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Role of video laryngoscopes in anesthesia practice

Maya S Suresh, MD*

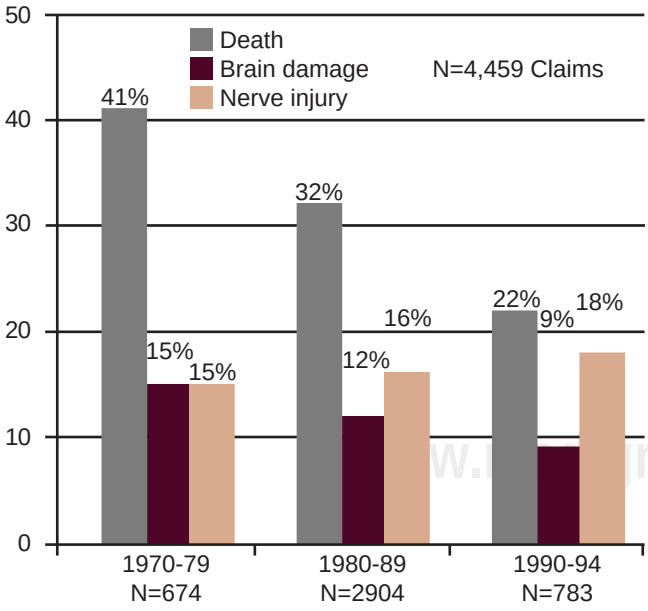
* The following presentation is the intellectual property of Maya S. Suresh, M.D., Baylor College of Medicine, Houston, Texas

OBJECTIVES

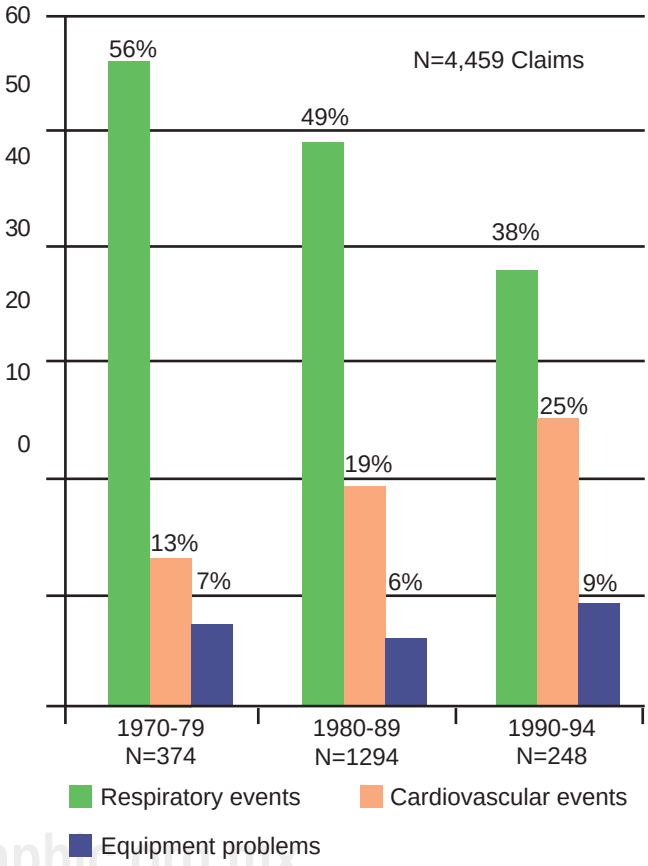
- Briefly discuss the airway –related closed claims studies in surgical/obstetrical patients
- Discuss the introduction of video laryngoscopy in airway management
- Discuss the different types of video laryngoscopes currently available in anesthesia practice
- Discuss the role of video laryngoscopes in the airway management of unanticipated, difficult or failed intubation
  – Obstetrical patients

ASA CLOSED CLAIMS PROJECT

Incidence of death and brain damage % of total claims

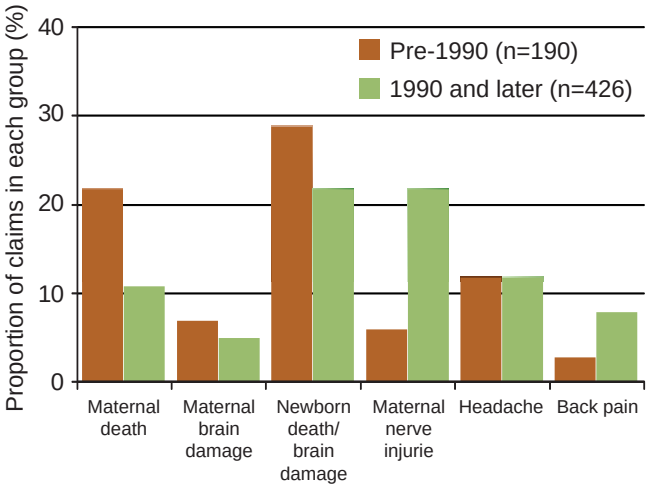


Incidence of respiratory, cardiovascular & equipment –related damages



Cheney FW. The ASA closed claims project:
What have we learned, How has it affected practice, & how will it affect practice in future-anesthesiology, 1999;91(2):552-556.

COMPARISON OF INJURIES IN OBSTETRIC ANESTHESIA CLAIMS BEFORE AND AFTER 1990



Davies JM, Posner KL, Lee LA, Cheney FW, Domino KB. Liability associated with obstetric anesthesia –a closed claims study. Anesthesiology 2009;110:131-9.

CLOSED CLAIMS STUDY IN OBSTETRICAL PATIENTS 1990-2003

- Closed claims study: Obstetric anesthesia claims for injuries from 1990 to 2003 compared to obstetric claims for injuries before 1990
  - Obstetric claims 1990-2003,
    - ♦ Maternal death or brain damage and newborn death or brain damage decreased
  - Respiratory causes of injuries decreased in claims from 1990 or later
    - ♦ 24% - pre-1990
    - ♦ 4% - 1990 or later
- Claims related to inadequate oxygenation/ventilation, aspiration decreased
- Claims related to difficult intubation did not change

	Pre-1990*	1990 or later	P value
Proportion of perioperative claims	190 (12%)	426 (13%)	NS
Mean age, yr (SD)	28 (5)	29 (6)	0.044
Mode of delivery			
Cesarean section	127 (67%)	246 (58%)	0.029
Vaginal delivery	63 (33%)	180 (42%)	0.029
Primary anesthetic			
Regional anesthesia	124 (65%)	342 (80%)	< 0.001
General anesthesia	62 (33%)	73 (17%)	< 0.001
Other or unknown	4 (2%)	11 (3%)	
Respiratory damaging event	46 (24%)	17 (4%)	< 0.001
Aspiration of gastric contents	8 (4%)	2 (< 1%)	0.012
Difficult intubation	10 (5%)	11 (3%)	NS
Esophageal intubation	7 (4%)	0 (0%)	0.007
Inadequate oxygenation/ ventilation	10 (5%)	3 (1%)	0.006
Standard of care			
Substandard care	74 (39%)	92 (22%)	< 0.001
Appropriate	87 (46%)	293 (69%)	< 0.001
Impossible to judge	29 (15%)	41 (10%)	NS
Payment made	100 (58%)	164 (42%)	< 0.001
Adjusted total payment in 2007 dollars			
Median	$455,000	$222,000	NS
Range	$1,539-$19,656,000	$1,196-$18,400,000	

DIFFICULT AIRWAY INCIDENCE

Surgical patients

- Difficult Intubation occurs relatively commonly in association with GA
  - Estimated incidence 1-3%
- Difficult Mask Ventilation
  - Estimated incidence 0.9-5% in general surgery patients
- Cannot intubate–cannot ventilate (CICV)
  - Estimated incidence CICV – 0.0.01% to 2 per 10,000

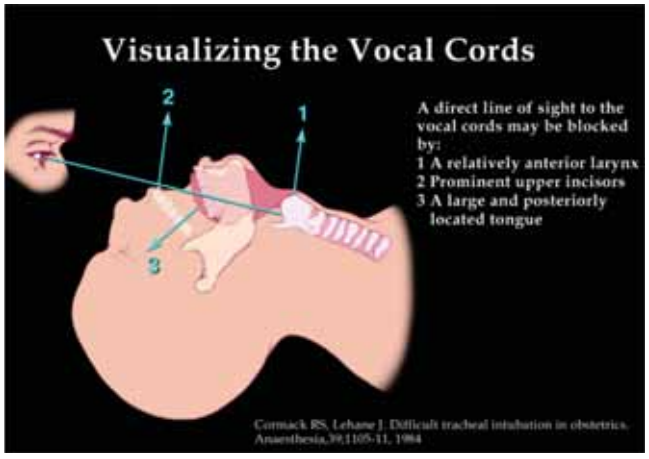
Obstetrical patients

- Cormack & Lehane
  - Difficult laryngoscopy Grade III view 1:2,000
- Hawthorne
  - Failed intubation 1:250

- Lyons
  - Failed intubation 1:300
- Samsoon & Young
  - Failed intubation 1:283
- Rocke et al.
  - Failed intubation 1:750
- Palanisamy et al.
  - CICV 1:98

BREAKING DOWN COMPLEXITIES OF ENDOTRACHEAL INTUBATION

- Direct laryngoscopy (DL): Technology developed in the 1940s (Miller and Macintosh)
- DL & Tracheal Intubation involves three distinct challenges:
  - Laryngeal (glottic opening) sighting
  - Delivering the tube to the glottic opening
  - Advancing the tube beyond the target into the trachea



VISUALIZATION OF THE GLOTTIS

- Video and optical/mirror laryngoscopes: (Routine & difficult intubation; teaching & training)
  - Achieve laryngeal exposure
  - These devices look around the curve of the tongue
  - Bypass the mechanical challenges of creating a direct line of sight to the larynx
  - Miniature video camera (charge coupling device) or prisms/mirrors at the tip of the scope transmits image of - glottic area/vocal cords & can be viewed on a monitor screen

ALTERNATIVE DEVICES IN INTUBATION VIDEO & MIRROR/OPTICAL LARYNGOSCOPES

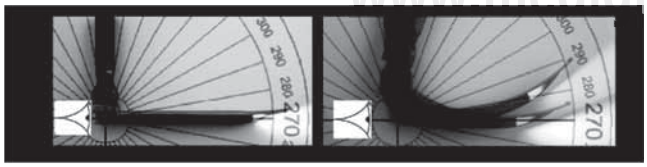
- Glide scope video laryngoscope
- Storz C -MAC video laryngoscope
- McGrath video laryngoscope
- Airtraq
- Pentax
- King vision

FEATURES AND COST OF VIDEO-LARYNGOSCOPES

Video -laryngoscope	Blade shape	Monitor	Portability	Disposability	Size range	Anti-fog mechanism	Cost
Storz C-Mac	Standard Macintosh blade	Separate, 7 in. TFT monitor	Yes	Reusable	Sizes 2 – 4	Yes	$ 7,980 VL, Monitor D -Blade: $5,300
Glidescope original	Angulated blade	Separate, 7 in. LCD monitor	No	Reusable	Sizes 2 – 5	Yes	GVL :$11,000 Additional blades $4,000
Glidescope Cobalt	Angulated blade	Separate, 7 in. LCD monitor	No	Single-use blades	Sizes 1 – 4	Yes	Video, monitor, Cable, scope 11,000 Disposable blades $15/each
Glidescope Ranger	Angulated blade	Separate, 3.5 in. LCD monitor	Yes	Reusable or single-use formats	Reusable: 3-4 Single use: 1-4	Yes	$11,000
McGrath	Angulated blade	Integrated, 1.7 in. LCD monitor	Yes	Single-use blades	Three adult lengths	No	$8,900 blades $10/each
Pentax-AWS	Anatomically shaped blade with a guide channel	Integrated, 2.4 in. LCD Monitor	Yes	Single-use blades	One size available	No	$10,000 Blades $20/each
Airtraq	Anatomically shaped blade with a guide channel	External monitor (when used as a video-, laryngoscope)	Not when used as a video-laryngoscope	Single-use device	Four sizes available	Yes	$80 each disposable blade Monitor $500

Niforopoulou et al. Acta Anaesthesiol Scand 2010;54:1050-1061.

ACHIEVING LARYNGEAL VIEW DEFINING THE VIEW AXIS



Miller Bladeer Macintosh Blade

- **Miller blade** has a very defined & limited view axis to target (narrow spatula/flange height)
- View axis is a straight line perpendicular to the handle 900
- Laryngeal sighting is by direct line of sight

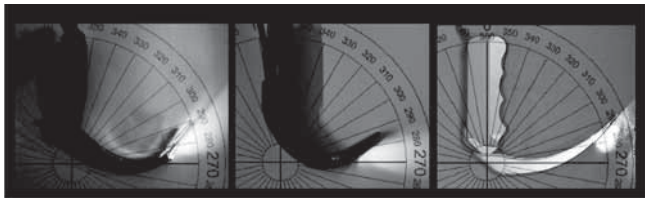
- **Macintosh blade** permits the view axis to pivot
- Amount of pivoting is restricted:
  - by the flange
  - curve of the spatula,
  - patient specific features:

  - mouth opening, upper dentition, tongue characteristics, epiglottis lift

- Laryngeal sighting is by direct line of sight

Levitan RM, Heitz JW, Sweeney M, et al. Ann Emerg Med 2011;57(3):240-247.

ACHIEVING LARYNGEAL VIEW DEFINING THE VIEW AXIS

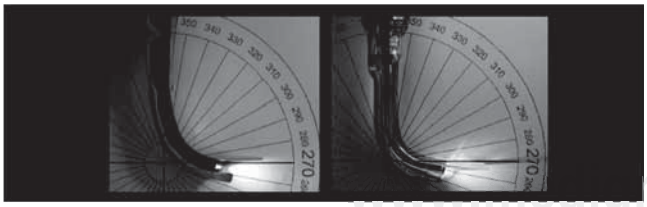


McGrath videolaryngoscope | Glide video-laryngoscope | C-MAC vide-olaryngoscope

- Compared to direct laryngoscopy these videolaryngo-scopes (VL) provide a look around the curve from 0 degrees to a **visual axis of approximately 270 to 300°**
- The distal tips of these video laryngoscopes point toward the 290°
- The cameras have a wide field of view: both up & down; left to right; including the distal tip of their blades
- Result is **supraepiglottic panoramic view of the larynx**, from above the epiglottis & posterior to the base of the tongue.

Levitan RM, Heitz JW, Sweeney M, et al. Ann Emerg Med 2011;57(3):240-247.

ACHIEVING LARYNGEAL VIEW DEFINING THE VIEW AXIS



Airtraq airway scope | Pentax airway scope

Airtraq & Pentax airway scope (AWS)

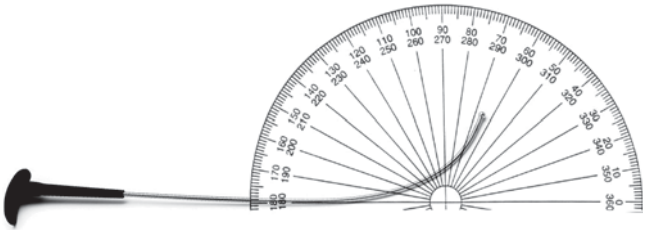
- These airway scopes have integrated channel for endotra-cheal tube delivery
- Viewing angle of these devices is less steep- distal tip is close to the handle
- Essentially offer a view to the larynx (optically designed) the view is approximately 900 to 260-270°
- The view axis is optically manipulated counterclockwise approximately 270°

Levitan RM, Heitz JW, Sweeney M, et al. Ann Emerg Med 2011;57(3):240-247.

GLIDESCOPE VIDEO SYSTEM

- Provides unobstructed & clear magnified view of the air-way on a monitor
- Provides a view that is more anterior than the operator would expect
- Novice user may experience difficulty in placing the ETT between the cords
- Requires a fair amount of hand –eye coordination

DELIVERING THE TUBE TO THE TARGET: GLIDE RITE STYLET



- The glide rite stylet, promoted by the GlideScope manufacturer
- The bend angle approximates 70 degrees
- The large plastic proximal stop permits 1-handed retraction of the stylet after the tube tip has passed through the vocal cords.

Levitan, Heitz, Sweeney Cooper. Ann Emerg Med 2011;57:240-247.

CLINICAL PEARLS: SUCCESSFUL VIDEOLARYNGOSCOPY GETTING AROUND THE CURVATURE OF THE TONGUE TO THE GLOTTIC OPENING DELIVERING THE TUBE TO THE GLOTTIC OPENING

4 Steps: First pass success

- Step 1: Look in the mouth to introduce the scope in *midline*
- Step 2: Look at video screen to obtain best optimal glottic view (top 1/3 of the video screen)
- Step 3: Back to mouth to introduce TT:
  - Use the glide rite 700 angled stylet reinforced TT
  - or ET bent into a 900
  - Insert the TT sideways in a horizontal plane through the mouth; along the blade
- Step 4: Final step: Look at screen to intubate the trachea

CLINICAL PEARLS FOR SUCCESSFUL VIDEOLARYNGOSCOPY:

SUCCESSFUL INTUBATIONS WITH GLIDESCOPE

First author	Number of patients	Operators' experience with Glidescope	Laryngoscopy	Intubation with Glidescope		
			Improvement in the C/L grade with Glidescope	Overall success (%)	Success in difficult airways (%)	Intubation (s) time
Cooper	728 adults	Limited or no previous experience with Glidescope	20 C/L III → 15 C/L I and 1 C/L II. 15 C/L IV →9 C/L I and 2 C/L II	696/722 (96.3)	15/18 (83.3)	–
Rai	50 adults	No previous experience with Glidescope	2 C/L III → 1 C/L I and 1 C/L II	47/50 (94)	–	40
Nouruzi-Sedeh	200 adults	Only manikin training	37 C/L III and 13 C/L IV → 5 C/L III and 3 C/L IV	93/100 (93)	–	63 ± 30
Xue	91 adults	No previous experience with Glidescope	17 C/L III and 2 C/L IV → 19 C/L I and II	91/91 (100)	27/27 (100)	38 ± 11
Stroumpoulis	112 adults	Good familiarity with Glidescope	28 C/L III and 13 C/L IV → 9 C/L III and 2 C/L IV	110/112 (98.2)	39/41 (95.1)	44.9 ± 19.7
Malik	75 adults	Good familiarity with Glidescope	6 C/L III and 2 C/L IV → 0 C/L III and IV	24/25 (96)	–	17 ± 12.31
Malik	120 adults with c-spine immobilization	Good familiarity with Glidescope	5 C/L III → 0 C/L > II	30/30 (100)	–	18.9 ± 6
Maassen	150 morbidly obese adults	Good familiarity with Glidescope	Mean C/L = 2.1 + 0.8 → Mean C/L = 1.1 ± 0.24	50/50 (100)	17/17 (100)	33 ± 18
Liu	70 adults with c-spine immobilization	Good familiarity with Glidescope	14 C/L III and 6 C/L IV → 0 C/L III and IV	31/35 (88.6)	–	71.9 ± 47.9
Van Zundert	450 adults	More than 30 intubations with Glidescope	Mean C/L = 1.68 + 0.76 → Mean C/L = 1.01 + 0.11	150/150 (100)	–	34 ± 20
Sun	200 adults	Good familiarity with Glidescope	15 C/L III → 8 C/L I and 6 C/L II	100/100 (100)	15/15 (100)	46
Xue	57 adults	Good familiarity with Glidescope	–	30/10 (100)	–	37.4 ± 9.9

C/L, Cormack–Lehane; c-spine, cervical spine.

Niforopoulou et al. Acta Anaesthesiol Scand 2010;54:1050-1061.

CASE SERIES OF SUCCESSFUL VIDEOLARYNGOSCOPIC INTUBATION IN OBSTETRIC PATIENTS GLOTTIC VIEW AT INTUBATION

	C+L 1	C+L 2	C+L 3
Standard view	14 (52)	12 (44)	1 (4)
Videolaryngoscope view	27 (100)	0 (0)	9 (0)

- 27 patients requiring general anesthesia were intubation successfully with videolaryngoscope
- An improved C&L view with VL was clearly evident – 100% grade I view
- All 27 parturients intubated successfully with VL
- VL shown to be superior to conventional laryngoscopy

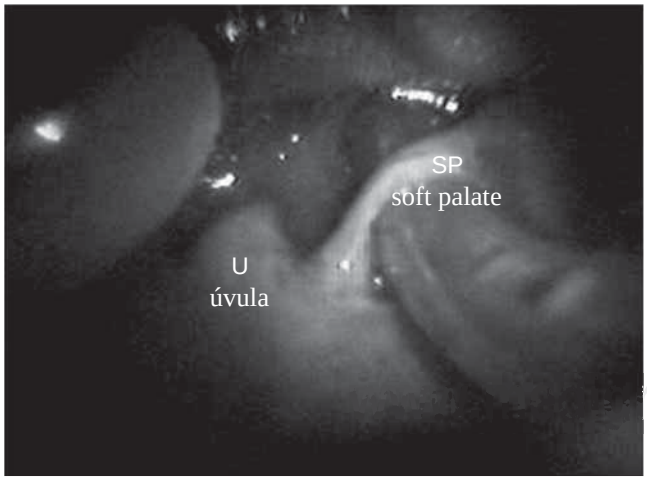
COMPLICATIONS WITH GLIDESCOPE

- Perforation of the right palatopharyngeal arch (two reports)
- Perforation of the right soft palate
- Perforation of the right anterior tonsillar pillar

- Diversion of attention from mouth to the monitor
- Injury to the lips, teeth, tongue
- Practitioner unaware of the location of the ETT
- As the VL is advanced to achieve laryngeal visualization upward force stretches the tonsillar pillars making them taut
  - Susceptible to perforation by an advancing ETT

- Glide VL should be introduced into the mouth, in the midline under direct visual control
- To avoid injury, insertion of the ETT parallel to and as close as possible to the laryngoscope blade attempting to reproduce its course
- Introduce ETT in midline, with proximal end oriented towards the right & then rotate counterclockwise 90º in a horizontal plane bringing it parallel to the blade
- Visualize the ETT go into the mouth and around the tongue
- If slightest resistance encountered STOP do not use force

PENETRATING INJURY OF THE SOFT PALATE DURING INTUBATION WITH GLIDE SCOPE



Hsu W, Hsu SC, Lee JS, Huang JS, Chen CL. Penetrating injury of the soft palate during Glidescope video laryngoscopy. Anesthesia & Analgesia 2007;104(6):1609-1610.

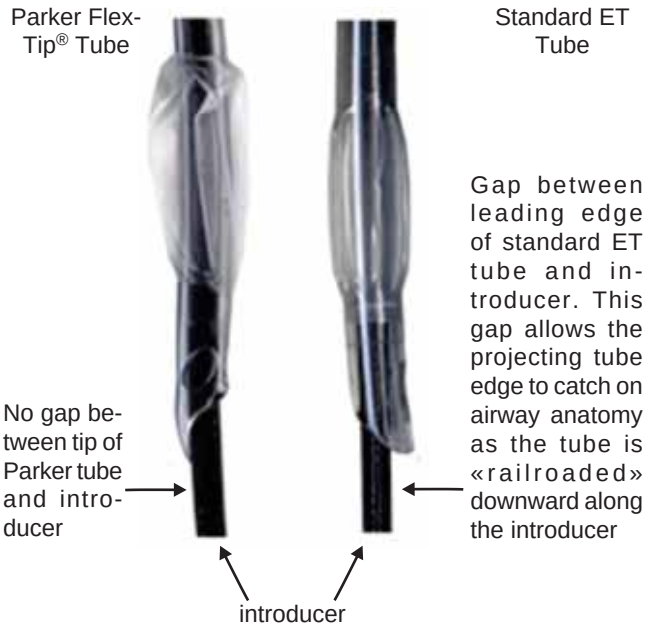
COMPLICATIONS WITH GLIDESCOPE: PENETRATION THROUGH RIGHT ANTERIOR TONSILLAR PILLAR

COMPLICATIONS WITH GLIDESCOPE

PARKER FLEX TIP TUBE/GLIDE RITE TUBE: SKI TIP

Unlike the broad, side-beveled tips of standard tracheal tubes, the tapered, centered tip of the Parker tube tends to move along the midline of the airway and through the center of the glottic opening. After entering the trachea, the resilient tip returns to its original shape, and is configured to «ski» smoothly down the tracheal wall on its broad, curved backside – unlike the tips of standard tracheal tubes which tend to scrape the tracheal wall.

Parker Flex-Tip® «Hugs» all tubular intubation guides (fiberoptic cables, bougies, ET tube exchangers)



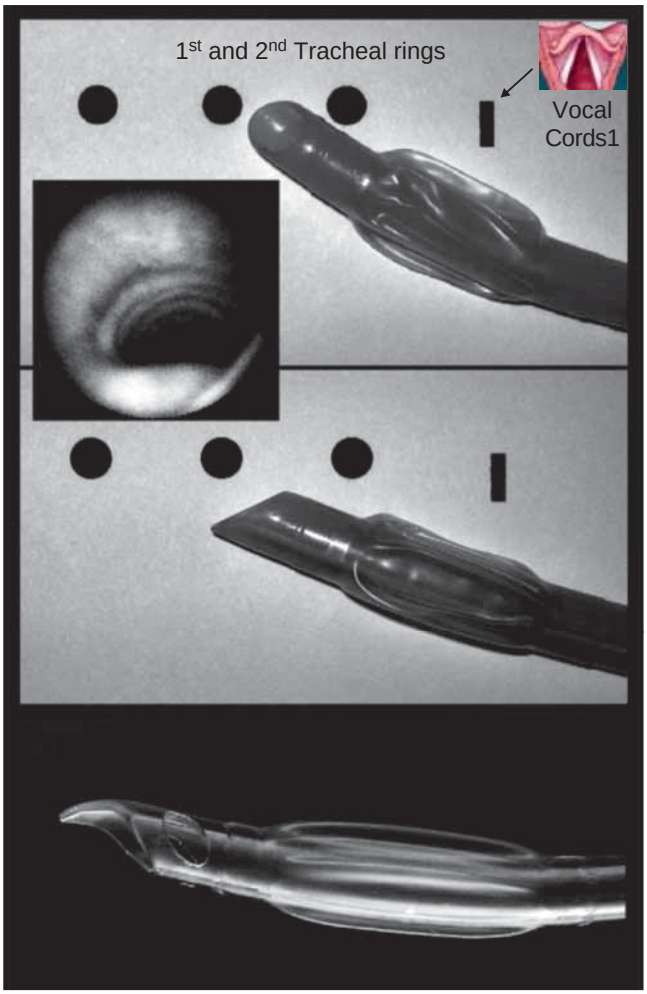
PATIENT CHARACTERISTICS AND INTUBATION PROFILES

	Standard tube	Parker tube	Significance
ASA PS (I/II/III)	12/5/3	11/6/3	NS
Age	61 ± 12	58 ± 13	NS
Height	157 ± 7	159 ± 9	NS
Weight	56 ± 9	58 ± 15	NS
TMD	6.4 ± 0.5	6.5 ± 0.7	NS
POGO	68 ± 14	65 ± 15	NS
Success rate at first attempt	4/20	14/20	P < 0.01
Cumulative success rate by second attempt	6/20	17/20	P < 0.01
Intubation time (s)	25 ± 4	17 ± 5	P < 0.01
Postoperative sore throat	8/20	4/20	NS
Postoperative hoarseness	4/20	2/20	NS

Data are presented as mean ± SD or actual number
NS not significant, ASA PS American Society of Anesthesiology Physical Status, TMD thyromental distance, POGO percentage of glottic opening

Suzuki, Ohmura, Tampo, et al. Parker Flex-Tip Tube ®provides higher intubation success with the Pentax-AWS Airwayscope® despite the AWS tip being inserted into the vallecula. J Anesth 2012; March 4 (Epub ahead of print).

ADVANCING THE TUBE INTO THE TRACHEA: TRACHEAL AXIS AND TRACHEAL RINGS



Top: Leading edge of the tube impinging between the 1st and 2nd tracheal rings

Middle: Rotation of the tube clockwise drops the tip downward, disengaging it from the tracheal rings

Bottom: The symmetric, ski-tip distal tip of the Parker endotracheal tube; advocated by the manufacturer

The top image shows a left-facing bevel of a standard endotracheal tube, with the leading edge of the tube between the first and second tracheal rings (the vocal cords are denoted by the thin vertical line; the rings, by solid dots). The drawing is from a lateral perspective of the trachea, with the round dots representing a sagittal cross-section of the tracheal rings. An inset shows the tracheal rings as they appear with a fiberoptic instrument. Rotation of the tube clockwise (middle image) drops the tip downward, disengaging it from the tracheal rings, and also lowering the trajectory of the tube. At the bottom is the symmetric, ski-tip distal tip of the Parker endotracheal tube. This tube design is also advocated by the manufacturer of the GlideScope.

Levitan, Heitz, Sweeney, Cooper. Ann Emerg Med 2011;57:240-247.

MCGRATH VIDEOLARYNGOSCOPE (MVL)

- Designed by a British Student
  - Won the 1999 Royal Society of Arts student design competition
- Series 5 McGrath VL is available for clinical use
- Fully portable video laryngoscope
- Single-use blade
  - Placed in three different positions
- On board mini color camera
- Flat screen monitor mounted on handle
- Battery powered
  - Single AA battery

Original
Mc Grath

McGrath series 5 video laryngoscope

MCGRATH VIDEOLARYNGOSCOPE

With permission of Dr. James Du Canto

CASE SERIES: THE MCGRATH® VIDEOLARYNGOSCOPE – AN INITIAL CLINICAL EVALUATION

[Série de cas: Le vidéolaryngoscope McGrath® - une première évaluation Chinique]

Ben Shippey BMBS MRCP FRCA, David Ray MD FRCA, Dermot McKcown MBChB FRCA

- Prospectively recorded factors associated with difficult tracheal intubation and complications using the McGrath in patients with normal airways
  - Phase I – 75 patients, experience with airway instrumentation was documented
  - Phase II – 75 patients, time to obtain an optimal view of the larynx and to complete tracheal intubation
- 98% of all intubations were successful using the McGrath
  - CL grade I views were obtained in 143 patients (95%)
  - Median time to obtain an adequate view was 6.3 seconds tracheal intubation was 24.7 sec
  - No complications were encountered in any patient
- The McGrath is an effective aid to airway management in patients with normal airways

USE OF THE MCGRATH® VIDEOLARYNGOSCOPE IN THE MANAGEMENT OF DIFFICULT AND FAILED TRACHEAL INTUBATION

B. Shippey,*† D. Ray† and D. McKeown†

- Report of 3 patients who had Grade 3 or 4 views in whom tracheal intubation was not possible using a conventional Macintosh laryngoscope
- Using the McGrath resulted in a Grade 1 laryngoscopic view followed by successful intubation
- Intubation was more awkward because of the more anterior view of the larynx with the McGrath -stylet is required for intubation
- Offers a valuable addition to the equipment currently available to rescue difficult or failed tracheal intubation

Shippey B, Ray D, Mc Keown D. Brit J of Anaesth 2008;100(1):116-19S.

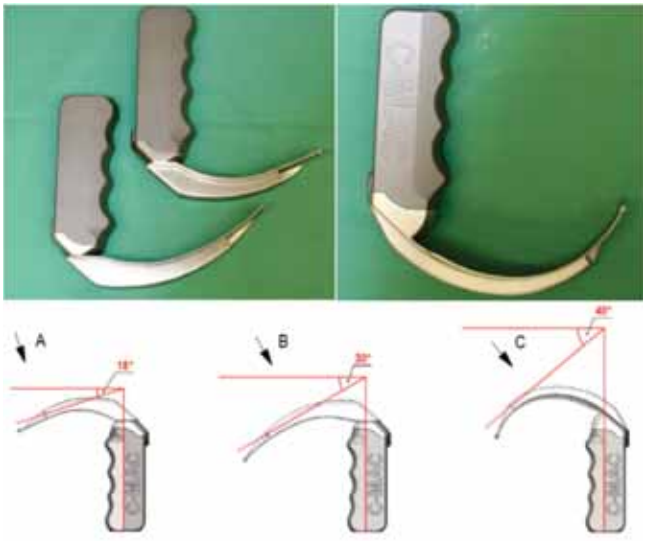
British Journal of Anaesthesia 2008;100(1):116-19.

ALTERNATIVES APPROACHES TO INTUBATION: STORZ VIDEO LARYNGOSCOPE

- The C-MAC VL contains a small camera and a light source at the distal third of the blade
- Two different types of Blades
  - Mac#3 & #4 Blades
  - D- Doerges Difficult airway blade

- Two different ways to visualize the glottis
  - ***Classic direct view*** using the naked eye similar to Macintosh blade
  - ***Indirect view*** via a miniature camera at the blade tip visualize the image on the monitor

FIRST CLINICAL EVALUATION OF THE C-MAC D-BLADE VIDEO LARYNGOSCOPE DURING ROUTINE AND DIFFICULT INTUBATION

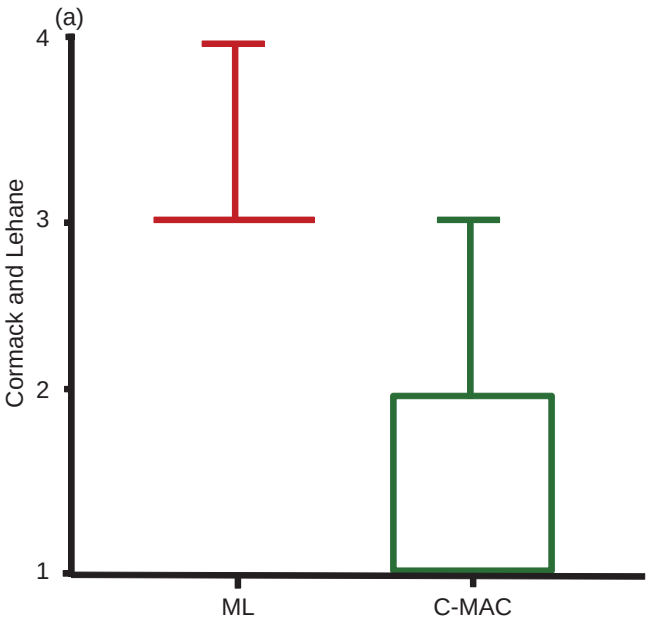


Comparison of the conventional C-MAC videolaryngoscope blades (Macintosh sizes 3 and 4; left panel, A,B) with the curved C-Mac D-Blade (right panel, C)

Cavus E, Neumann T, Doerges V, et al. Anesth Analg 2011;112:382-5.

PERFORMANCE OF THE C-MAC VIDEO LARYNGOSCOPE IN PATIENTS WITH LIMITED GLOTTIC VIEW USING MACINTOSH LARYNGOSCOPY

- 52 consecutive patients found to have unanticipated CL grade 3 (n = 49) and CL grade 4 (n = 3)
- The percentage of glottic opening (POGO)/glottic view improved in 49 of 52 patients
- Tracheal intubation in 3 patients failed



Piepho T et al. Performance of C-MAC VL in patients after limited glottic view using Macintosh blade Anaesthesia 2011;66:1101-1105.

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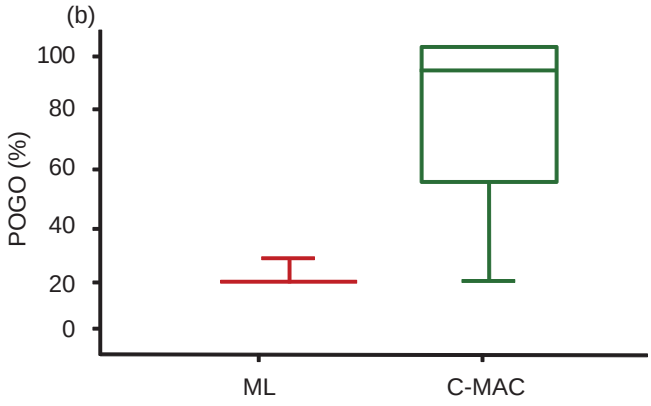
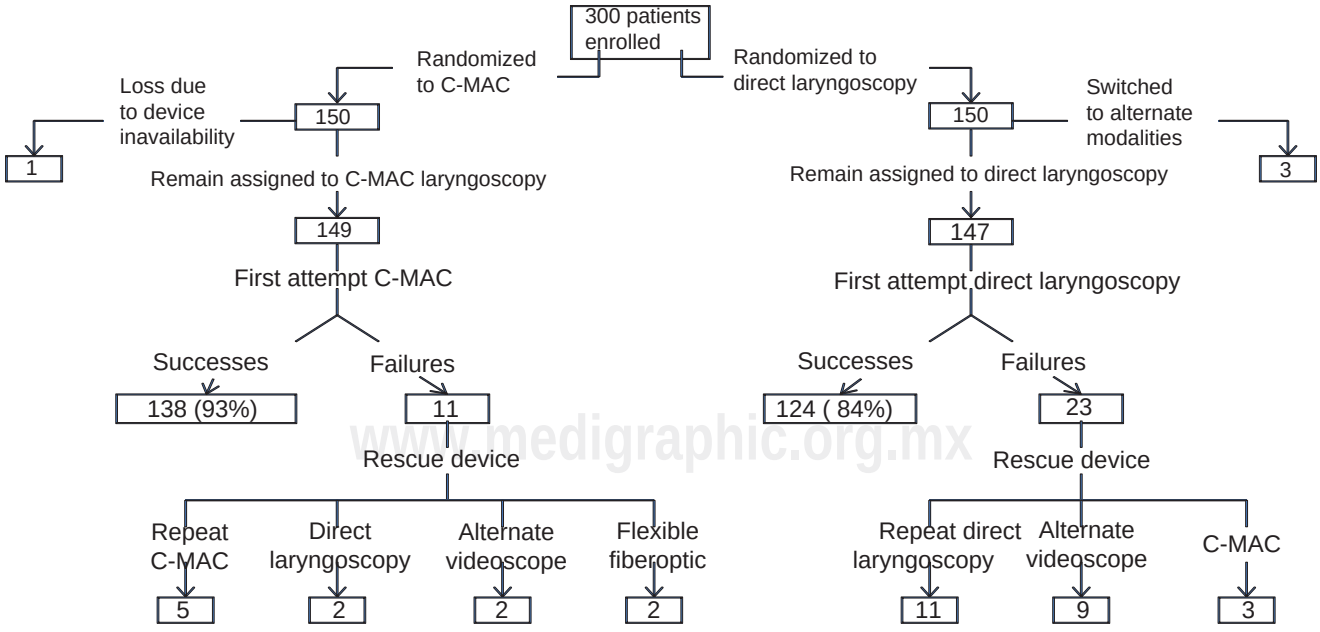


- The percentage of glottic opening (POGO) improved in 49 of 52 patients
- Tracheal intubation in 3 patients failed

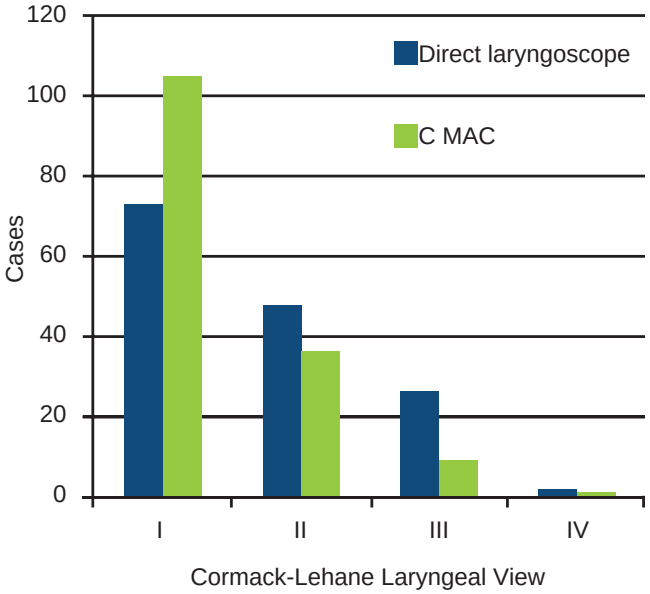
Redrawn from «C-MAC in limited glottic view», Piepho T et al. Anaesthesia 2011;66:1101-1105 POGO: Percentage of Glottic Opening.

COMPARATIVE EFFECTIVENESS OF THE C-MAC VL *VS* DIRECT LARYNGOSCOPY IN PREDICTED DIFFICULT INTUBATION



Aziz M et al. Anesthesiology 2012;116:629-36.

COMPARATIVE EFFECTIVENESS OF THE C-MAC VIDEOLARYNGOSCOPE *VS* DIRECT LARYNGOSCOPY IN PREDICTED DIFFICULT AIRWAYS

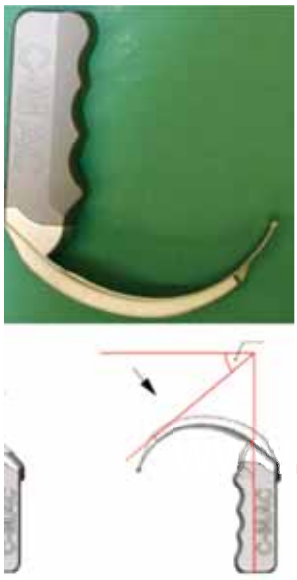


- Use of C-MAC in patients with predicted difficult airway
- Diverse group of providers (residents, anesthesiologists, CRNAs) achieved higher and more successful intubations on first attempt using the C-MAC VL
- Use of gum –elastic bougie and /or external laryngeal manipulation were required less with C-MAC compared to DL
  - Time to intubation:
    - **C-MAC** was 46 s (40-51)
    - **DL** was 33 s (29-36) < 0.001

Aziz M et al. Anesthesiology 2012;116:629-36.

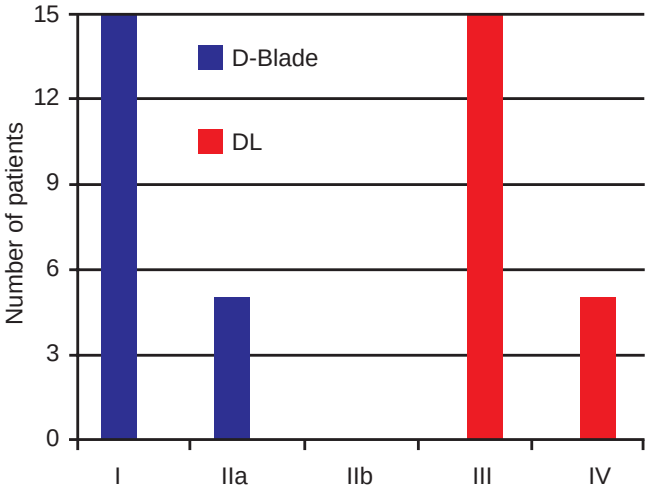
FIRST CLINICAL EVALUATION OF THE C-MAC D-BLADE VIDEOLARYNGOSCOPE DURING ROUTINE AND DIFFICULT INTUBATION

Curved C-Mac D-Blade angle is increased from 18º to 40º



Cavus E, Neumann T, Doerges V, et al. Anesth Analg 2011;112:382-5.

FIRST CLINICAL EVALUATION OF THE C-MAC D–BLADE VL DURING ROUTINE & DIFFICULT INTUBATION



Time to optimal view: 11(5-45 secs)
Time to successful intubation: 17 secs (3-80 secs)
Improvement of Cormack-Lehane grade from conventional **direct laryngoscopy (DL) to C-MAC D-Blade** view in patients with difficult airway (n = 20)

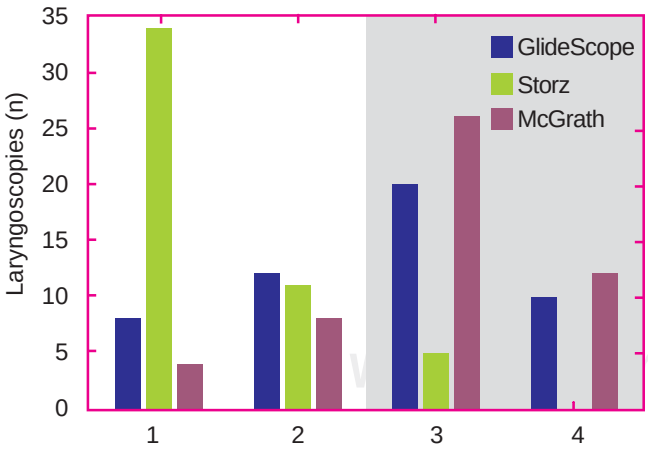
Cavus E, Neumann T, Doerges V, et al. Anesth Analg 2011;112:382-5.

DELIVERY OF THE TUBE THE TARGET WITH C-MAC VL

- Shape and size of the C-MAC proximal blade makes tube delivery to the glottis much more straightforward
- The trajectory of the tube tip inserted into the oropharynx, then advanced into the hypopharynx is tilted upward into the larynx
  - Stylet if required (10%) straight to cuff with 35° bend or may not be necessary

C MAC PORTABLE –POCKET MONITOR

COMPARISON OF THREE VIDEOLARYNGOSCOPES IN MORBIDLY OBESE PATIENTS

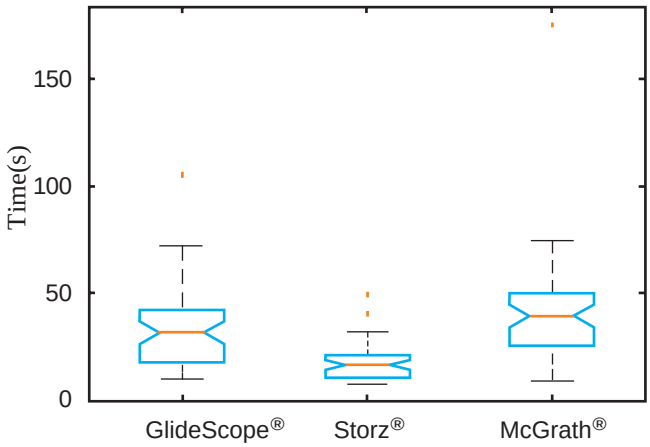


C-MAC >Glidescope>McGrath

Comparison of number of laryngoscopy attempts for intubation using 3 videolaryngoscopes (VLSs). There are significantly fewer attempts necessary with the Storz® VLS than with both the GlideScope® and the McGrath® ($P < 0.01$), and fewer attempts necessary with the GlideScope than with the McGrath VLS ($p < 0.05$).

Maassen R, Lee R, Hermans B, et al. Anesth Analg 2009;109:1560-5.

COMPARISON OF THREE VIDEOLARYNGOSCOPES IN MORBIDLY OBESE PATIENTS



C-MAC >Glidescope>McGrath

Comparison of required intubation attempts for 3 videolaryngoscopes (VLSs) for Cormack and Lehane (C&L) grade as assessed with a classic laryngoscope. The Storzâ VLS performed better than both the GlideScopeâ and McGrathâ VLSs with fewer attempts required across the spectrum of patient C&L grades ($p < 0.01$). C&L grade as assessed by classic laryngoscopy was a significant factor in the number of intubation attempts with the different VLSs ($p < 0.01$).

Maassen R, Lee R, Hermans B, et al. Anesth Analg 2009;109:1560-5.

Table II. Comparison of video laryngoscopes and related devices.

DEVICE	Size	Angles, degrees	Type of Monitor	Battery	Minitor Size, In	Location of monitor	Single-use blade	Can be used for conventional DL	Defogger required	Channel tube guide
Airtraq	Adult (regular & small) Nasotracheal, double-lumen, & child (coming soon	95 (blade)	Coming soon	Yes	N/A	Unattached	Yes	No	No	Yes
Berci-Kaplan DCI	Mac 3&4 Dörges, Miller 2 & 3	60-80 (viewing)	DCI	Yes (C-Mac; rechargeable)	7	Unattached	No	Yes	Yes	No
GlideScope	Small, midsize, large	50-60 (blade)	LCD	Yes (Ranger; rechargeable)	3.5	Unattached	Yes (co-balt)	Possible, but not recommended	No	No
McGrath	Child, adult	35-45 (refraction)	LCD	Yes (AA)	1.7	Attached	Yes	Possible, but not recommended	No	No
Pentax airway scope	Single size	90 (viewing)	LCD	Yes (AA)	2.4	Attached	Yes	No	No	Yes
Truview premier	Small & adult	42 (refraction)	LCD	Yes (recharge-able)	2.5	Attached; can be used with eyepiece	No	No	Optional	No
Weiss angulated video-intubation laryngoscope	Single size	70 (viewing)	N/A	No	N/A	Unattached	Yes	No	Yes	No

DCI, Direct coupler interface; DL, direct laryngoscopy; LCD, liquid crystal display.

Law JA, Hagberg CA. Anesthesiology News. Guide to Airway Management 2008.

AIRTRAQ VIDEOLARYNGOSCOPE: CHANNEL VL

- Airtraq videolaryngoscope

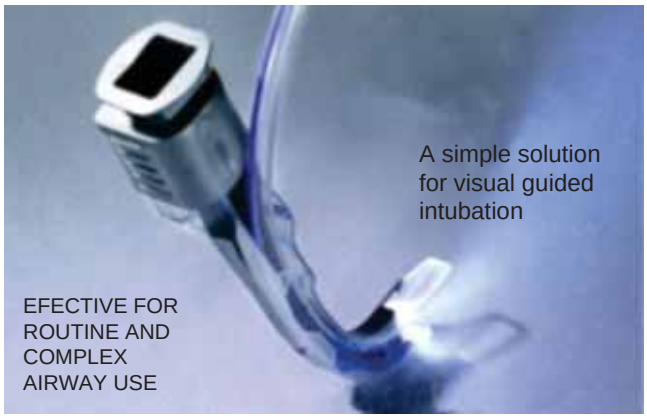
- New disposable intubating laryngoscope
- Inexpensive, portable, lightweight
- Alternative approach to emergency airway management
- Designed to provide a view of the glottis without alignment of oral, pharyngeal, and tracheal axis
- Operator must learn to maneuver the device rather than the ET for proper insertion

TRACHEAL INTUBATION USING THE AIRTRAQ® IN MORBIDLY OBESE PARTURIENTS UNDERGOING EMERGENCY CESAREAN DELIVERY

Case report:

- Report of two cases morbidly obese parturients undergoing emergency cesarean delivery
- Airway exam: MP III (IV) in operating room. Following RSI CL Grade 3 or 4 with regular Macintosh blade
- Failed DL intubation, failed Bougie
- Rapid tracheal intubation successful with Airtraq laryngoscope

- Time to optimal glottic view: 10 & 14 secs respectively
- Time to securing airway 21 & 23 secs respectively
- Dhonneur G: Anesthesiology 2007;106:629-30.



VIDEO-ASSISTED LARYNGOSCOPY AIRTRAQ

PENTAX AIRWAY SCOPE

Pentax AirWay Scope showing tracheal tube in track.

Video Screen and target sights on Airway Scope.

- Pentax –AWS *(Pentax corp Tokyo, Japan)* is a new rigid, portable, indirect laryngoscope
- Has an integrated tube passage function, monitor, single –use blade *(p-blade)*
- Channel on the right side of the p-blade guides the tube
- A target mark on the monitor indicates the tracheal tube direction and helps in advancement of tracheal tube direction

Pentax –AWS a new VL; is more effective than the Macintosh for tracheal intubation in patients with restricted neck movements randomized comparative study

View of the glottis at laryngoscopy with Pentax –AWS and Macintosh DL

Cormack & Lehane classification	1	2	3	4
Macintosh	124	57	21	1
Pentax-AWS	203	0	0	0

Enomoto Y, Asai T, Arai T, et al. Abr J Anaesth 2008;100:544-8.

PENTAX –AWS A NEW VL; IS MORE EFFECTIVE THAN THE MACINTOSH FOR TRACHEAL INTUBATION IN PATIENTS WITH RESTRICTED NECK MOVEMENTS RANDOMIZED COMPARATIVE STUDY

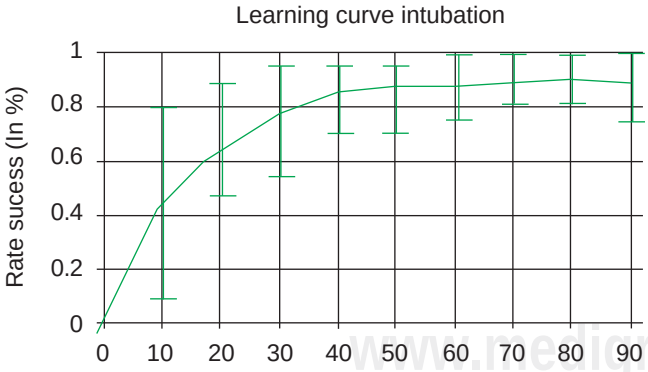
Success or failure of tracheal intubation using a Macintosh laryngoscope or the Pentax-AWS, within 120 s

	Success	Failure
Macintosh	93 (89%)	11
Pentax-AWS	99 (100%)	0

Enomoto Y, Asai T, Arai T, et al. Abr J Anaesth 2008;100:544-8.

PROFICIENCY

The direct laryngoscopy intubation learning curve



Redrawn from «Learning manual skills» Konrad et al. Anesth Analg 1998;86:635-9.

- Statistical modeling: Ninety percent probability of a «good/successful» intubation required 57 laryngoscopic intubation procedures

PROFICIENCY

Success rate and recommended case load

Procedure	Success rate (%)	Recommended case load (Mean)	95% confidence interval for success rate[a]
Intubation	90	57	0.80-0.99
Spinal anesthesia	90	71	0.75-1.0
Epidural anesthesia	78	90	0.71-0.85
Brachial plexus Block	87	62	0.76-0.97
Arterial line	84	60	0.60-1.0

[a] Confidence intervals are given for the mean recommended numbers (values were calculated from all 11 residents).

Konrad C, Schupfer Guido, Wietlisbach M, et al. Anesth Analg 1998;86:635-9.

SIMULATED *NORMAL* AIRWAY SCENARIO

	GlideScope (n = 20)	Pentax airway scope (n = 20)	P value
Time taken to visualize glottis; s	4.5 (3.7-5.8 [2.0-14.9])	3.2 (2.4-5.3 [1.0-9.4])	0.037
Time taken from visualization of glottis to insertion of tracheal tube; s	5.4 (3.3-10.9 [1.0-13.2])	3.6 (2.7-6.7 [1.3-13.5])	0.1
Total time taken for tracheal intubation; s	10.4 (7.4-14.9 [6.0-28.1])	7.6 (5.6-10.5 [3.4-18.0])	0.044
Success of tracheal intubation	20 (100%)	20 (100%)	1.0
Ease of intubation	2 (1.0-2.8 [1-3])	1 (1-2 [1-2])	0.022
Choice of device	5 (25%)	14 (70%)	< 0.001

Time taken and success of tracheal intubation by medical students in simulated normal airway scenario. Results are expressed as median (interquartile range [range]) or number (%). Ease of intubation was scored: 1 = very easy, 2 = easy, 3 = difficult, 4 = very difficult.

Tan BH, Liu EHC, Lim RTC, Liow LMH, et al., Anaesthesia 2009;64:187-190.

SIMULATED *DIFFICULT* AIRWAY SCENARIO

	GlideScope (n = 20)	Pentax airway scope (n = 20)	P value
Time taken to visualize glottis; s	5.5 (3.17.2 [2.0-10.2])	4.2 (3.4-4.9 [2.6-6.8])	0.2
Time taken from visualization of glottis to insertion of tracheal tube; s	12.1 (8.1-15.7 [5.7-24.5])	5.7 (2.9-8.4 [1.5-10.4])	<0.001
Total time taken for tracheal intubation; s	17.3 (13.3-20.3 [9.6-32.4])	10.0 (7.0-12.6 [5.2-16.3])	< 0.001
Success of tracheal intubation	20 (100%)	20 (100%)	1.0
Ease of intubation	2.5 (2-3 [1-4])	1.5 (1-2 [1-3])	< 0.001
Choice of device	2 (10%)	16 (80%)	< 0.001

Time taken and success of tracheal intubation by medical students in simulated normal airway scenario. Results are expressed as median (interquartile range [range]) or number (%). Ease of intubation was scored: 1 = very easy, 2 = easy, 3 = difficult, 4 = very difficult.

Tan BH, Liu EHC, Lim RTC, Liow LMH, et al. Anaesthesia 2009;64:187-190.

SUMMARY

- Direct laryngoscopy/devices for intubation introduced 70 years ago
- Video and optical laryngoscopy technology/devices one of the most significant advances for airway management:
  - Indirect laryngoscopy
  - Normal & difficult airways, teaching and training, unstable spine, trauma, and in obstetrical patients
- VL & Optical Laryngoscopes are now used:
  - Either as primary airway device or immediately available in patients with predicted difficult intubation
  - or as rescue device in unanticipated difficult intubation

Thank You

Annual refresher course of anesthesiology and perioperative medicine México City:

I have no financial disclosures or conflict of interest.