

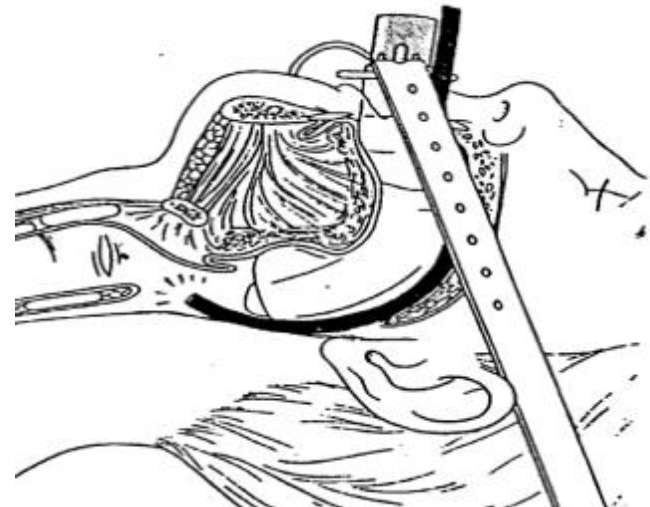
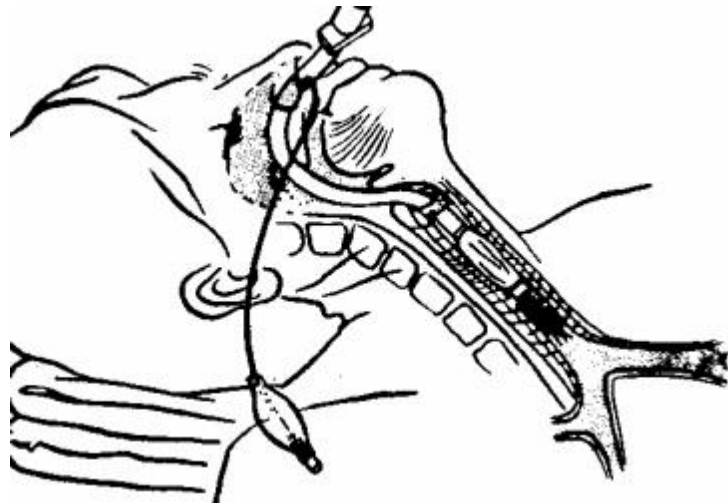
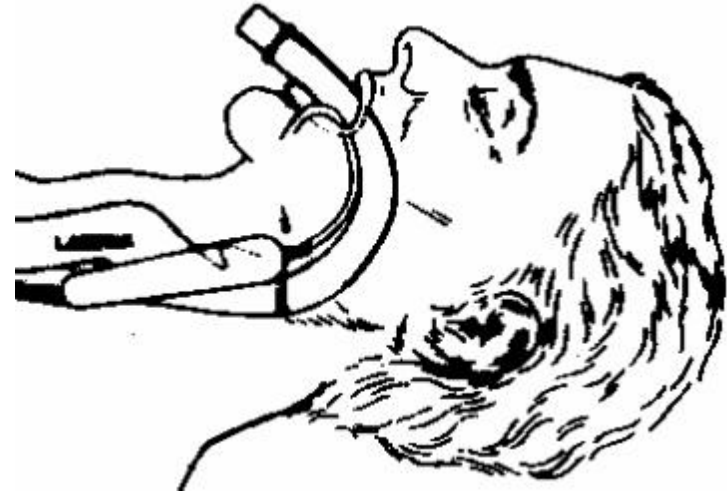
New Extratracheal Airway

-LMA & COPA-

Dong-A University Hospital

Chanjong Chung M.D.

Airway Management



Laryngeal Mask Airway (LMA)

- Dr A.I.J. Brain (1981)
- UK(1988) , US (1991)
- **Types of LMA**

Classic LMA

Reinforced flexible LMA (RLMA)

Intubating LMA (ILMA)

Gastric LMA



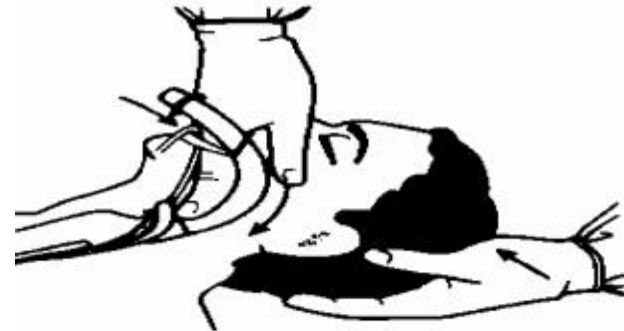
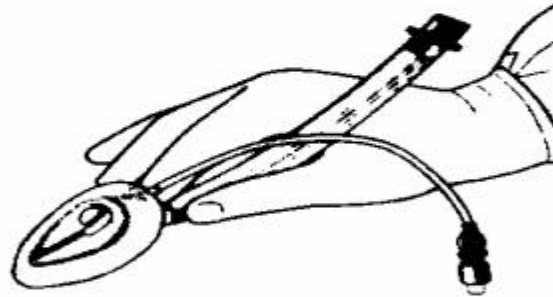
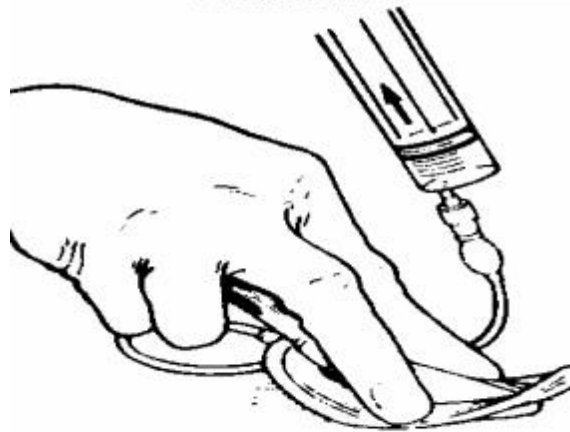
Sizes of Classic LMA

Mask Size	적용대상 Weight	공기주입량 (최대)	ETT (ID)	FOB (mm)
# 1	5kg 이하	< 4 ml	3.5 mm	2.7 mm
# 1.5	5 - 10 kg	< 7 ml	4.0 mm	3.0 mm
# 2	10 - 20 kg	< 10 ml	4.5 mm	3.5 mm
# 2.5	20 - 30 kg	< 14 ml	5.0 mm	4.0 mm
# 3	30 - 50 kg	< 20 ml	6.0 mm cuffed	5.0 mm
# 4	50 - 70 kg	< 30 ml	6.0 mm cuffed	5.0 mm
# 5	70kg 이상	< 40 ml	7.0 mm cuffed	7.3 mm

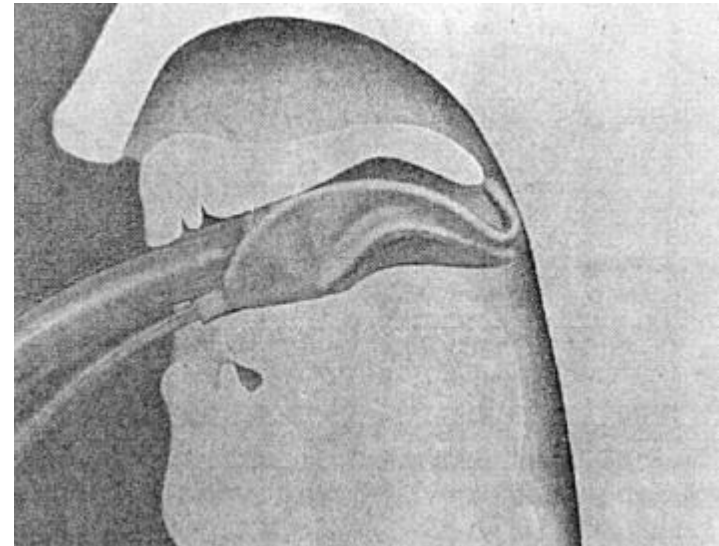
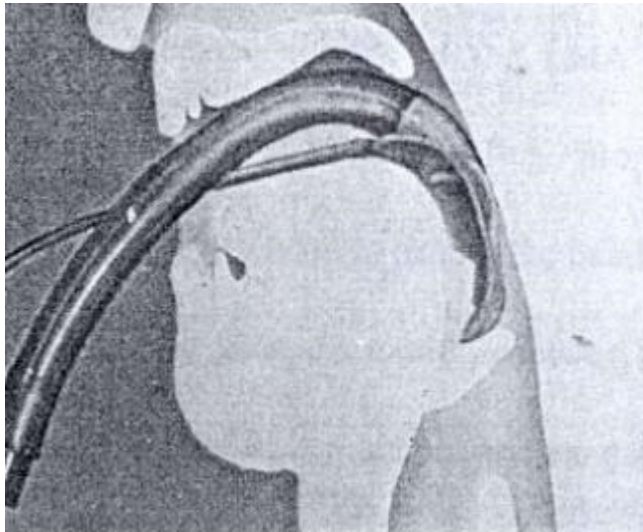
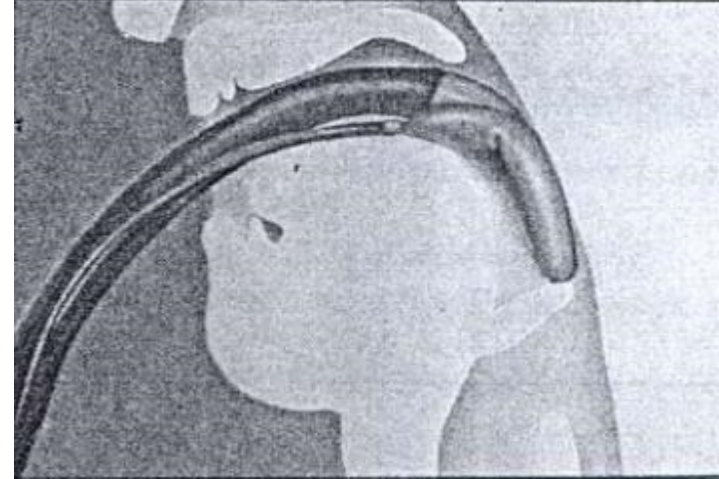
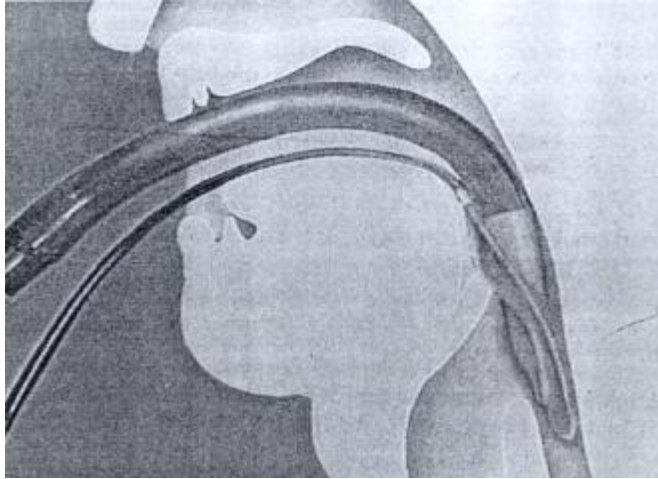
Induction for LMA Insertion

- Adequate level to obtund laryngeal reflex
 - propofol 2-2.5 mg/kg > thiopental
(CJA 1993; 40 : 816)
 - inhalational agents (sevoflurane)
- Muscle relaxant are unnecessary
- Insertion techniques

Standard Insertion Technique



Failure of LMA Insertion



Advantages

- Compared to facemask
 - better airway, free hands, reduce fatigue
- Compared to ETT
 - easily placed (even in inexperienced personnel)
 - not require laryngoscopy or NMB - prevent Cx
 - hemodynamic and IOP stability
 - well tolerated at light plane -->clear airway
 - lower incidence of sore throat (7-12%)
 - useful in difficult intubation

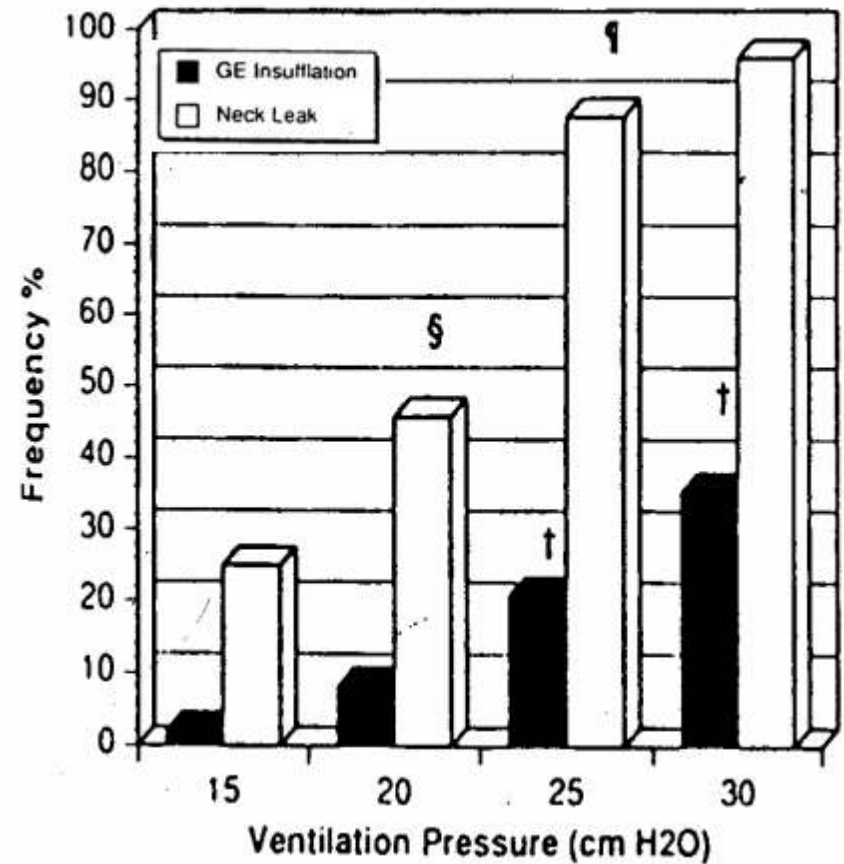
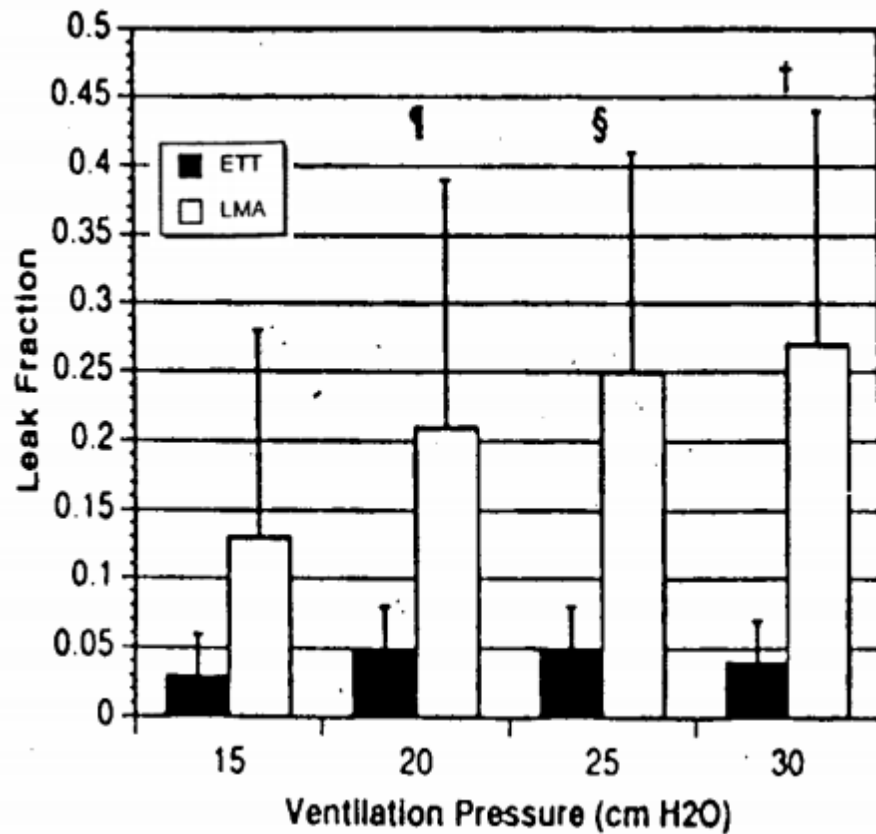
Meta-analysis : Brimacombe CJA 1995; 42: 1017

Problems

- Airway leak **Positive pressure ventilation ?**
- Regurgitation **Risk of aspiration ?**
- Gastric insufflation
- Failed insertion
- Pharyngeal /laryngeal trauma
- Nerve palsies
- Laryngospasm / bronchospasm

LMA- Positive Pressure Ventilation

Devitt JH et al; Anesthesiology 1994; 80:550



Airway Sealing Pressure-Mucosal Pressure

Volume (mL)	ASP (cm H ₂ O)	FOS (4/3/2/1) ^a	ICP (cm H ₂ O)	A
0	14 (11 to 16)	0/12/6/1	-26 (-23 to 28)	2 (0 to 4)
10	20 (16 to 23)	2/10/6/1	29 (19 to 41)	7 (4 to 11)
20	26 (22 to 29)	4/11/3/1	69 (55 to 80)	16 (10 to 23)
30	26 (23 to 30)	6/6/6/1	120 (101 to 138)	24 (8 to 39)
40	24 (21 to 27)	5/5/7/2	190 (177 to 202)	27 (8 to 46)
Total	22 (20 to 24)	17/44/28/6	76 (61 to 92)	15 (10 to 21)

Brimacombe J et al *Anesth Analg* 1998;:87:1379-82

Rules for Positive Pressure

- Largest size of LMA possible
- Standard insertion technique
- Tidal volume : 6-8 ml/kg
- Airway pressure : 15-20 cmH₂O
- Inflate to only 60 cm H₂O intracuff pressure
- Auscultation of neck
- Reverse nm block while still deep
- Removal only when fully awake

Airway Pressure in LMA & ETT

	TV (ml/kg)	LMA	TT	P Value
Peak inspiratory pressure (cm H ₂ O)	5	14.4 ± 3.7	16.5 ± 5.0	<0.0001
	10	19.1 ± 7.1	24.6 ± 6.1	
	15	24.0 ± 4.9	28.1 ± 6.1	
Mean airway resistance (cm H ₂ O L ⁻¹ s ⁻¹)	5	5.1 ± 2.9	9.1 ± 4.7	<0.0001
	10	5.5 ± 3.3	9.9 ± 4.4	
	15	5.0 ± 2.4	10.8 ± 4.6	
Device resistance (cm H ₂ O L ⁻¹ s ⁻¹)	5	1.7 ± 0.1	3.9 ± 0.2	<0.0001
	10	1.7 ± 0.1	3.8 ± 0.1	
	15	1.7 ± 0.1	3.8 ± 0.2	
Pulmonary airway resistance (cm H ₂ O L ⁻¹ s ⁻¹)	5	3.4 ± 2.9	5.6 ± 4.7	<0.0001
	10	3.8 ± 3.3	6.3 ± 4.4	
	15	3.3 ± 2.4	7.2 ± 4.6	

Berry A et al Anesthesiology 1999; 90:395-7

Influence of Head/Neck Position

	Leak pressure		Fiberoptic score	
	Adult	Children	Adult	Children
Neutral	20.1	21	5/9/4/2	7/11/5/1
Flexion	25.1	26	3/10/4/3	2/10/5/7
Rotation	21.6	22	3/10/5/2	6/12/4/2
Extension	17.2	18	3/10/5/2	10/10/3/1

Keller et al ; Anesth Analg 1999; 88: 913-6

Okuda et al ; Anesth Analg 2000; 90: S226

Aspiration Related to LMA

- Brimacombe & Berry (1995); J Clin A 7: 297
 - LMA Meta-analysis; 3/12,901
 - ETT: 0.026% (Warner MA et al; A 1993 : 78: 65-62)
- Cho DK et al; KJA1997; 32: 377-83
 - > 2 hr, PPV, methylene blue & pH < 4 (GE reflux)
 - ETT : LMA 2/49 : 3/41 (only in removal phase)
- ASA refresher course (1999)
 - 20 cases/ 100 million, risk factors, fully recovered

Specific Uses of LMA

- Superficial procedures
- Ambulatory surgical procedures
- Ophthalmic surgical procedures
- Oral and ENT surgical procedures
- Endoscopic procedure
- Pediatric surgical procedures
- Obstetric anesthesia
- Difficult intubation
- Emergency airway management

Survey of laryngeal airway usage in 11,910 patients

- Verghese C et al; *Anesth Analg* 1996; 82: 129-33
- LMA : 11,910(29.9 %) / 39,840 2-yr study
99.8%: successful placement (ETT ; 14 : seal, 9 : placement)
44% : PPV
18.7%: intraabdominal op including laparoscopic procedures
op : 2hr more : 579 patients (322 : controlled ventilation)
44 (0.37%) critical incidents, airway: 18, cardiovascular : 16
-- regurgitation 4, vomiting 2, aspiration 1, bronchospasm 3
laryngospasm 8, gastric dilation 0
- Safety & efficacy (PPV, laparoscopic, prolonged anesthesia)

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