A Comparison of the Geometry of Videolaryngoscopes for use in Obstetric Anaesthesia

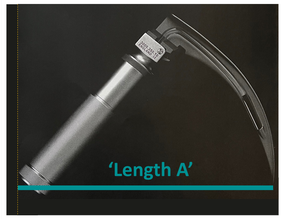
Kylie-Ellen Edwards, Sarah Watson, Nuala Lucas, David Vaughan, Abigail Richardson. Department of Anaesthesia, Northwick Park Hospital, LNWUH NHS Trust.

Videolaryngoscopy and the Obstetric Airway

Videolaryngoscopy has transformed airway management, but adoption in obstetrics lags other areas of anaesthesia despite relatively high rates of difficult intubation in this group [1]. A frequently cited barrier to videolaryngoscope (VL) use in obstetrics is the lack of a short-handled VL. Short-handled direct laryngoscopes (DLs) are particularly useful in obstetrics, where the cephalad movement of breasts when supine effectively shortens the thyro-sternal distance and can impede laryngoscope placement.

Methods

Two physical characteristics of VLs were postulated as being associated with an increased likelihood of the device impacting breast tissue. With the tip of the laryngoscope blade held vertical (90 degree angle to the ground) the measurements are 'Length A', the horizontal length of the device from laryngoscope tip to the furthest inflexible component of the device and 'Length B' the relative vertical distance between the tip of the blade and the most inferior point of the device. A longer device length (Length A) and lower profile of the inferior edge (more negative Length B) are associated with greater risk of impacting breast tissue.





For devices with a removable electrical plug or movable camera, measurements were taken with and without the plug, and with the camera at both extremes of movement. Given the relatively subjective nature of tip positioning, lengths were averaged across measurements taken by four operators.

Laryngoscope Physical Characteristics (Length A and Length B)

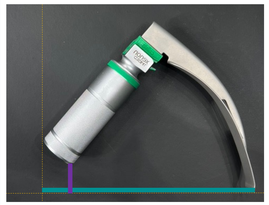
	Standard Handle Mac 4	Short Handle Mac 4	McGrath 4 Blade Camera Flexed	McGrath 4 Blade Camera Extended	GlideScope Mac 4	GlideScope LoPro 4	Karl Stortz C-MAC Mac 4	Karl Stortz CMAC D Blade
	Mac Blade DL	Mac Blade DL	Integrated Camera VL	Integrated Camera VL	Mac Blade VL	Hyper-Angulated VL	Mac Blade VL	Hyper-Angulated VL
Length A (cm) (Base Unit) [1]	18.98 (1.00)	16.65 (1.18)	20.35 (0.97)	18.88 (0.45)	17.12 (0.34)	15.88 (0.30)	14.68 (0.43)	15.65 (1.44)
Length A (cm) (With Plug) [1]	NA	NA	NA	NA	21.73 (0.41)	20.10 (0.80)	18.27 (0.50)	18.42 (0.54)
Length B (cm) (Base Unit) [1]	-1.15 (0.34)	2.55 (1.44)	-2.48 (3.69)	-3.67 (0.53)	1.05 (0.21)	-1.52 (0.69)	2.45 (0.69)	-3.33 (0.46)
Length B (cm) (With Plug) [1]	NA	NA	NA	NA	1.60 (0.29)	1.02 (0.62)	2.15 (0.71)	-4.68 (0.90)

[1] Mean (SD)

Examples of Laryngoscope Geometry Compared to Short-Handled Mac 4

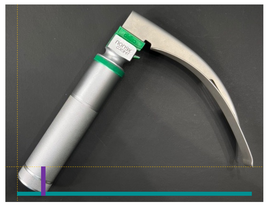
It is useful to consider how different blades compare to the short-handled Mac 4 laryngoscope which is promoted as the best available laryngoscope geometry in obstetric anaesthetic practice. For videolaryngoscopes the comparison is made with the device only (detachable plug removed), as the plug can be connected after placing the laryngoscope tip in the patient's mouth.

Short Handled Mac 4 Blade



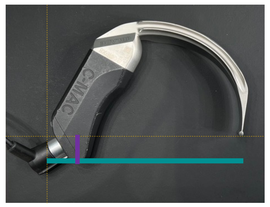
Length A: 16.65 cm
Length B: +2.55 cm

Standard Mac 4 Blade



Length A: 2.33cm Longer
Length B: 3.7cm more negative

Karl Stortz CMAC 'D Blade'



Length A (no plug): 1cm Shorter
Length B (no plug): 5.8cm more negative

Karl Stortz CMAC MAC 4 Blade



Length A (no plug): 1.97cm shorter
Length B (no plug): 0.1cm more negative

Conclusions and Implications

Where significant clinical suspicion exists that breast tissue may provide an impediment to positioning of the laryngoscope during an obstetric intubation, these data suggest that videolaryngosopes with Mac 4 style blades have more favourable geometry than videolaryngoscopes with hyperangulated blades or integrated cameras.

The geometry and characteristics of Mac 4 style videolaryngoscopes appear non-inferior to a standard handled Mac 4 direct laryngoscope for obstetric intubations. The geometry of hyperangualted videolaryngoscope blades were the least favourable in terms of potential impingement on breast tissue, and we propose that unless a specific indication for their use is present they should be avoided as a first choice blade in obstetric intubations.

Where length of the device is likely to pose the greatest barrier to positioning the videolaryngoscope, connection of the electrical plug to the device after placing the videolaryngoscope blade in the oropharynx can optimise geometry.

Future development of new videolaryngoscope blades should ensure that Length A and Length B are optimised, in order to maximise the devices utility and safety in an obstetric setting. These data will also be useful for clinicians involved in procurement decisions regarding videolaryngoscopes in obstetric theatres.

References

[1] Odor PM, Bampoe S, Moonesinghe SR, Andrade J, Pandit JJ, Lucas DN; Pan-London Perioperative Audit and Research Network (PLAN), for the DREAMY Investigators Group. General anaesthetic and airway management practice for obstetric surgery in England: a prospective, multicentre observational study. Anaesthesia. 2021 Apr;76(4):460-471.