Comparison of aspiration protection by extraglottic airways in an anatomically-correct regurgitation model

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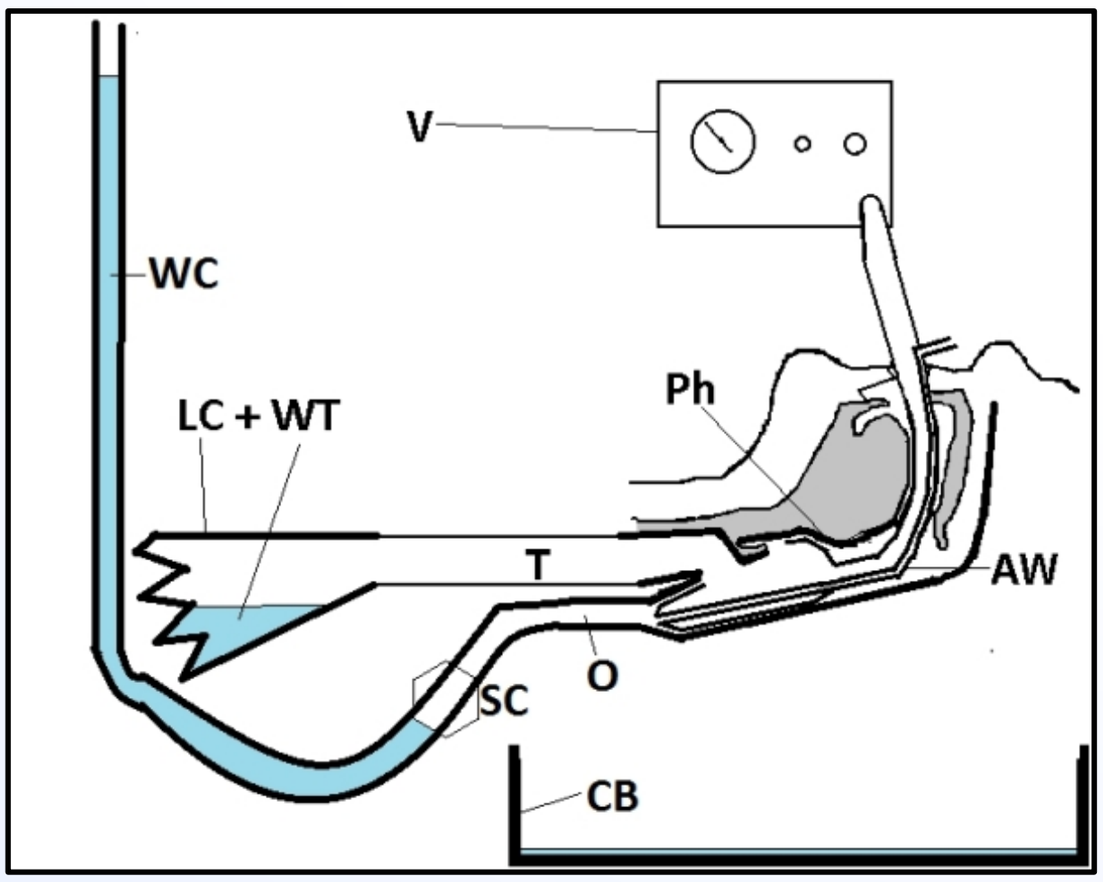
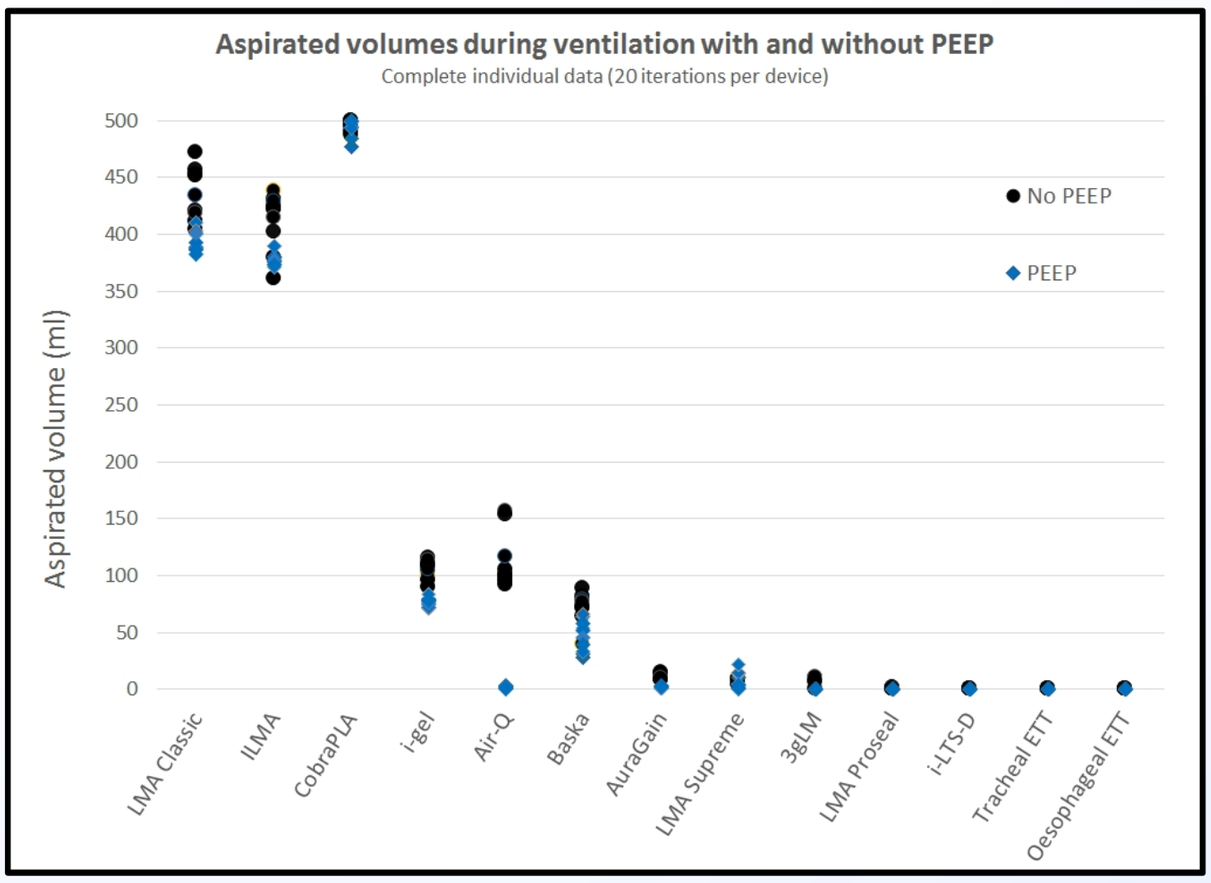




Background and Goal

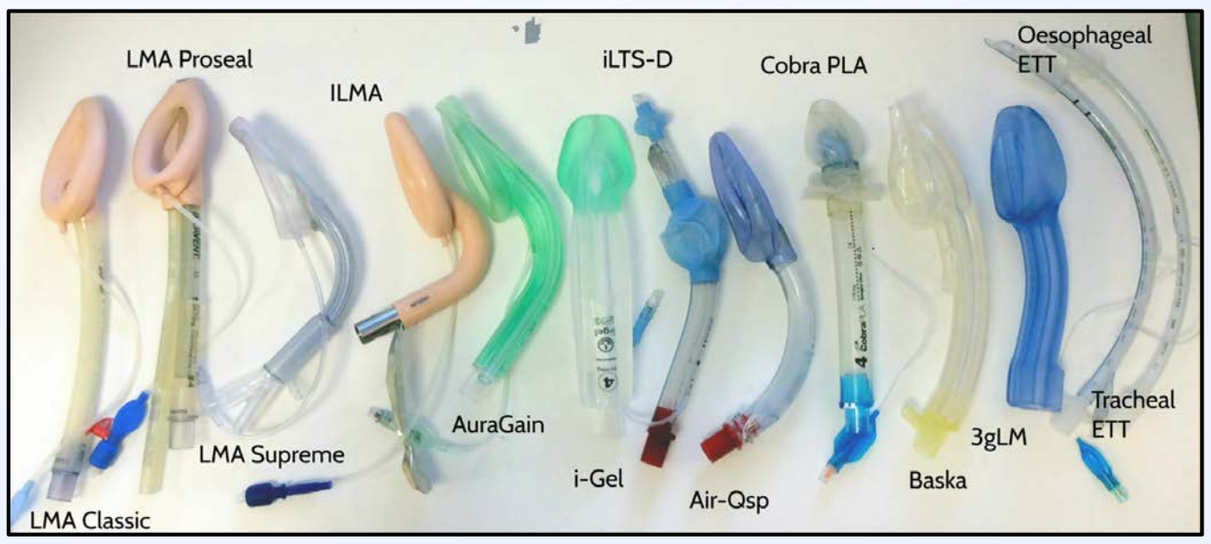
The most common cause of airway morbidity/mortality during anaesthesia or resuscitation is aspiration of gastric contents. Even the traditional gold standard (a cuffed endotracheal tube) does not guarantee protection. Extraglottic airway device (EAD; supraglottic airway; SGA) use has steadily increased, playing vital roles in routine and difficult airway management. However, EADs may be associated with increased aspiration, and employ many design features to reduce risk. *In vivo* heterogeneity has led to limited literature robustly comparing devices. Previous studies have used small numbers or single devices using dye or cadaveric models.[1,2] We developed a laboratory model to allow repeated, accurate and direct testing.

Materials and Methods

An airway model (Ph) was created using latex moulds of cadavers in combination with three-dimensional computed tomography scans of normal individuals. An elastomer with compliance similar to human tissue was selected. The trachea (T) was connected to a test lung (LC), and oesophagus (O) via a stopcock (SC) to a water column (WC), allowing simulated passive regurgitation. A leak-compensating pressure-controlled ventilator (V) delivered intermittent positive pressure ventilation with and without positive end-expiratory pressure (PEEP). Water (WT) entering the test lung during each iteration was measured. Thirteen SGA/EAD configurations (AW) were tested, with 20 iterations each (10 with PEEP).

Results and Discussion

The complete data set and summary descriptive statistics are shown in the figure and table**. Devices could be grouped into three categories: those providing complete (or near-complete) protection, partial protection, and no protection.** Those designed with features which provide aspiration protection (e.g. drainage channels) outperformed basic devices when confronted with passive regurgitation.



Device	Mean (SD)	Min	Median	Max		Mean (SD)	Min	Median	Max
	Passive regurgitation					Passive regurgitation with PEEP			
LMA Classic	437 (23)	404	443	472		394 (9)	382	391	410
ILMA	412 (25)	361	422	438		377 (5)	371	376	390
CobraPLA	496 (5)	487	497	505		494 (8)	477	499	50 0
i-gel	105 (8)	90	107	115		76 (4)	71	76	83
Air-Q	111 (24)	92	101	156		1 (1))	0	1	3
Baska	72 (13)	39	75	89		47 (14)	28	49	66
AuraGain	10 (2)	8	10	15		2 (2)	1	2	3
LMA Supreme	7 (2)	4	7	10		9 (7)	0	8	22
3gLM	7 (3)	0	9	11		0 (0)	0	0	0
LMA Proseal	0 (0)	0	0	1		0 (0)	0	0	0
i-LTS-D	0 (0)	0	0	0		0 (0)	0	0	0
ETT Trachea	0 (0)	0	0	0		0 (0)	0	0	0
ETT oesophagus	0 (0)	0	0	0		0 (0)	0	0	0

OpenAirway

Scan this QR code to access this poster online, where you can download a PDF, watch or link to the video files, and obtain the references.

Video demonstration of aspiration model in use, showing excellent seal but no aspiration protection offered by Cobra PLA, and complete protection by i-LTS-D.