The Sutherland Emergency Department

Airway Corner Newsletter

April 2019

	April			Δ March		
Number of intubations	4			3		
Indications	**Trauma**	**Medical:**		**Trauma**	**Medical**	
	0	ICH/Stroke: 0 Overdose/Ingestion: 0 Sepsis/Resp Failure:1 Cardiac Failure: 2 Arrest: 1		0	ICH/Stroke: 0 Overdose/Ingestion: 1 Sepsis/Resp Failure: 1 Reduced LOC (not OD): 1 Arrest: 0	
Team-leader	**FACEM**	**AT**	**Other**	**FACEM**	**AT**	**Other**
	4	0	0	2	1	0
Intubator	**FACEM**	**AT**	**Other**	**FACEM**	**AT**	**Other**
	3	1	0	1	0	1 (anaesthetics)

	April			March		
Airway ax performed	Yes 2 / No 2			Yes 3 / No 0		
Checklist utilisation	Yes 3 / No 1			Yes 3 / No 0		
ApOx used	Yes 3 / No 1			Yes 2 / No 1		
Induction rx	**Ketamine**	**Propofol**	**Other**	**Ketamine**	**Propofol**	**Other**
	2	1	1 No agents	1	1	1
Paralytic rx	**Rocuronium**	**Suxamethonium**		**Rocuronium**	**Suxamethonium**	
	3	0		2	1	
Laryngoscope	**Direct**	**Video**		**Direct**	**Video**	
	0	4		0	3	
First pass success rate	75%			100%		

Intubation manoeuvres	**Nil**	**NPA/OPA**	**BVM**	**LMA**	**Repositioned**	**Cric**	**Nil**	**NPA/OPA**	**BVM**	**LMA**	**Repositioned**	**Cric**
	3	0	1	0	0	0	3	0	0	0	0	0

	April	March
Desaturation	None	None
Hypotension	None	None
Equipment Failure	None	None
Aspiration	None	None
Oesophageal intubation	None	None
Mainstem intubation	None	None
Laryngospasm	None	None
Drug error	None	None
Airway trauma	None	None
Cardiac arrest	None	None

Please contact D Gaetani or K Ostrowski should any issues arise regarding airway management within the department

Case Dissection

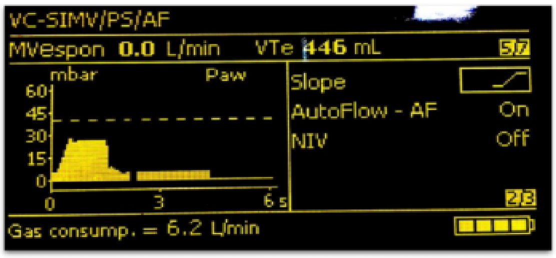
Laryngoscope use

Always ensure that the laryngoscope stays inserted until the endotracheal tube is confirmed in the trachea and the cuff is inflated. This is done for several reasons:

- Allows for the endotracheal tube being visualised going through the cords
- Ensures that the endotracheal tube is inserted to an appropriate depth
- Confirmation that there is no cuff herniation when the cuff is inflated
- Allows for troubleshooting If there is difficulty railroading the ETT over the bougie

Auto-Flow: *Does the VTe = VTi? If not, it might be the Auto-flow.*

Draeger's method of delivering pressure-controlled volume-guaranteed ventilation i.e. you dial up the VT which is then delivered as a decelerating ramp pattern, rather than the traditional VCV square inspiratory waveform (the simplicity of VCV with the benefits of PCV). This works by the vent delivering a low VT breath and measures the end inspiratory pressure. This pressure is then used to deliver a PCV breath and the VT is measured. The pressure is then adjusted +/- 3cmH2O over subsequent breaths to achieve desired VT. Autoflow is automatically turned ***ON*** for the Oxylog 3000 plus. Variable lung compliance (ARDS, Asthma) will lead to inaccurate and lower VT. If you observe that the ***VTe ≠ VTi***, ensure there is no leak (cuff to vent), deepen sedation and re-paralyse to address dysynchrony, and consider turning off Auto-flow (no harm in doing so).



Code Brown Scenario of the Month: Severe + Life-threatening Asthma

DISCLAIMER: ***The following section is aimed to raise awareness about a range of techniques available to tackle difficult airway scenarios. They should be considered in consultation with expert airway operators (ED consultants, ICU, Anaesthetics and ENT).***

Modifying the 9 P's of RSI for Patient's with Status Asthmaticus

1-3% of acute severe asthma requires intubation. Prevention of intubation and mechanical ventilation are the goals of managing acute severe asthma, this can be achieved by maximising pre-intubation therapy. Once an asthmatic is intubated and ventilated their morbidity and mortality increasing dramatically, and it can be difficult to wean from the ventilator. Ensure all medical therapy has been maximised in order to try and avoid having to intubate the critically unwell asthmatic.

Indications for mechanical ventilation

- Cardiac or respiratory arrest
- Reduced level of consciousness
- Progressive exhaustion
- Severe hypoxaemia despite maximal non-invasive oxygen delivery
- Failure to reverse severe respiratory acidosis despite maximal medical therapy
- pH <7.2mmHg, PaCO2 >70mmHg or increasing 5mmHg/hr, or Pao2 <60mmHg

Challenges with mechanical ventilation

- Effective pre-oxygenation impossible
- No margin for error or delay
- Need to be intubated by most experienced person available
- High intrathoracic pressure after RSI and risk of DHI and barotrauma/volutrauma

Preparation (Equipment, People, Place)

Intubation of a severe asthmatic is a high-risk procedure and all efforts must be made to maximize first pass success as prolonged manipulation of the airway can cause bronchoconstriction. This should be done in the resuscitation bay by the most experienced airway operator available. A large ETT should be used (size 8/8.5) in adults to minimize airway resistance and facilitate bronchoscopy. Due to the risk of acute desaturation and hypotension, every attempt should be made to optimize pre-oxygenation and haemodynamics, with a second operator present at bedside should the need for front of neck access be required.

Positioning

The asthmatic patient should be placed in the position of greatest comfort for the patient, this usually is in a seated or semi recumbent position. Once the patient loses consciousness they can remain in this position or be placed in a supine to facilitate laryngoscopy.

Protect c-spine

Not applicable

Pre-oxygenation

Pre-oxygenation is vital when preparing to intubate the patient with severe or life-threatening asthma. All patients should receive apnoeic diffusion oxygenation via high flow nasal prongs or standard nasal prongs at a flow of 15L/min. Spontaneous ventilation via a BVM 15L/min or NIV will provide higher inspiratory oxygen concentrations than a NRM. Delayed sequence intubation (DSI) using Ketamine and NIV (IPAP >8/EPAP =<5) should be considered in patients who are agitated and combative secondary to hypoxia. Consider gentle BVM ventilation during the apnoeic period to avoid risk of critical hypoxia and respiratory acidosis.

Pre-treatment

Medical management should be optimised

- Continuous Salbutamol nebs
- IV Hydrocortisone 4mg/kg
- IV Magnesium Sulfate 0.2 mmol/kg over 20 minutes (Max 2g)
- IV Aminophylline 5mg/kg over 20 minutes then 0.5mg/kg/hr (500mg in D5% 500ml)
- IM Adrenaline 10mcg/kg (Max 500mcg)
- IV Salbutamol 5 – 15 mcg/kg over 10 min (child) or 200 – 300 mcg (adult) then 5 mcg/minute or IV Adrenaline 6mg in D5% 100mls at 1 – 15ml/hr
- Consider Ketamine 0.5 – 1 mg/kg to facilitate DSI

Patient's should receive a crystalloid bolus of 20ml/kg and Adrenaline 10 mcg/ml should be drawn up and ready to administer for the inevitable hypotension which occurs following introduction of positive pressure ventilation in these patients.

Lignocaine 1.5mg/kg administered 2-3 minutes prior to intubation can suppress cough reflexes, however evidence that Lignocaine reduces bronchospasm is less clear.

Plan

The most experienced operator should always have the first pass attempt, and this should be the best attempt. Ventilation of an asthmatic via LMA or BVM may be difficult due to high airway pressures. The team should have a low threshold to progress to surgical cricothyroidotomy if initial attempts at laryngoscopy and rescue devices fail. All members of the team should be briefed on the airway plan prior to induction.

Paralysis and induction

Ketamine would be the optimal induction agent due to its bronchodiliatory effects. Rocuronium would be the optimal paralytic agent as it will keep the patient paralysed for a longer period of time which can help with initial ventilator management. A low dose induction + high dose paralytic strategy should be considered due to risk of post intubation hypotension.

Placement with proof

Standard of care (waveform capnography and chest radiograph)

Post-intubation care

The goals of mechanical ventilation in a critically unwell asthmatic are to

- Reduce work of breathing
- Ensure adequate oxygenation
- Ensure sufficient gas exchange until airway obstruction is reversed

This is done through following an obstructive ventilation strategy while allowing for permissive hypercapnia.

FiO2: Start patients on an FiO2 of 100%, this can be titrated downwards while maintaining an SpO2 92-95%.

RR: Commence at 6-8 brpm prior to connecting to ventilator. RR should be commenced at 10 brpm and titrated to pH and PCO2 according to a permissive hypercapnoeic strategy.

I:E Ratio: Allow for increased expiratory time by decreasing I:E ratio to 1:>4

TV: Start with 6 mL/kg IBW and titrated to pH and PCO2 according to a permissive hypercapnoeic strategy.

PEEP: Use no PEEP i.e. ZEEP, or low PEEP i.e. < 5cm H2O

PMax: Peak inspiratory pressures (PIP) will be high due to airway resistance, so turn PMax to 50 – 60 cmH2O.

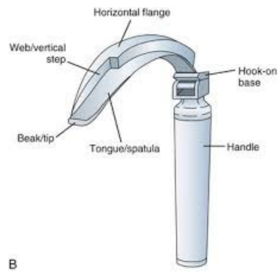
PPlat: Plateau pressure rather than PIP should be monitored for dynamic hyperinflation. Plateau pressure should be kept <30 cmH2O and can be measured by holding the inspiratory old button on the Oxylog 3000.

Troubleshooting the crashing ventilated asthmatic: If there is a sudden clinical deterioration the patient remember to disconnect the patient, compress their chest, administer high flow oxygen via BVM and troubleshoot using the DOPES mnemonic: Displacement of the endotracheal tube, Obstruction of the endotracheal tube, Pneumothorax, Equipment failure, and Stacked breaths. Ventilation of severe asthmatics can be challenging and the patients likely will benefit from being transferred to an ICU level ventilator.

If the PPlat is too high: Decrease RR (min 4 brpm) then TV (min 4ml/kg). Continue neb Salbtamol. Re-paralyse and deepen sedation. Disconnect and externally compress chest to assist ventilation. In-line suctioning.

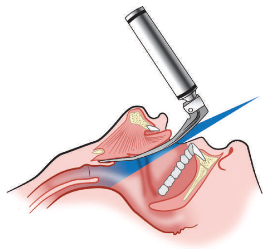
Equipment Fact of the Month: The Laryngoscope

The concept of direct laryngoscopy (DL) is simple—to create a straight line of sight from the mouth to the larynx in order to visualize the vocal cords. The tongue is the greatest obstacle to laryngoscopy. The laryngoscope is used to control the tongue and displace it out of the line of sight. A laryngoscope consists of a handle, a blade, and a light source. It is used as a left-handed instrument regardless of the operator's handedness.

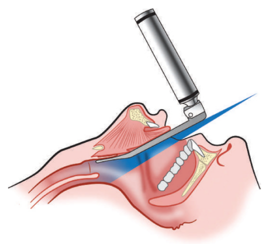


The 1940s saw the development of the Miller and MacIntosh laryngoscopes in common clinical use today. In 1941, Robert Miller described his straight laryngoscope blade, while in 1943 Robert MacIntosh described his curved blade. (MacIntosh hoped that by minimizing contact with the epiglottis, that his laryngoscope would be less stimulating).

Macintosh blades have a gentle curve, a vertical flange for displacing the tongue, and a relatively wide square tip with an obvious knob. Variations of the original Macintosh blade design, which include a smaller vertical flange and a shorter light-to-tip distance, have also been manufactured. The vertical flange height of the size 3 and 4 blades is similar, making it reasonable to start with the longer size 4 blade in all adults. Curved blades are intended to be advanced into the vallecula, and when the knob on the tip makes contact and depresses the hyoepiglottic ligament, the epiglottis elevates, exposing the vocal cords.



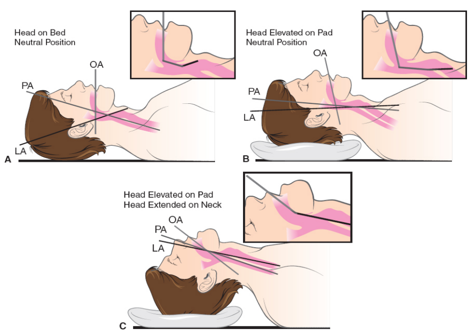
Miller blades have a narrower and shorter flange and a slightly curved tip without a knob. The smaller flange may be advantageous when there is less mouth opening, but makes tongue control more difficult and decreases the area of displacement for visualization and tube placement. Size 3 and 4 Miller blades are nearly identical except for length, so it may be reasonable to start with the longer size 4 blade in most adults. Miller blades are intended to be passed posterior to the epiglottis, to lift it directly in order to expose the vocal cords.



Most operators prefer the curved Macintosh blade because it is wider and allows better control of the tongue; however, the straight Miller blade may provide better visualization of the glottis when there is limited cervical movement, prominent upper incisors, a large tongue, limited mouth opening, or a large and floppy epiglottis, so it is important to master both techniques.

The laryngoscope should be held low on the handle, so the proximal end of the blade pushes into the thenar or hypothenar eminence of the left hand. This grip will encourage lifting from the shoulder, keeping the elbow low, and keeping the wrist stiff during laryngoscopy. The operator should be in an upright position with his or her arms and hands at a comfortable working height, rather than stooping or straining to reach the patient. The patient's bed should be elevated and the operator should step back from the patient so that his or her back is relatively straight during laryngoscopy.

Optimal head and neck positioning for DL is often described as the "sniffing position": lower cervical flexion and atlanto-occipital extension. The sniffing position attempts to align the oral, pharyngeal, and laryngeal axes of the upper airway.



Word on the Street: Mallampatti Score in ED

Green, S.M. & Roback, M.G. (2019). 'Is the Mallampati Score Useful for Emergency Department Airway Management or Procedural Sedation?' Annals of Emergency Medicine.

The Bottom Line: The Mallampati score lacks the accuracy, reliability, and feasibility required to supplement a standard airway evaluation before ED airway management or procedural sedation.

Is the Mallampati Score Useful for Emergency Department Airway Management or Procedural Sedation?

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We review the literature in regard to the accuracy, reliability, and feasibility of the Mallampati score as might be pertinent and applicable to emergency department (ED) airway management and procedural sedation. This 4-level pictorial tool was devised to predict difficult preoperative laryngoscopy and intubation, but is now also widely recommended as a routine screening element before procedural sedation. The literature evidence demonstrates that the Mallampati score is inadequately sensitive for the identification of difficult laryngoscopy, difficult intubation, and difficult bag-valve-mask ventilation, with likelihood ratios indicating a small and clinically insignificant effect on outcome prediction. Although it is important to anticipate that patients may have a difficult airway, there is no specific evidence that the Mallampati score augments or improves the baseline clinical judgment of a standard airway evaluation. It generates numerous false-positive warnings for each correct prediction of a difficult airway. The Mallampati score is not reliably assessed because independent observers commonly grade it differently. It cannot be evaluated in many young children and in patients who cannot cooperate because of their underlying medical condition. The Mallampati score lacks the accuracy, reliability, and feasibility required to supplement a standard airway evaluation before ED airway management or procedural sedation. [Ann Emerg Med. 2019;■:1-9.]

0196-0644/$-see front matter

https://doi.org/10.1016/j.annemergmed.2018.12.021

INTRODUCTION

The Mallampati score is a graded 4-level pictorial scale (Figure) created to predict difficult intubation before general anesthesia[1-3] and is now routinely used for this purpose in operating rooms worldwide.[4,5] The score has subsequently been extrapolated outside of the operating room to procedural sedation, with a number of specialty societies recommending it as a routine screening element.[6-11] The American Academy of Pediatrics, for example, whose guidelines are "intended for all venues," including the emergency department (ED), stipulates that the routine presedation health assessment include a Mallampati evaluation.[6] The Mallampati score is widely embedded in electronic medical records (Figure) as a standard assessment step before both general anesthesia and procedural sedation.

This extrapolation of Mallampati scoring to procedural sedation is noteworthy because it applies a tool designed to predict difficult intubation to a different setting in which intubation is never the objective and is essentially never performed. Its proponents assume that the Mallampati score might similarly predict airway and respiratory adverse events during procedural sedation, as well as potential difficulty with bag-valve-mask ventilation, the key rescue intervention for procedural sedation.

The Mallampati score is intended to supplement, but not replace, the baseline clinical judgment of a general multidimensional airway evaluation.[12-15] This standard airway assessment includes a history and physical inspection of the craniofacial structure to identify risk factors such as short neck, obesity, obstructive sleep apnea, long upper incisors or overbite, restricted mouth opening, micrognathia, macroglossia, laryngomalacia, tonsillar hypertrophy, airway edema, blood or vomit in the airway, cervical immobility, and facial or neck trauma. The quality and reliability of this general airway evaluation will at times be hindered or limited by emergency situations, impaired patient cooperation, and unavailable medical history.

Although meta-analyses of Mallampati score accuracy have been published,[5,16-19] we were unable to identify any clinical review article summarizing the accuracy, feasibility, and reliability of this score in the context of ED airway management or procedural sedation. Accordingly, we performed such a narrative review of the Mallampati score literature as might be pertinent and applicable to the ED setting.

References

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