA was positioned at the referral hospital in

4 cases; in 1 case, the LMA was positioned during

interhospital helicopter transport because of an un-

expected apneic episode that did not respond to

stimulation and bag-and-mask ventilation.¹⁰ In 1 

case, the LMA was used as a rescue device for 90 

minutes, from the time of birth to the arrival of the 

transport team. These cases demonstrate that the 

LMA may play an important role in airway manage-

ment in all phases of the transport process, ie, during 

stabilization at the referral hospital (before the ar-

ival of the transport team), during the transfer, and 

after arrival at the tertiary center.

The duration of LMA use ranged from 5 minutes 

to 4 hours. No complications related to its use were 

reported, which suggests the safety of this device for 

both inexperienced and skilled personnel.² Different 

transport vehicles were used for the transportation of 

these patients; the LMA was always useful, particu-

larly in situations in which access to the patient’s 

airway was limited, such as in a helicopter.¹⁰ Place-

ment of the LMA does not require manipulation of 

the patient’s head, neck and jaw, is not influenced by 

anatomic factors, and does not require laryngosco-

py.² All of these characteristics could be life-saving in 

the treatment of sick neonates, particularly during 

interhospital transport, which is considered a dan-

gerous phase in the care of newborns.

Airway congenital malformations were reported 

for 4 patients, which suggests that the role of the 

LMA is particularly important for this group of ne-

onates; however, the use of this device should also 

be considered for patients with normal airways.¹⁰ The 

LMA has been recommended by the American Heart 

Association and the European Resuscitation Council 

for use in adult resuscitation.¹³ In road traffic acci-

dents, paramedics have used the LMA to provide 

emergency airway control for victims when limited 

access to the patient has made laryngoscopy impos-

sible.²

Recently published International Guidelines for 

Neonatal Resuscitation suggested that “the LMA 

may serve as an effective alternative for establishing 

an airway if bag-mask ventilation is ineffective or 

attempts at intubation have failed.”¹⁴(p9) However, 

routine use of the LMA cannot be recommended at 

this time.¹⁴,¹⁵

Standard equipment listed for interhospital care of 

perinatal patients includes a variety of devices, such 

as tracheal tubes, facial masks, and oral airways.¹²,¹⁶ 

We recommend that the list should include the LMA, 

for situations in which airway management is diffi-

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cult or cannot be achieved with a facial mask or tracheal tube. Rescue personnel must be trained in the use of the LMA before this modality is added to all protocols.

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Pediatrics 2005;115;e109
DOI: 10.1542/peds.2004-1468 originally published online December 15, 2004;

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*Pediatrics* 2005;115:e109
DOI: 10.1542/peds.2004-1468 originally published online December 15, 2004;

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