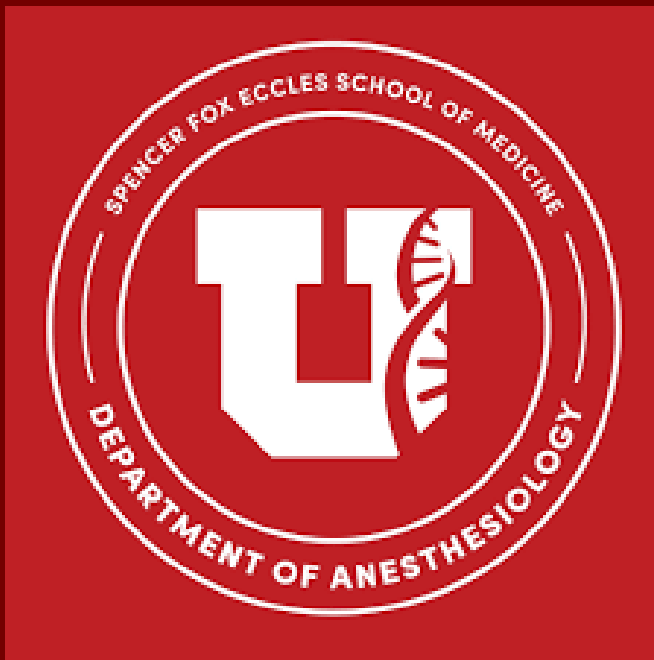
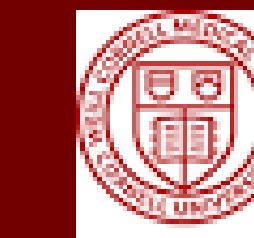




Three Intubations Recorded from Above and Below the Glottis. A Novel Visual Perspective of Intubation.

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Introduction

Successful intubation requires endotracheal tubes (ETT) travel 1) through the upper airway, 2) the vocal cords, and 3) the subglottic trachea. Video laryngoscopes visualize and record the upper airway and glottis. Modern mental models of airway geometry as an anteriorly directed primary curve of the upper airway and a posteriorly directed secondary curve from the glottis to the mid trachea. The angle of inflection between these curves lies hidden below the glottis. Without visual confirmation of this lower part of the serpentine mental model, it may be to directly understand the nature of the inflection point and secondary curve.¹ (See Figure 1)

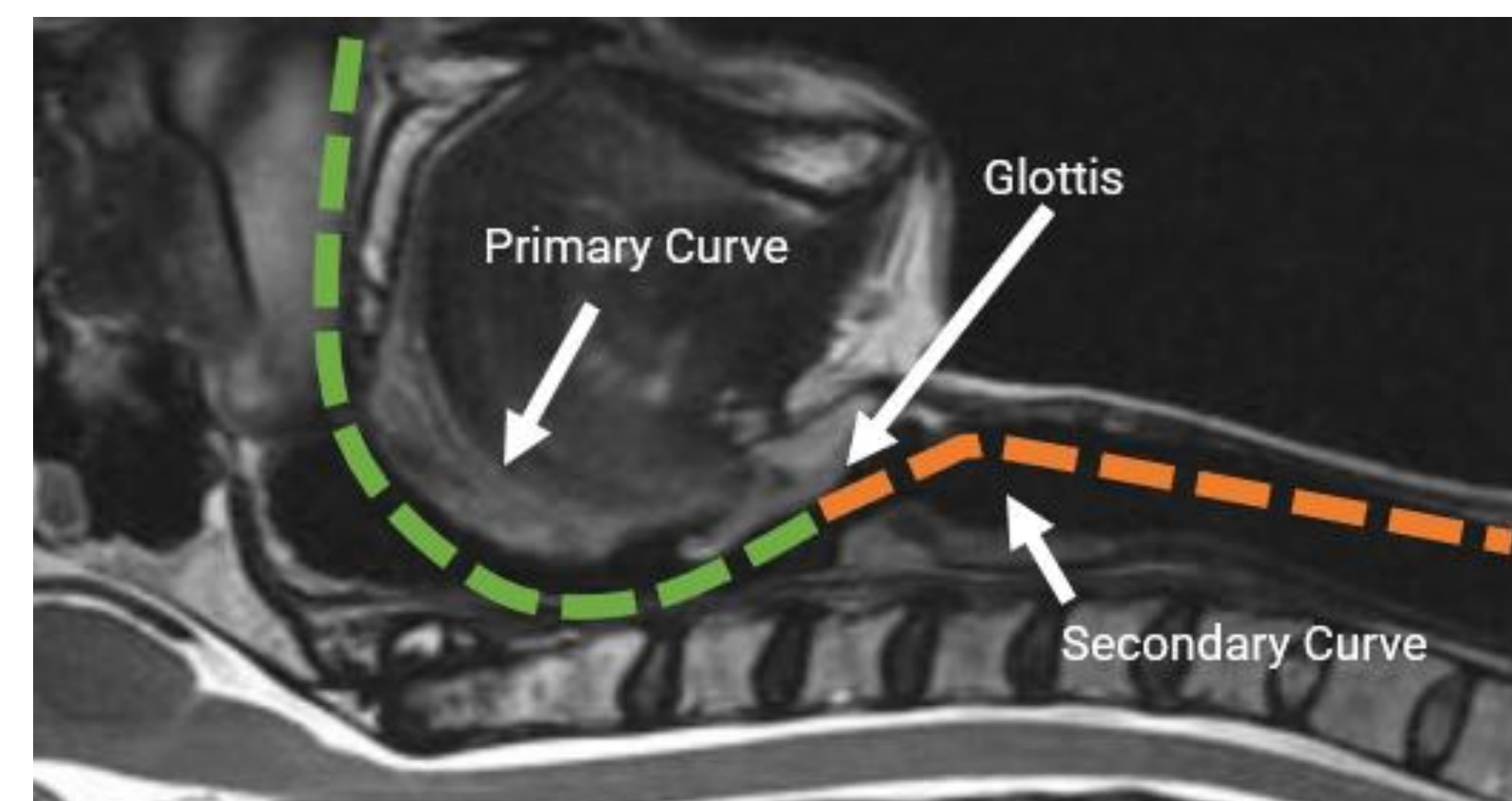


Figure 1. Serpentine airway geometry

Methods

A series of tracheal intubations was recorded simultaneously from above the glottis and below the glottis and proximal trachea. IRB approval was obtained for this study. A bronchoscope inserted into the distal trachea via thoracotomy in a fresh cadaver provided a view of the subglottic trachea.

Three VL intubations were performed while recording simultaneously with the VL and bronchoscope:

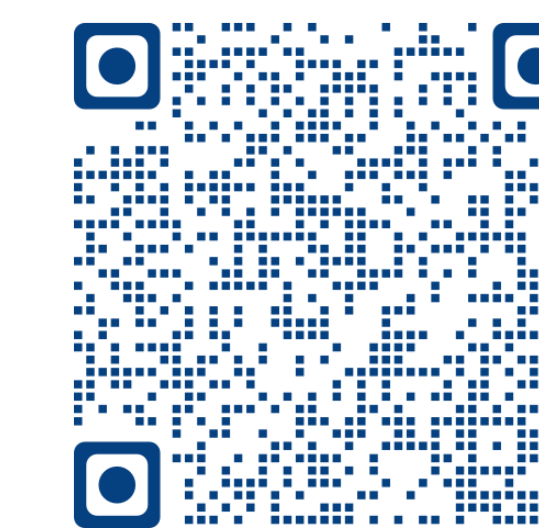
- 1) [Standard geometry blade and a bougie](#)
- 2) [Hyperangulated VL blade and a rigid anteriorly oriented stylet](#)
- 3) [Hyperangulated VL blade and a dynamic introducer](#)

This series of tracheal intubations filmed from above and below the glottis provide based s visualization of the upper and lower airway. We believe this is the first recorded laryngoscope intubation to include the visual perspective of ETTs entering the trachea. This new perspective can give insight into relationships of airway geometry, VL geometry, tracheal access equipment capabilities and the forces applied to the trachea during intubation. (See Table 1.)

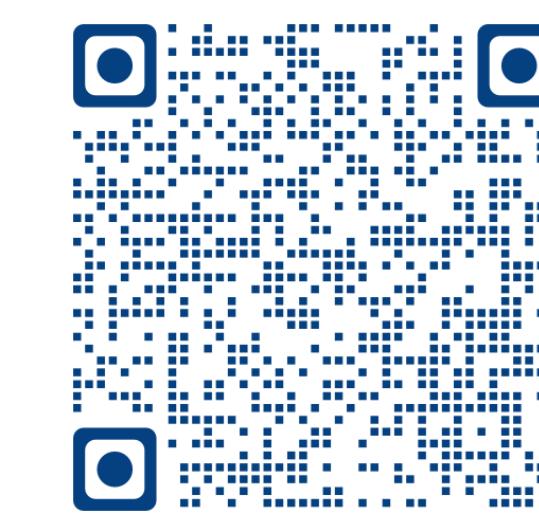
<i>Blade Geometry</i>	<i>Tracheal access geometry</i>	<i>Tracheal Access Equipment used</i>	<i>Contact with Anterior Trachea</i>	<i>Forced Displacement of Anterior Trachea</i>
<i>Standard Geometry VL</i>	Linear	Bougie	Bouie tip bounces on tracheal rings	Mild
<i>Hyperangulated VL</i>	Serpentine	Rigid anterior curved stylet	Tip of ETT collides with anterior trachea	Sever
<i>Hyperangulated VL</i>	Serpentine	Dynamic introducer	No contact with anterior trachea	none

Table 1. Visual characteristics tracheal access of different combinations of VL blade geometry and tracheal access equipment.

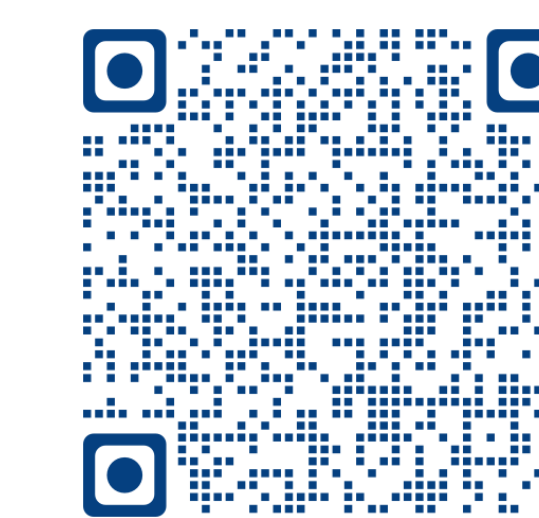
Results



[Standard geometry blade and a bougie](#)



[Hyperangulated VL blade and a rigid stylet](#)



[Hyperangulated VL blade and a dynamic introducer](#)

Conclusions

The forces transmitted to the anterior trachea During tracheal access vary with VL blade geometry and static or dynamic nature of tracheal access equipment used.

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Disclosures

Dr Runnels holds shares in and is the CEO of TTCmed.com

Reference:

1. Greenland KB etal. Changes in airway configuration with different head and neck positions using magnetic resonance maging of normal airways *Br J Anaesth.* 2010;105(5):683-690. doi:10.1093/bja/aeq239