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Topicalisation and Sedation for Awake Fibreoptic Intubation

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Introduction

Awake Fibreoptic Intubation (AFOI) is an essential core component of the Anaesthetic skill set.

Successful AFOI relies on three critical elements to ensure a successful intubation. Firstly, an informed discussion with the patient and consent for the procedure, appropriate preparation of the airway, which may range from a pure topicalisation to a pure sedation technique or a combination of both and, finally, the ability to steer and navigate the fibrescope.

Experienced fibreoptic endoscopists are likely to have developed their own techniques based on their reading, training and experiences. They will find this application useful as a point of reference and as an aid for teaching registrars about AFOI.

Less experienced fibreoptic endoscopists will become aware of tips & techniques that may enhance their own practice. We would encourage people to develop one technique initially which they can practice and become familiar with. This will help build confidence, reduce stress and increase the likelihood of success.

We realise there are many ways to achieve the desired outcome, so please don't be upset or dismissive if your method of choice or favorite piece of equipment is omitted.

**Consent from all the patients was obtained for photographs.*

Contributors

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Gordon is a board member of the West Australian Airway Group and regularly teaches rescue airway techniques in the "wetlab" at Royal Perth Hospital. His interests include the management of the difficult or failed airway as well as anaesthesia for ENT, head and neck plus emergency neurosurgery.

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Keith has practiced extensively in both private and public Anaesthesia, including 7 1/2 years in Hong Kong during SARS and Bird flu epidemics. He has over 30 publications on difficult airway management and received an M.D. qualification from the University of Queensland in July 2011. His thesis title was "A Reappraisal of Adult Difficult Airway Management Theoretical and Practical Aspects"

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Andy has been involved in airway training and improving airway management since starting at RPH as a Staff Specialist in 2003. He is most well-known for his work on the emergency surgical airway but has also taught and published on many airway related topics. He is currently the WA representative on the Airway SIG, as well as currently being the Chair of the Western Australia Airway Group.

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Richard is a UK trained Anaesthetist currently working as the Airway Fellow at Royal Perth Hospital. He is a member of the UK DA and regularly teaches rescue airway techniques in the "wetlab" at Royal Perth. In addition to his interest in the difficult airway he has a specialist interest in acute pain management. He is the lead editor for the World Federation of Anaesthetists' Tutorial of the Week project and has an interest in supporting anaesthesia in developing world countries.

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Reny has established a national fibre-optic training program for specialists, a national airway program from trainees (NATCAT) and is involved in numerous other airway training events both in Australia and beyond. He is one of the founders of theAirway SIG and was it's previous chair. He lectures on the subject of airway management and training and has a number of publications in this field. He is a full time public cardio- thoracic anaesthetist and has a part time private practice in Melbourne.

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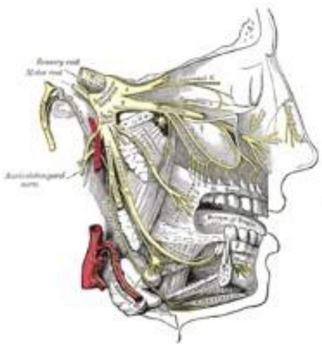
Neuro-Anatomy of the Airway

For an awake intubation to be well tolerated and ultimately successful, gag and cough reflexes need to be suppressed effectively and laryngospasm prevented.

Airway topicalisation for awake fiberoptic intubation involves anaesthetising two or three nerves that innervate the airway at different levels depending on whether a nasal or oral intubation is being performed.

1. **Trigeminal nerve branches** - Sensory innervations of the nasal cavity.

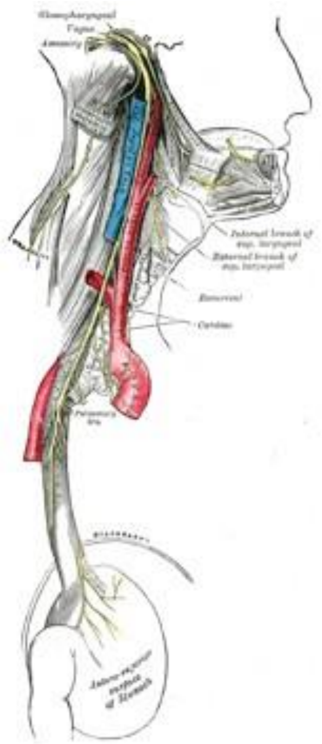
- **Nasociliary nerve (V1)**
- **Nasopalatine nerve (V2)**
- **Posterior branches of Maxillary nerve (V2)**

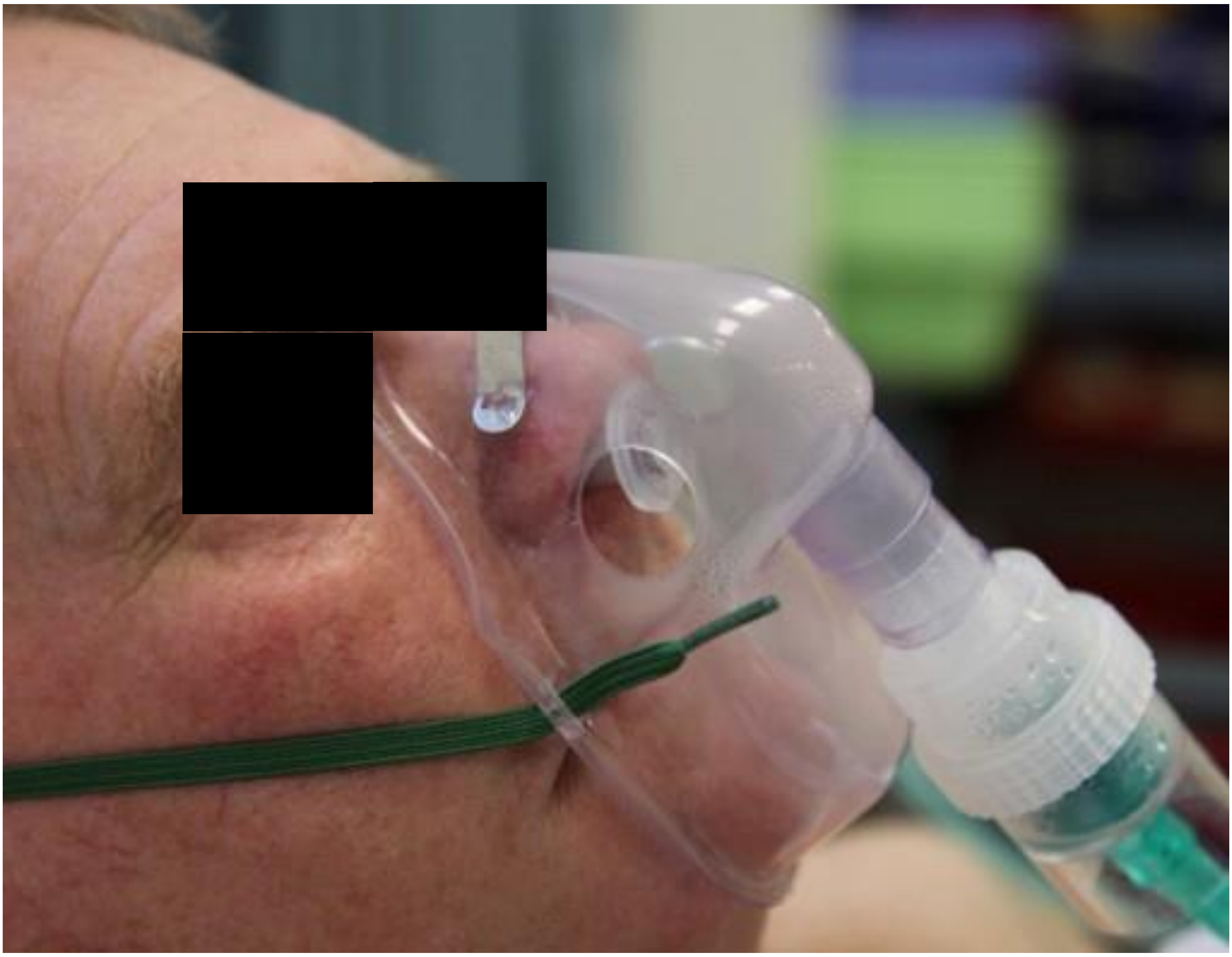


2. Glossopharyngeal nerve - Sensory innervations of the posterior two thirds of the tongue, fauces, tonsils, epiglottis and the pharynx.

3. Vagus nerve branches

- **External branch of the Superior laryngeal nerve** - Motor innervation to Cricothyroid muscle.
- **Internal branch of the Superior laryngeal nerve** - Sensory innervation to the larynx above the vocal cords.
- **Recurrent laryngeal nerve** – Sensory innervation to the larynx below the vocal cords and upper trachea. Motor innervation to most of the vocal musculature.





Local Anaesthetics

Lignocaine and Cocaine have a rapid onset of action and are the most commonly used local anaesthetics in airway anaesthesia. Benzocaine and tetracaine are equally effective agents for this purpose. The goal is to efficiently anaesthetise the upper airway and trachea whilst using a safe amount of local anaesthetic agent. Large proportions of local anaesthetic used for topicalisation may be lost to the external environment or absorbed through the gastric mucosa. Addition of a vasoconstrictor to local anaesthetics does not slow their systemic absorption, but does suppress the peak level. Management of suspected local anaesthetic toxicity should be based on local guidelines.

Cocaine

Cocaine has intrinsic vasoconstrictor properties making it a desirable agent to anaesthetise the nasal mucosa that is vulnerable to bleed during instrumentation. The anaesthetic effect of cocaine is rapid, however its vasoconstrictor effect takes 5-10 minutes to achieve. The recommended **maximum safe dose is 1.5mg/kg**. In addition to its local anaesthetic toxicity in larger doses, it also has the potential to cause tachycardia, hypertension, dysrhythmias and seizures. Its accessibility is restricted due to the potential for misuse. Cocaine as an ester local anaesthetic should not be used in porphyria. Moffatt's Solution is not recommended.

Lignocaine

Lignocaine is available in different concentrations (0.5%-10%) and preparations: solution, paste, gel, thickened fluid for gargling, mixed with adrenaline, and phenylephrine for vasoconstriction. The widest margin of safety makes lignocaine the most popular local anaesthetic for topicalisation. Concentrations of 2% and 4% are used for topicalisation, and 1% - 2% concentrations are more commonly used for regional anaesthesia. We recommend the use of at least 3% lignocaine in airway topicalisation so as to minimise the risk of inadequate airway anaesthesia.

Preparation of phenylephrine 0.5% and lignocaine 5% spray (CoPhenylcaine is used to minimise nasal bleeding by vasoconstriction of the nasal mucosa.

Lignocaine is rapidly absorbed through the mucosal membrane of the respiratory tract. Total absorption is typically higher with topicalisation for diagnostic bronchoscopy than for intubation alone. Plasma concentration below 5 mcg/ml is effectively safe without clinical toxicity. The absorption process varies markedly between individuals. Peak plasma concentration is achieved in 20-30 minutes. Early symptoms of lignocaine toxicity are better tolerated with sedation. Without sedation, symptoms like light-headedness, dysphoria, dizziness and drowsiness are reported with plasma concentrations of lignocaine as low as 2.5 mcg/ml.

Absorption of effective doses of local anaesthetics is difficult to predict due to the marked variation in the pharmacokinetics of the local anaesthetic absorption between individuals.

In addition, the absorption of local anaesthetic markedly varies between individuals. In patients with liver disease, congestive heart failure and advanced age, the plasma concentration of lignocaine is higher. This is due to decreased clearance and increased bioavailability. The British Thoracic Society recommends 8.2 mg/kg of lignocaine for topicalisation for diagnostic bronchoscopy. Woodall et al recommends up to 9 mg/kg of lignocaine.

Lignocaine Plasma concentration	Clinical features
5 mcg/ml	Onset of symptoms
8-12 mcg/ml	Seizure
20-25 mcg/ml	Cardiac arrest

Conclusion

A maximum of **8-9mg/kg lignocaine** can be used for topicalisation with sedation. Variation in local anesthetic absorption needs to be taken into consideration.

Airway Preparation

There are many methods to prepare the airway for awake fibreoptic intubation ranging from a pure local based anaesthetic techniques to pure sedation or a combination of both techniques. Airway preparation should include antisialagogues. There is no ideal way to prepare the airway rather the preparation should be individualised for the patient determined by the clinical situation and degree of urgency. If you are not performing topicalisation on a regular basis, the preparation should be a technique that you can use in most clinical circumstances.

This allows you to practice that technique regularly.

With a local anaesthetic based technique it is important to ensure adequate anaesthesia prior to instrumenting the airway. This is in practice often difficult to elucidate and we would encourage using a sufficient dose of lignocaine prior to attempting fibreoscopy. Two endpoints are the loss of gag and voice change.

The emphasis is to titrate to the endpoints of the patient rather than administrating a prescribed dose that may be inadequate or excessive.

Topicalisation Techniques

Whichever technique is chosen, it is important to work out the maximum safe dose that can be used for topicalisation taking into account variations in local anesthetic absorption.

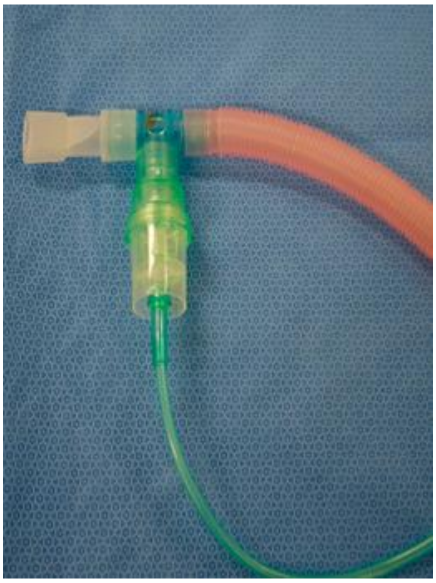
Spraying techniques	Direct application	Regional blocks
Nebuliser	Pledgets /Swab sticks	C.N. IX
Atomiser	Gargling	Superior Laryngeal Nerve blocks
Aerosols	Transtracheal injection	
	“Spray as you go” via FOB	

The absolute maximum lignocaine dose is 8-9 mg/kg and is dependent on the method of local anaesthetic administration; ie “Spraying/Aerosolised techniques = 8-9 mg/kg, where as regional blocks are 2-3 mg/kg.

The most popular ways of topicalisation are:

- Nebulised (via an nebulising Hudson mask)
- Aerosolised (via a Mucosal Atomising Device or a De Vilbiss type atomiser)
- Nerve blocks (blocking the super laryngeal block).

The nebulised and atomised modalities are short acting. These modalities will provide around 10 - 15 minutes of effective topicalisation once the endpoints have been acheived. It is extremely important to start the AFOI at the instant the topicalisation is finished and ideally by the 10 minute mark the patient should be intubated and asleep. That time frame implies a high degree of organisation (patient, equipment, theatre logistics, staff, sedation) prior to starting topicalisation.

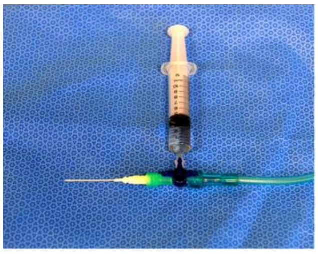
1. Nebulised:

Nebulisers are a non-invasive technique that can be implemented in situations with limited resources and are designed to deliver very fine particles of drugs to the distal airway. As a sole technique it may provide adequate anaesthesia for instrumentation of the airway. However combined with other techniques, it provides better patient acceptance and haemodynamic stability. Facemask nebulisation can be used for nasal or oral topicalisation.

4 - 5ml of 2%, 4% and 10% lignocaine can be nebulised for 10 -15 minutes *(doses will vary depending on weight and techniques employed).* The patient is asked to take shallow breaths to topicalise the more proximal airway and to take slow deep breaths for the more distal airway. This process may need repeating to ensure adequate airway anaesthesia.

For nasal intubation a facemask that covers the mouth and the nose can be utilised. It is important to ensure the patient does not speak during nebuliser application. If oral intubation is planned, a nebuliser attached to a mouthpiece is sufficient.

2. Atomiser:



The atomiser is a drug delivery system that is potentially the most efficient method of topicalising the airway due to the generation of very small local anaesthetic droplets and the ability to directly spray these into the pharynx, larynx and trachea from the mouth. The atomised droplets are smaller than nebulised droplets, so the local anaesthetic will penetrate the tracheo-bronchial tree with ease. The mist generated with the local anaethetic is also extremely well tolerated.

A) DeVilbiss Model 163 Atomizer®

This atomiser has been commercially available in Australasia since 2006. However it has been used routinely for over 2 decades in the US with excellent results and no reported toxic results.

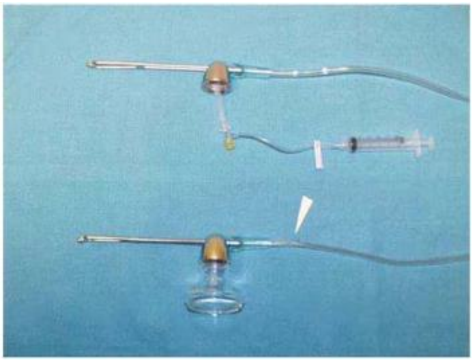
The DeVilbis atomiser is a glass atomiser. It has an adjustable tip to direct the flow of particles. The glass container is filled with the required amount of 2% or 4% lignocaine.

Activating the atomiser to spray: Oxygen set at 10L/min is connected to the atomiser via the green bubble tubing. The activation can be controlled by cutting a small hole in the tubing and intermittently occluding the hole to create the venturi effect of mixing oxygen with local anaesthetic.

Patient positioning: The patient is positioned supine with head elevated or in a beach chair position.

The atomised particles are initially aimed posteriorly towards the nostrils and the pharynx. The tip is then directed towards the larynx for laryngeal and tracheal topicalisation. The flow can be timed for inspiration by controlling the oxygen flow.

Alternatively attaching a paediatric intravenous tubing and a syringe to the intake tube, rather than the glass container, can modify this device. This modification provides better control of the local anaesthetic delivery.



Advantages:

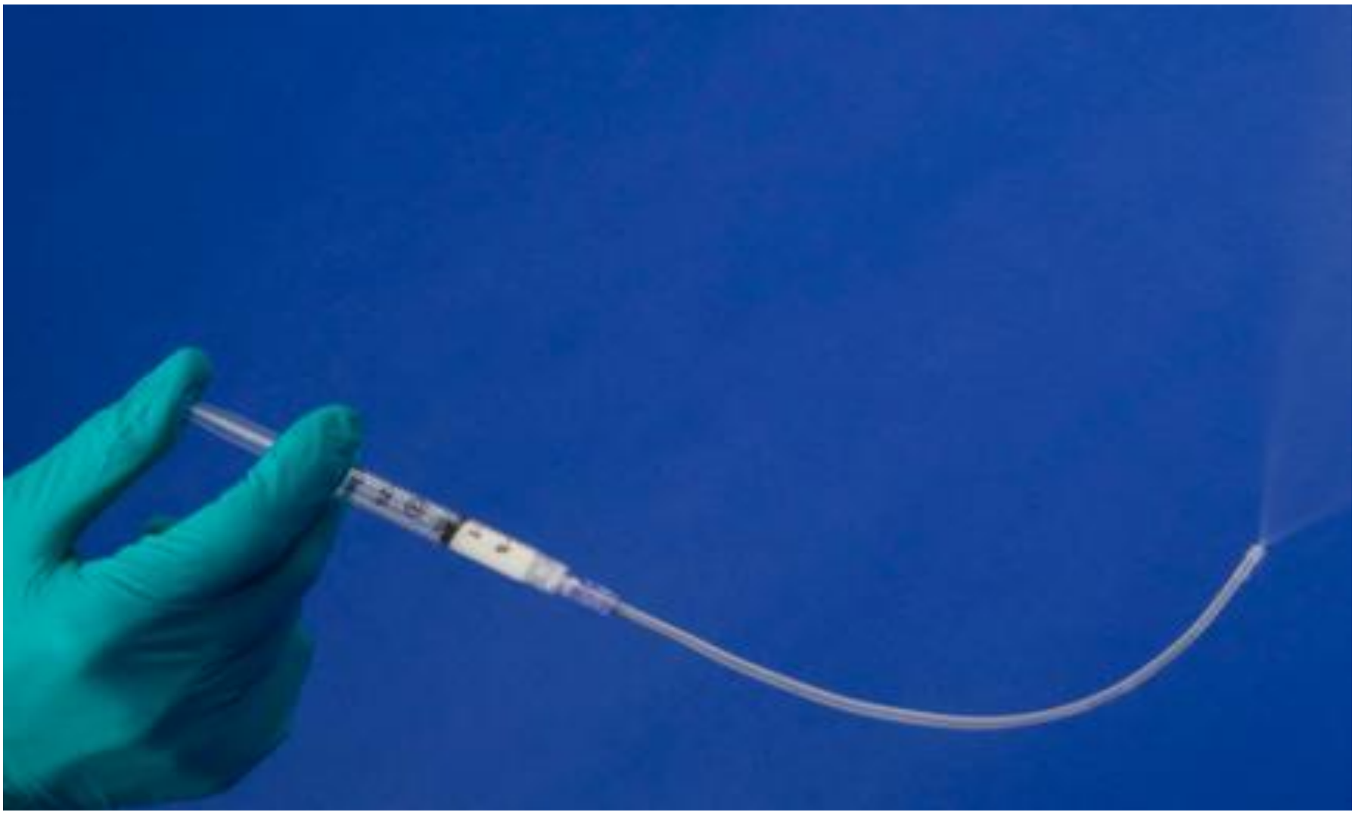
- Better control and efficient use of the local anaesthetic.
- The metered dose can be timed to match inspiration. Thus facilitates carriage of the local anaesthetic to the distal airway.
- High-powered mist generated by the atomiser is directed into the airway."

Disadvantages:

- Needs to be sterilised between patients.

B) Mucosal Atomiser Device: MADgic® (Wolf Troy Medical INC)

This disposable latex-free device releases 30-100 micron particles through its nozzle. The particles are larger than those produced by the DeVilbiss glass atomiser. This may reduce the amount of local anaesthetic absorbed from the distal airway.



The soft plastic coating around the cannula can be pre-shaped to facilitate the delivery into the nostrils, oropharynx and into the larynx. There is a luer lock connection that allows a syringe or 3-way tap and oxygen to be attached so the operator can accurately control the delivery of local anaesthetic agent.

This is particularly advantageous when the volume and dosage of local anaesthetic is limited

e.g. weight less than 40kg.

Advantage: " " Disposable

Disadvantage: " Difficult dose conservation as large volumes are required to generate the

" " " atomisation

3. Gargling:

Gargling targets the glossopharyngeal nerve as it traverses the oropharynx and is extremely useful for suppressing the gag reflex. After gargling, excess solution is expelled. This prevents the excessive systemic absorption. Since this method only anaesthetises the oropharyngeal surface, further topicalisation is required to anaesthetise the larynx and the trachea. It is useful in conjunction with any technique when gagging remains troublesome.

4. Nasal-Oro-Pharyngeal Spray

Spraying a local anaesthetic solution facilitates the coating of the mouth and oropharynx, ie a lignocaine solution or Co-phenylcaine spray.

5. Spray as you go:

A fibreoptic bronchoscope can be used to apply local anaesthetic to the laryngeal inlet and the tracheal mucosa. After the oral or nasal mucosa has been anaesthetised, a fibreoptic bronchoscope is inserted and the tip is advanced under direct vision to just above the epiglottis, the vocal cords and other glottic structures. Local anaesthetic and air mixtures are then injected through the working channel of the bronchoscope. Insertion of an epidural catheter through the working channel is an alternative to facilitate a diffuse spread of local anaesthetic and may reduces the local anaesthetic requirements further as the delivery may be more accurately applied.

As the operator locates the target structures, the assistant injects the local anaesthetic through the epidural catheter. Anaesthetising the airway is performed in stages and after the spray of local anaesthetic at each stage, 30-45 seconds is required to achieve topical anaesthesia.

In practice and on courses we have found that adequate topicalisation can be achieved if the tip of the scope is aimed at structure, e.g. epiglottis, left cord, right cord when spraying down the channel without epidural catheter.

The combined techniques of nebulised lignocaine and spray-as-you-go can produce favourable conditions for intubation. However, care should be taken in calculating the total dose of lignocaine, when using the combined technique.

6. Nasal:

A) Pledgets / Cotton Swabs

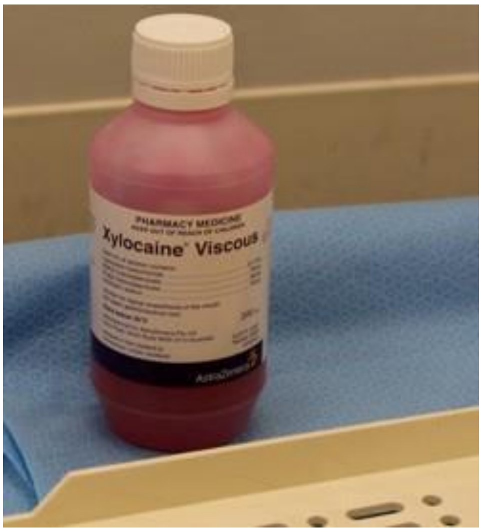
Cotton swabs or pledgets soaked both in a mixture of lignocaine and adrenaline, or with cocaine, are inserted and advanced gradually along the floor of the nose. Alternatively, pledgets soaked in a mixture of lignocaine and phenylephrine can be applied. It is generally easier to use Co-phenylcaine spray. Pledgets need to be inserted between inferior and middle turbinates to anesthetise the sphenopalatine ganglion. The pledget is left in place for several minutes to anaesthetise the branches of ethmoidal and trigeminal nerves. This method provides better nasal anaesthesia than nebulisation. This also verifies that the nasal airway is patent for intubation and secretions have been removed. The nasal airway may need to be topicalised with a local anaesthetic spray before this is attempted.

B) Serial Nasopharyngeal Insertion

A series of nasopharyngeal airways are used to topicalise and size the nasal airway. A smaller airway coated with viscous lignocaine gel 2% is inserted into the allocated nostril and left in there for a few minutes.

This technique is repeated with gradually larger sizes of airway until the size of the endotracheal tube selected for intubation is reached. This procedure can be uncomfortable at the beginning.

Lignocaine gel used in this method can however obstruct the view through a bronchoscope and the nasopharyngeal airways may cause bleeding.



Sedation Techniques

Use of sedation in patients having an awake fibreoptic intubation can improve the patients experience and the quality of intubating conditions. There are proponents such as the Aintree group, who advocate a pure sedation technique over a topicalisation approach, however a heavily sedated patient undergoing bronchoscopy is at risk of laryngospasm and loss of airway due to lack of cooperation. Great care should be taken with the pure sedation technique. It is also important to remember that the best anxiolytic is reassurance from a confident Anaesthetist, not midazolam. It is probably reasonable to say amnesia is not always required as patient satisfaction will still be good as long as they did not experience major discomfort.

The key to this approach is that a specific person is responsible for the sedation and a separate person performs the intubation. The medication used in this approach should ideally be reversible. For this reason, Propofol should be used with caution when performing an awake fibre optic intubation. The dosing regime may need to be modified according to the current medical condition and physical status of the patient.

For combined topicalisation-sedation techniques, the aim is to obtund pain, gag and cough with some conscious sedation. Ideally analgesics and sedation should be commenced before the airway topicalisation to minimise the unpleasant sensation and the taste of local anesthetic.

The selected technique should provide patient comfort and have a wide margin of safety so that the chance of loss of consciousness is remote. Discretion should be used when administering midazolam together with opioids (which suppress the gag reflex) because of the synergism in causing respiratory depression.

An ideal agent should

- Be short acting and easily titratable
- Be rapidly reversible if over sedation occurs
- Maintain the compliance of the patient
- Have the peak effect to match with the procedure

The dose of the specific agent needs to be strictly titrated to maximise the patient comfort whilst maintaining a patent airway and adequate spontaneous ventilation. Level of stimulation varies with different stages of fiberoptic intubation and this leads to variation in requirement of sedation. Therefore, rapidly titratable, fast acting agents are best suited to this procedure.

Remifentanil is probably the ideal first line agent to use for providing sedation for fibreoptic intubation.

Risks of Sedation

- Minute ventilation is reduced
- Hypercapnoea
- Hypoxia
- Causes sleep apnoea and airway obstruction in at risk patients
- Loss of compliance

Agents

1. Remifentanil:

Is a potent, ultra short acting, titrable opioid, which is metabolised by non-specific plasma and tissue esterases. It can effectively minimise both the patient's cough (antitussive) and gag reflex. It has a short context sensitive half time and can be reversed by intravenous naloxone 100 mcg - 400 mcg. The preferred concentration for remifentanil should be 20-40 mcg/ml to aid with rapid changes in titration rather than higher concentrations which are more suited to analgesic infusion for longer cases.

Remifentanil target control infusion (TCI) with the Minto pharmacokinetic model may be used. An effect site target concentration of 3 ng/ml is achieved at the beginning and then the concentration is titrated according to the desired intubating condition without causing significant respiratory suppression. Individual variation in opioid tolerance needs to be taken into consideration when initiating the remifentanil infusion.

As a sole agent for nasal endoscopy the mean (SD) effect site concentration has been reported as 6.3 (3.87) ng/ml titrated up to 8.06 (3.52) ng/ml for tracheal intubation.

Remifentanil	Initial Regime
Minto TCI	3 ng/ml
Infusion	0.5 -1.0 mcg/kg bolus followed by 0.05 -0.1 mcg/kg/minute infusion
The dosing regime may need to be modified according to the current medical condition, physical status of the patient and stage of the procedure.	

Alternatively remifentanil may be given by a controlled bolus followed by infusion. If you are not familiar with bolusing with remifentanil then this is not the time to experiment. Start with an infusion of 0.05 – 0.1 microgram per kilogram per minute and titrate up or down as required. This should ideally be started 5-10 minutes prior to the endoscopy.

Lack of anxiolytic and amnesic properties of opioids may require titration of anxiolytics, such as midazolam (maximum 5 mg) in selected patients. However this can have potentially dangerous synergistic effects.

2. Fentanyl / Midazolam combination:

Fentanyl is a highly lipid soluble opioid with a slower onset and longer duration of action than remifentanil. It has been successfully used, often in combination with midazolam, for conscious sedation for fibreoptic intubation. These drugs are familiar and easily titratable.

However, the synergistic effects can produce excessive sedation with further adverse consequences. Importantly they can be rapidly reversed. Naloxone is used to reverse fentanyl and flumazenil 10-20 mcg/kg iv can reverse the effects of midazolam.

Combined	Initial Regime
Fentanyl	1-1.5 mcg/kg bolus (up to 3 mcg/kg WITHOUT midazolam)
Midazolam	25 -50 mcg/kg bolus (max 5mg)
The dosing regime may need to be modified according to the current medical condition, physical status of the patient and stage of the procedure.	

3. Propofol:

Propofol can be administered by either continuous infusion with a fixed rate or by target control infusion. The Schnider pharmacokinetic model is available in many infusion pumps for target control infusion of propofol. Initial target of the effect site concentration is 0.5 mcg/ml.

Then the desired level of sedation is achieved by changing the effect site concentration by 0.1-0.2 mcg/ml.

Propofol	Initial Regime
Schnider TCI	0.5 mcg/ml
The dosing regime may need to be modified according to the current medical condition, physical status of the patient and stage of the procedure.	

The short duration of action and anxiolytic properties make propofol appear, at least initially, like a good agent for sedation for fibreoptic intubation. However, propofol requires careful titration to avoid airway obstruction and loss of cooperation of the patient given its narrow window between sedation and general anaesthesia.

4. Dexmedetomidine

Dexmedetomidine is a short-acting, highly selective, alpha 2 adrenergic receptor agonist. It has both sedating and analgesic properties with minimal respiratory suppression even in deep sedation. This differs from benzodiazepines and opioids.

Patients sedated by dexmedetomidine are able to communicate and cooperate with the clinician. It also has anxiolytic and antisialog properties. The latter is a favorable feature for fiberscope visibility. Dexmedetomidine may have some amnesic properties as well. Initial bolus of 1.0 mcg/kg over ten minutes and infusion of 0.5 to 1 mcg/kg/h, is titrated to desired level of required sedation.

Dexmedetomidine	Initial Regime
Infusion	1 mcg/kg loading dose over 10 minutes followed by 0.5 mcg/kg/hour infusion
The dosing regime may need to be modified according to the current medical condition, physical status of the patient and stage of the procedure.	

It is worthwhile pointing out that dexmedetomidine is not rapidly titratable and has none of the antitusive properties afforded by the opiates. Bradycardia and hypotension are some of the potential problems with dexmedetomidine and can be seriously detrimental to patients with cardiac disease. Initial bolus is infused over 10 minutes to avoid the bradycardia. Currently dexmedetomidine does not have any reversal agent in an emergency.

5. Ketamine

Ketamine can provide analgesia and sedation for awake intubation. Unlike opioids, ketamine does not cause significant impact on the respiratory drive. 0.2 - 0.5 mg/kg bolus of ketamine can be used as a sole agent or at reduced doses in combination with midazolam. Secretions however, may be increased and be problematic.

Antisialagogues

These are important in minimising the secretions and to be effective need to be given 30 -45 minutes prior to the endoscopy.

Antisialagogues	Regime
Glycopyrrolate	2-4 mcg/kg (max dose 400 mcg)
Atropine	5 mcg/kg (max 600 mcg)
The dosing regime may need to be modified according to the current medical condition, physical status of the patient and stage of the procedure.	

In addition, having a flow of O_2 through the suction port of scope will also aid in eliminating and mobilising secretions from the field of view.

Regional Airway Anaesthesia

Regional anaesthesia of the airway provides more effective anaesthesia than nebulised methods, resulting in better suppression of airway reflexes and reduces haemodynamic changes during intubation. Transtracheal injection, superior laryngeal and glossopharyngeal nerve blocks are invasive techniques used alone or in conjunction with other techniques.

Transtracheal injections and superior laryngeal nerve blocks are the most commonly used regional techniques for airway anaesthesia. Regional anaesthetic techniques are not always safe, possible or effective, specifically with inexperienced practitioners, patients who are unable to open their mouths, in the setting of grossly distorted anatomy or infection (submandibular abscess or anterior neck haematoma).

Glossopharyngeal Nerve Block

Sensory innervation of the posterior two thirds of the tongue, oropharynx and epiglottis can be anaesthetized by glossopharyngeal nerve block. As a result, the sensory limb of the gag reflex is interrupted. This facilitates the passage of a bronchoscope and an endotracheal tube through the pharynx.

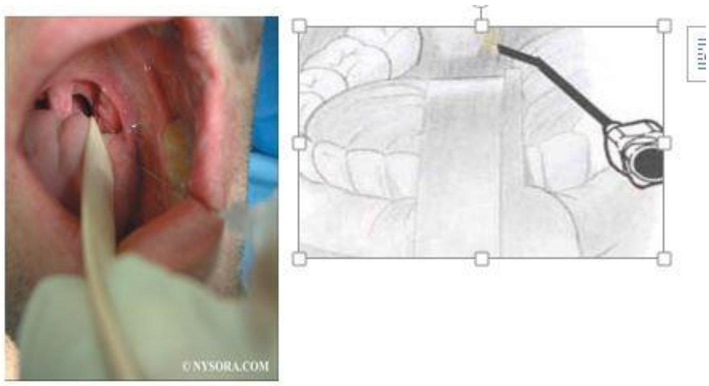


Figure 2 [6]

Intraoral approach:

This technique requires good mouth opening to locate the posterior tonsillar pillars. The mouth needs to be topicalised before the injection. Whilst the tongue is displaced medially, a long 22-gauge needle is used for submucosal infiltration. The injection of 5 ml of 2% lignocaine is performed at the caudal aspect of the posterior tonsillar pillars. This can be repeated bilaterally.

Peristyloid approach:

The styloid process is located at the midpoint between the tip of the mastoid process and the angle of the jaw. A line is drawn between these two structures and the midpoint is marked. After a small amount of skin infiltration with local anaesthetic, a 22 gauge needle is inserted at the mid-point perpendicular to the skin, until it has contact with the process. This is normally achieved at a depth of 1-2 cm. The needle is then walked off the process posteriorly until no resistance is felt. After negative aspiration, 5-7ml of 2% lignocaine is injected. This is repeated on the contralateral side.

Superior Laryngeal Nerve Block

This is a commonly utilised regional technique to anaesthetise the base of the tongue, the posterior surface of the epiglottis, aryepiglottic fold and arytenoids. This can be used to consolidate the topical application of local anaesthetic or as a sole agent to anaesthetise the above structures.[2] The superior laryngeal nerve is blocked bilaterally at the greater cornu of the hyoid bone where it passes medially. At this level it divides into a larger internal and smaller external branches.

The patient is positioned supine with slight neck extension. The hyoid bone is displaced laterally towards the side of the injection and a short beveled needle is inserted and walked off the inferior margin of the greater cornu of the hyoid. The needle advanced 2-3 mm so that the tip lies between the thyrohyoid membranes laterally and laryngeal mucosa medially.

Following negative aspiration for both blood and air, 2-3ml of lignocaine is injected. The procedure is repeated on the contralateral side. If locating the hyoid bone is anatomically difficult, the superior cornu of the thyroid cartilage can be walked off in a cephalad direction to achieve the same results.

Ultrasound may be used to guide this block when anatomy is difficult to distinguish.

Care should be taken when doing this block due to the close proximity of vascular structures.

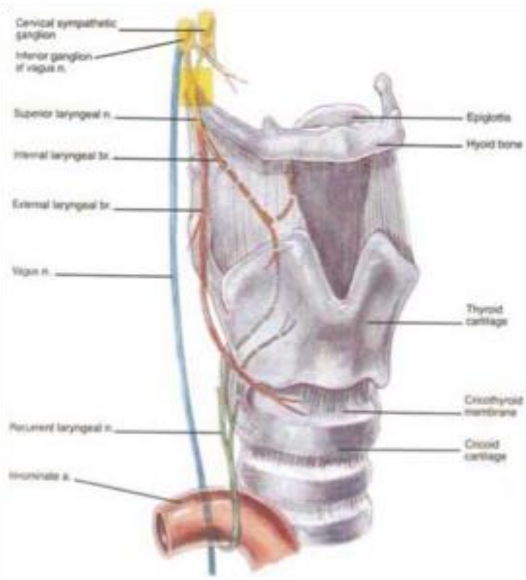


Figure 3 [6]

Transtracheal Injection

The cricothyroid membrane is located anteriorly between the thyroid cartilage and cricoid ring. The patient is positioned supine and the neck is slightly extended. The cricothyroid membrane is identified and marked. A 22-gauge needle or intravenous cannula with syringe attached is inserted in the midline, angling slightly caudal with negative aspiration. When the anterior tracheal wall is passed, air should be aspirated freely, and then 4-6 ml of lignocaine (2% or 4%) is injected.

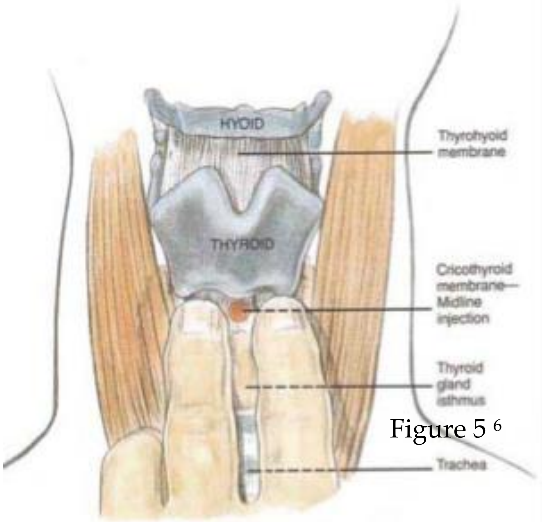


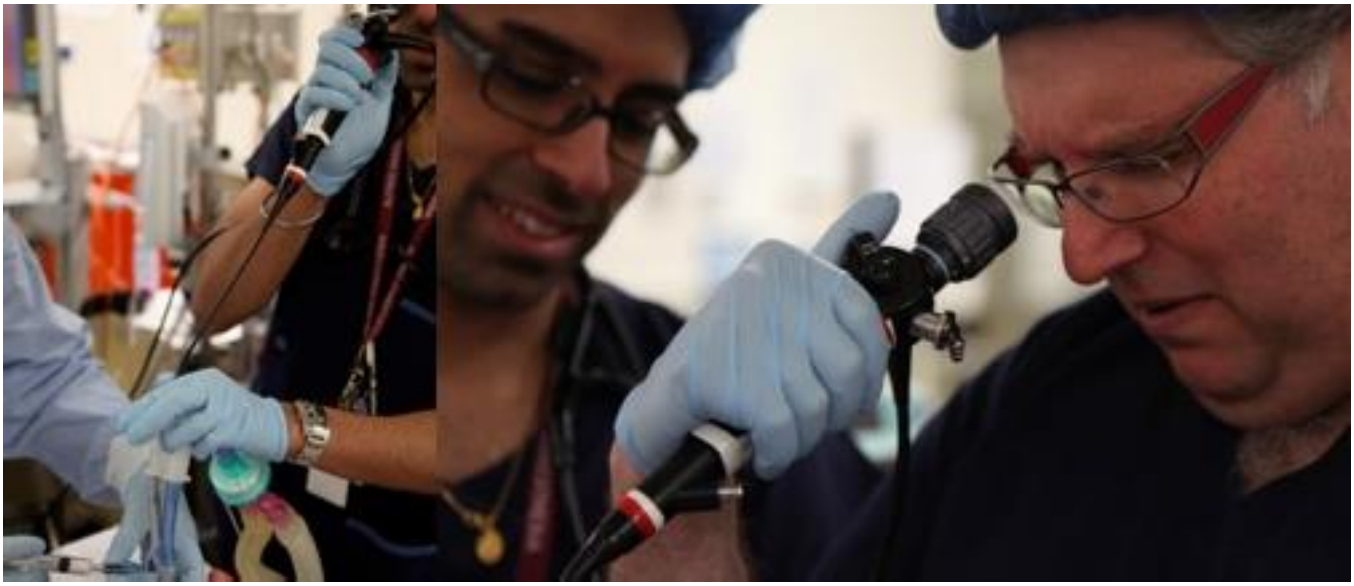
Figure 5 [6]

The needle needs to be removed quickly as the local anaesthetic often triggers intense coughing. Coughing causes the retrograde spread of the local anaesthetic. If a cannula is used it can be left in place, so injections may be repeated or jet oxygenation performed. The trachea and structures below the vocal cords are anaesthetised very quickly with this method.

Transtracheal injection can be utilised in conjunction with other techniques to anaesthetise the structures above the vocal cords.

Complications of the Regional Technique

Regional techniques are invasive and can be associated with inadvertent intravascular injection, haematoma formation and nerve injuries leading to vocal cord paralysis. Vagal responses of bradycardia and hypotension have been attributed to both glossopharyngeal and superior laryngeal nerve blocks. The spread of local anaesthetic to the carotid bulb and the main trunk of the vagus may trigger this response. Care needs to be taken when the hyoidbone is handled as it can be easily fractured.



Indications & Cautions

Indications

Fibreoptic intubation is best suited to the non-emergency management of an anticipated difficult airway or to confirm double lumen tube placement. It is particularly indicated if bag and mask ventilation and intubation are both predicted to be difficult. Commonly, fibreoptic intubation is performed if there is a history of previous difficult intubation.

Fibreoptic intubation is best employed in cases with:

1. Pathology present outside the airway when the normal airway anatomy is maintained (e.g. trismus, radiation scarring, cervical spine injury, morbid obesity)
2. Pathology in the upper airway above the larynx (cellulitis, tumours, upper airway burns)

Contraindications

1.Uncooperative patients.

Cautions

1. Bleeding in the airway makes vision very difficult. *This technique should be used with vigilance when there are haemorrhagic lesions in the airway because of the risk of bleeding and airway compromise.*
2. Gross airway distortion in the laryngo-pharynx e.g. certain laryngeal tumours. *An awake surgical airway may be a better choice.*
3. A fixed laryngeal obstruction e.g. from laryngeal tumours with stridor implies an airway diameter of 4mm or less. *A fibreoptic bronchoscope with an endotracheal tube loaded on will not be able to pass through this obstruction even if the cords were able to be identified.*
4. Airway topicalisation and instrumentation can cause complete airway obstruction, *therefore extreme caution must be exercised in using this approach in a patient who presents with significant respiratory distress or airway compromise.*

Fibrescope

A fibreoptic endoscope is a hand-held device consisting of tiny glass fibres, arranged in bundles, to carry light source illumination to the distal end of the scope and reflect light from objects in front of the endoscope back to the eyepiece. Each glass fibre has an outer coating to prevent light escaping.

There are a few key components of a fibreoptic endoscope which will be described in more detail:

Eyepiece/Camera

The eyepiece is at the proximal end of the scope and it is here that the image is magnified and focused. Correct focusing can be achieved by turning the eyepiece clockwise or anti-clockwise whilst simultaneously looking down the scope at an object, until the image becomes crisp and clear. When one looks through the eyepiece, one may see an orientation indent on the periphery of the image. With the endoscope in a neutral position, the indent should lie at the “12 o’clock” position and indicate the plane of flexion of the tip. Some endoscopes may have a camera head fitted onto the endoscope. In this instance, the orientation of the video camera and endoscope should be aligned and any adjustment in focus done using the camera head.

Angulation Lever

The angulation lever is normally positioned on the back of the handle and is commonly manipulated by the thumb. A downward movement of the angulation lever causes an upward movement of the tip of the endoscope and vice versa. The plane of movement of the tip will be in the “12’o clock” or “6 o’clock” position when the endoscope is held in a neutral position i.e. in the plane of the orientation indent.

Working and Suction Channel

The working and suction channels are essentially 2 separate lumens running down the scope and exiting at the distal tip. Their proximal openings are normally in close proximity to the eyepiece. They allow for the use of suction and the ability to inject substances or pass wires down the endoscope whilst the endoscope is in use. In smaller endoscopes, the 2 channels are combined into a single channel. The suction port can also be used to deliver a flow of oxygen (up to 2 l/min) that will help remove secretions from the field of view and provide oxygenation.

Insertion Cord Diameter

The greater the diameter of the endoscope, the greater the number of glass bundles and the better the optical features of the endoscope. A greater diameter also allows for larger, more effective working channels. When endoscopes are used to assist in intubation however, the diameter of the endoscope becomes an important feature. The endoscope needs to be able to fit into the airway comfortably and it also needs to be able to have an endotracheal tube railroaded over it. Endoscope sizes are described according to their external diameter and endotracheal tubes according to their internal diameter. An endotracheal tube at least one size larger than the chosen fibreoptic scope should be selected e.g. a size 5 endotracheal tube should

fit onto a 4mm scope etc. Common endoscope sizes used for adult fibreoptic intubations range between 4mm and 6 mm. Take care with RAE (Ring, Adair and Elwin) tubes as they cause an increase risk of scope damage.

Light Source

Light sources can be portable, battery powered units which connect directly onto the endoscope or conventional light sources which plug into the mains. Both types should be adjusted to maximize view and minimize glare.

Fibrescope Care

Fibrescopes are expensive pieces of delicate equipment. Great care should be taken when using the scope. Never twist, use excessive force or bend the scope. Movement should always be gentle.

Field of Vision

For awake fibre-optic bronchoscopy, choose an adult fibre-optic scope with a diameter of 5.0 or 5.2 mm. Smaller bronchoscopes will give you a reduced field of vision, inadequate suction ability, reduced manipulation ability, difficulty in “rail-roading” an ETT and are more prone to damage. Classically smaller diameter bronchoscopes are used for nasal endoscopy, checking double lumen tubes, paediatric practice or more recently in the Aintree Intubating Catheter (AIC) Railroading Technique.

In the event of secretions, it may be possible to gently brush the tip against mucosa in the hypo-pharynx to clear the lens. Note also oxygen through the suction port can help prevent adherence of secretions.

Lubrication

Lubricate the scope before endoscopy while avoiding the tip. We advise against using KY Jelly as it dries too quickly and becomes sticky. Do not use a petroleum-based lubricant. We have found that the use of either eye lubrication such as Lacri-Lube or a medical grade silicone lubricant works best.

Never push the scope against resistance when it’s within a ETT. Although it won’t harm the patient, it will destroy the scope. Stop, withdraw and lubricate.

Scope Manipulation & Dexterity

It is beyond the breadth of this text to give you the ability to manoeuvre the endoscope towards the desired target i.e. “how do I get the scope to go where I want it to go” which is better suited to a dedicated bronchoscope workshop.

In order to be able to successfully intubate using a bronchoscope, it is essential to be familiar with the basic endoscope movements in order to “drive” the endoscope to where you want it to go.

The good news is that there are only 3 movements required to maneuver a scope successfully:

- Handle rotation
- Tip flexion
- Cord insertion/ retraction

Handle Rotation

Rotation of the endoscope handle causes rotation of the endoscope tip and this is achieved by flexion and extension of the wrist. N.B: The shoulder is not used in this movement.
Approximately 80% of the scope manipulation comes from flexing and extending the wrist.For the movement in the handle to fully translate to the tip, the cord must be straight at all times. Any bends or loop in the cord are easy to do and overlooked in clinical endoscopy. We call this a dead loop. The dead loop will cause a reduced translation of handle movement to tip movement. This will frustrate the endoscopists ability to drive and accurately direct the scope.

Tip Flexion

Pulling the angulation lever down will flex the endoscope tip up. Pulling the angulation lever up will flex the tip down.

Cord Insertion

The hand not holding the endoscope handle (the lower hand) controls the advancement of the scope by gently pulling or pushing the endoscope cord as required.

The use of a combination of the above 3 movements, leads to the ability to perform oblique movements with the endoscope.

Successful Endoscopic Maneuvering

Successful maneuvering of the endoscope requires constant adherence to the **"3 steprule"**:

1. **STOP**
2. **CENTRE**
3. **MOVE**

STOP: once you have moved the endoscope into the first part of the airway, it is important to stop and identify where you want to advance the scope.

CENTRE: once you have identified your target, you should ensure that the target is placed in the centre of the endoscope's field of view by using the 3 movements described above. The endoscope should not be advanced until this has been achieved.

MOVE: only once centered, should the scope then be advanced until such time as the target moves out of the centre of the field of view, at which time one should stop, centre and move again.

When one first starts using a fibreoptic endoscope, one should consciously focus on making very small movements. This will result in a better adherence to the "stop, centre, move" dictum and ensure a greater success rate. With training, this will no longer be perceived by the casual observer as three separate phases but rather as one fluid motion. Speed should not be the primary objective when first starting out using an endoscope.

Other tips to successful endoscopic maneuvering

• Ensure that the endoscope is kept as straight as possible and that a loop doesn't form. Loop formation decreases the ability to rotate the tip of the endoscope, as all wrist rotation will be transmitted to the loop and not the tip. Practically this may require you to position yourself on a platform or lower the height of the patient's bed. Also having your assistant make you aware of any loop formation while you are looking down the endoscope can be helpful.

• Don't bend the endoscope beyond its natural curve as you will damage the delicate glass bundles in the scope.

• Avoid shoulder movement. All movement should come from only the wrist. Any other movement makes maneuvering the endoscope harder and increases the chance of loop formation.

• Ensure the endoscope is properly lubricated with lubricating jelly.

• Ensure the endoscope is properly focused before you start.

• If the view down the endoscope becomes unclear because of secretions or condensation, gently touch the tip of the endoscope against normal mucosa and this often clears the view. Aggressive contact with the mucosa can result in bleeding and causes patient discomfort.

• One can stand behind or in front of the patient when performing a fibreoptic intubation. When standing behind the patient, relative orientation is preserved i.e. your left is the patient's left and the upper part of the visual field represents the anterior part of the patient. This is the opposite when standing in front of the patient. It is a good idea to try and become familiar with both positions.

• If you cannot see or have a pink out, draw the scope back until you can see the airway and then Stop, Centre, Move.

Preoperative Evaluation

Whilst AFOI is the mainstay of management of a difficult airway, a complete airway assessment should be made. A thorough evaluation for second plan and third plan contingencies should also be made.

History and Assessment

Walls (2002): “The difficult airway is something you anticipate; the failed airway is something you experience. “

Prediction of the Difficult Airway

Whilst most anaesthetists perform an airway assessment, frequently of greater importance is prediction of difficult bag-mask ventilation. It is important to stress this assessment as it is frequently a rescue method when initial endotracheal intubation has failed.

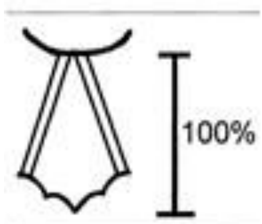
In planning for airway control, the anaesthetist should assess not only the bedside predictors of difficulty with direct laryngoscopy, but also predictors of bag-mask ventilation difficulty and supraglottic device difficulties.

Difficulty with Direct Laryngoscopy

From classic teaching, the scoring system of Cormack and Lehane (C&L) has defined how to think of intubation. However, for all its utility, there are still several questions which are often difficult to define. Typically, we may ask the question : how much of the cords must be viewed to guarantee success?

The C-L definition incorporates a definition of conventional laryngoscopy with a direct laryngoscopic view and performed as a best attempt.

Levitan has suggested an alternative method : POGO – Percentage of Glottic Opening. Certainly we advocate that POGO scoring should be used when referring to video laryngoscopic or indirect laryngoscopic techniques, or techniques where standard positioning is not used.



The assessment process should include

- Bedside Predictors of Difficulty with Intubation via direct laryngoscopy.
- Predictors of Difficult Bag Mask Ventilation.
- Prediction of Difficult Supraglottic Airway Device.
- Predictors of Difficult Cricothyroidotomy.

Summary of Preoperative Review

Whilst awake FOI will usually succeed in allowing management of a difficult airway, it is associated with a failure rate. Indeed, topicalisation can result in acute airway obstruction and so assessments and alternative plans should be ready, with equipment and personnel required present.

Consideration of all of the above factors may result in the decision to perform an awake tracheostomy under local anaesthesia alone.

Be vigilant, assess carefully and have a methodical plan in place.

Bedside Predictors of Difficulty with Intubation via Direct Laryngoscopy

Orlando and Hung refer to the mnemonic LEMON as a useful bedside guide to prediction of difficult intubation.

Bedside Predictors of Difficulty with Intubation via direct laryngoscopy	
L	Look externally. A variety of features on external examination suggest difficult laryngoscopy: Small or recessed mandible, poor dentition, a short neck, facial disruption, presence of a halo-thoracic brace or cervical spine collar and a large tongue are just some features which would suggest a difficult direct laryngoscopic intubation.
E	Evaluation. Evaluation incorporates three common assessments: • Mouth opening – > 5cm is rarely associated with difficult intubations. • Thyromental distance – The thyromental distance as described by Patil in 1983 is a predictor of difficulty intubation, with a thyromental distance < 6cm associated with difficult intubation.
M	Mallampati Class. Mallampati I & II patients are associated with low failure rates. In comparison, class III patients have a intubation failure rate > 10%. Unfortunately this scale is not sensitive or specific, and has a relatively poor positive predictive value.
O	Obstruction. Bedside signs of impending obstruction include stridor, voice changes and failure to swallow secretions. Once stridor appears, the airway diameter has been reduced to 4.0mm or less.
N	Neck mobility. Positioning of the head and neck is vital for success in direct laryngoscopy. Classic positioning advice is to place the patient in the "sniffing the morning air" position – ie neck flexion and head extension. Hence practitioners should beware in patients with limited neck extension – e.g. patients with cervical spine injuries, pathologies such as ankylosing spondylitis, radiation injuries or patients in cervical spine immobilization collars.

Predictors of Difficult Bag Mask Ventilation

Murphy and Walls identified five indicators that are remembered by the pneumonic MOANS. Whilst bag-mask ventilation devices commonly can generate 50-100 cm H_2O of pressure, this requires an adequate seal and compliance to ensure ventilation. Some conditions where this may not be possible are listed below.

Predictors of difficult bag mask ventilation	
M	Mask seal – facial features such as beards, saliva or blood, or anatomical disruptions such as facial fractures may make mask seals difficult.
O	Obesity is often a predictor of difficult BMV, often requiring higher airway pressures to overcome total chest compliance. Parturients or at-term mothers may be considered in this group also.
A	Age > 55 is associated with a higher risk of difficulty, often because of loss of tissue tone or facial structure.
N	No Teeth. The edentulous make may mask seal more difficult and several options are possible – including leaving the dentures in situ until just prior to intubation.
S	Snoring and/or Stiff. BMV may be difficult in the face of decreased pulmonary compliance e.g. pulmonary fibrosis, oedema or acute severe bronchospasm.

Prediction of Difficult Supraglottic Airway Device

Similarly, the anaesthetist should evaluate the ease of placement of a supraglottic device, as these form the mainstay of rescue treatment to provide ventilation and oxygen in the event of failure of bag-mask ventilation and endotracheal intubation.

Prediction of difficult supraglottic airway device	
R	Reduced mouth opening: Small mouth opening will limit the ease of placement of a laryngeal mask airway.
O	Obstruction – upper airway obstruction that is glottis or infraglottic will not be assisted by a supraglottic device.
D	Distorted airway – unusual airway anatomy that is distorted may mean that a supraglottic device may not seat properly and hence the seal will be compromised.
S	Stiff neck or lungs – Decreased lung compliance e.g. asthma may make ventilation impossible with a supraglottic device. Beware the patient with limited neck movement, where a supraglottic device may form a poor seal.

Predictors of Difficult Cricothyroidotomy

Similarly, the anaesthetist should evaluate the ease of placement of a infraglottic device, as these form the mainstay of rescue treatment to provide ventilation and oxygen in the event of failure of bag-mask ventilation, placement of a supraglottic device and endotracheal intubation.

Predictors of difficult cricothyroidotomy	
S	Surgery on the neck may result in obviously distorted anatomy and make airway access more difficult e.g. a carotid endarterectomy that bleeds post-procedure.
H	Haematoma or infection.
O	Obesity.
R	Radiation can result in limited neck extension, reducing entry space to the trachea from an anterior approach.
T	Tumour around the airway or within the airway can make cricothyroid puncture and cricothyroidotomy more difficult.

Explanation

It is essential that the whole process is fully explained to the patient in a honest step-by-step manner, as from a patients point of view, this is an extremely threatening and invasive procedure. The explanation should be done in a confident manner and any questions answered. It is important to gain the patient's confidence from the first meeting to the procedure. Failure to achieve this will result in poor conditions for the endoscopists, a bad experience for the patient and the theatre staff and reluctance of both parties to repeat this procedure in the future, however clinically indicated.

Specific points to be addressed:

1. The reasons why you are going to do an AFOI and the issue of its safety and comfort.
2. The topicalisation process including the metallic local anaesthetic taste.
3. The saw-dust like, dry throat from the glycopyrrolate and local anaesthetic.
4. If any light sedation is going to be used and awareness of the procedure.
5. The time frame for the process.
6. The in-theatre process, personnel and monitoring.
7. The pressure or slight discomfort when passing the ETT through their nose.
8. A coughing sensation when the endoscope is passed through the vocal cords.
9. The subjective feeling of not being able to breath when the ETT is passed through the cords.
10. Confirmation of position with ETCO.
11. Approximate timeframe of 15 seconds before drifting them off to sleep with either a volatile agent or iv induction agent.
12. You will be constantly communicating and telling them what you are doing as you progress.

Obtain their consent.

Tube Selection

Bullet tip tubes, such as the ETT that accompanies the LMA Fastrach (PacMed) or Parker Flex- tip tubes, are associated with a much lower rate of "hang-up" on arytenoids or vocal cords than a standard ETT. We highly recommend choosing and preparing one of these ETT for AFOI.

If one if these tubes is not available, the next best choice is a reinforced ETT. The tip is slightly more rounded and the tip is softer. A RAE can be used but we suggest you soften the tube first in hot water to make it more malleable. The Oral RAE tube, like the classic ETT has a tip which is not ideal. It's sharp profile leads to an increased rate of "hang up". On the other hand, the Nasal RAE can be used for nasal intubation as there is adequate length of the tube to secure the airway properly and intubating via the nasal route, the angles are not as sharp as during an oral intubation.

Note the Polar, North-Facing Nasal Preformed Endotracheal Tube is very long and the tube tip may enter the patient's nose before the scope is positioned within the trachea. A way of avoiding this is to remove the 15mm connector prior putting tube on scope. This gives an extra 2-3 cms of length on scope. Care must be taken to put the 15mm connector on the end of the catheter mount to be used to ensure it doesn't end up misplaced.

Size of tube for nasal intubation is a topic of much discussion. A possible cause for failure of a nasal fibreoptic intubation is that the tube on the scope has too large an external diameter to pass through the chosen nostril. This is a frustration in the elective patient but can lead to serious consequences in the urgent case. Care must thus be taken to choose the smallest tube (external diameter) that will fulfil the duties required. And we encourage the intubator to assess the nostril for size and patency prior to selecting the tube. With experience you can gain an idea as to whether a tube will fit. Some reinforced tubes have a larger external diameter to internal diameter and may cause problems with insertion.

This possible failure is why some airway specialists choose to insert nasopharyngeal airways prior to endoscopy of the nose. This technique may cause bleeding which prevents fibrescopy and does not dilate the bony vault so you are not enlarging the hole. Nasopharyngeal airways are soft and pliable and do not ensure passage of a similarly sized tracheal tube. If you are presented with the case where success at nasal intubation is a priority in the urgent setting, then we recommend you use the smallest tube that will pass over your scope (ensuring it is long enough to reach the trachea) to ensure it will not be held up in the nose. Once the airway is secured you can proceed to planning to change it if required.

Conduits

Berman Airway

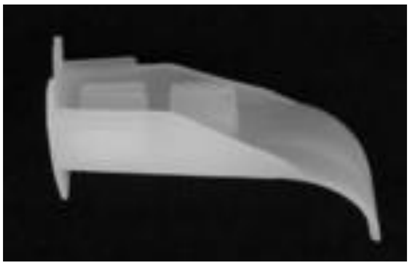
These are similar to a Guedel airway but have a slit in the side. They are the best choice for oral airway conduits for AFOI. They come in a range of lengths: from 4cm to 10cm. A 9cm and 10cm Berman airway is appropriate for most adults. Anecdotally, a smaller size tends to be better tolerated.

Lubricating the Berman with ligocaine gel enhances topicalisation and patients can often insert the airway themselves. They are then asked to bite down on it. It is important to ensure that it stays in the midline. The fibrescope (tube loaded at top) is then introduced into the Berman airway. Ideally the vocal cords will be visible on exiting the distal end of the Berman airway. The flange of the airway can be tilted back and forth to improve the view.

Once the tip of fibrescope has been delivered a short distance into the trachea, the Berman airway can be prized open (lateral opening right side, hinge on left).

The endotracheal tube can then be guided into the trachea over the endoscope.

Ovassapian Airway



Evidence suggest that there is a higher rate of failure using the Ovassapian Airway than the Williams Airway or the Berman Airway.

Williams Airway

Limited availability

A modified Guedel Airway with an open or cut away distal end.

Supraglottic Devices

Intubating LMA (iLMA)

The iLMA has been designed for blind intubation. It has a first time success rate of about 70-80%. If the iLMA is used in conjunction with a fibrescope the success rate is greatly increased to near 100%. The iLMA comes with it's own ETT. *Caution should be used when using the blind intubating technique through the iLMA in the presence of upper airway/oesophageal pathology due to the risk of perforation.*

Classic LMA /Proseal (cLMA/pLMA)

The classic LMA or Proseal can be used as a conduit for intubation either with a fibrescope alone or a combined Aintree Catheter/Fibrescope technique (the preferable technique).

cLMA / pLMA	Max ETT Size
Size 3	6.0
Size 4	6.0
Size 5	7.0

If there are issues with the ETT not being long enough for the LMA (ie the cuff may be between the cords), then a MLT, a warm nasal RAE or iLMA ETT should be used, as they are often longer then standard ETTs.

In the majority of cases, the larynx can be seen from within the lumen of the LMA when a fibrescope is passed down a LMA. The view may also be improved by using head and neck movements e.g. chin lift, jaw thrust or cricoid pressure under direct vision. Anecdotally, using a fiberscope through a pLMA often results in a better view of the glottis compared with the iLMA or cLMA. This is due to the presence of the epiglottis elevating bar in the iLMA and aperture bars in the cLMA.

I-Gel

A second generation supraglottic device that has been successfully used as a conduit. The size of the ETT that passes through an I-Gel is calculated by taking the I-Gel size and adding 3

(e.g. No. 3 I-Gel will take a 6mm ID ET).

Caution should be used to ensure there is no endobronchial intubation as it has a shorter stem.

LMA Supreme (sLMA)

The sLMA which has incorporated many of the benefits of the iLMA and pLMA, ***should be avoided as a conduit for fibreoptic intubation*** due it's narrow elliptical shaped channel.

LMA/Fibrescope Technique

Prepare an appropriately sized LMA and ETT *(easiest to choose a 6.0 ETT).* Prepare a 4 mm fibrescope (*using a bigger scope will result in difficulty in passing it through a size 6.0 ETT)*

Insert LMA and confirm ability to ventilate

Insert fibrescope through the ETT so that the distal end of the fibrescope lies just within the distal end of the ETT. Ensure the outside of the ETT is lubricated. Insert both into the conduit (cLMA/iLMA/pLMA) and advance together.

If iLMA used: advance so that the ETT elevates the EEB after which the fibrescope is advanced through the cords and the ETT railroaded over it into the trachea.

If cLMA/pLMA used: once glottis visualized, advance fibrescope through vocal cords (first through the aperture bars in cLMA) and railroad ETT into trachea. Aperture bars should be flexible enough to allow ETT through when using a cLMA.

Check ability to ventilate through ETT. *If ventilation is required during intubation, then a fibrescope adaptor can be inserted into the circuit attached to the ETT.*

The LMA can be deflated and left in situ or be removed. Removal may risk extubation.

Aintree Intubating Catheter (AIC) Technique

This is a very similar device to the airway exchange catheters (Cook Critical Care, Bloomington, IN) but is specifically designed to fit snugly over an adult **4mm** fiberscope leaving the flexible 3cm tip of the fibrescope unsheathed.

It was developed in Liverpool , UK and first described in 1996.

It is 56cm long hollow bougie with an internal diameter of 4.7mm and an external diameter of 6.5 which allows its use with size 7 and greater ETTs.

It comes with a detachable Rapifit leur lock device which allows for oxygenation if required.

For AIC assisted orotracheal fibreoptic intubation via a laryngeal mask

1. Insert LMA classic

2. Ensure oxygenation (can use a bronchoscope attachment)

3. The AIC is loaded onto the fiberscope, which is then passed down the LMA and into the trachea.

4. Remove scope and LMA, leaving AIC insitu.

5. Railroad ETT (smallest size is a **7.0** that can be used) over AIC. A laryngoscope can be used to facilitate this. There have been case reports of the ETT and Aintree ending up in the oesophagus after railroading, in-spite of the trachea being identified prior to removal of the fibreoptic scope. Replace the Fibreoptic scope back down the Aintree and then railroads the tube whilst watching the tip of the scope in the trachea. This different manoeuvre changes the final part of the Aintree insertion from being a blind to a visual techniques and should improve success rates. Check the $EtCO_2$.

This technique is safer and easier than the guiding a 6.0 ETT with a fibrescope through the LMA.

If there is any difficulty in railroading the ETT over the AIC, the AIC may be used as a ventilation device via the Rapifit 15 mm connector or as an oxygen insufflator leur lock connector using an Enk oxygen flow modulator or the “Leroy” / “Alfroy“(A Leroy variation). The anaesthetist should be ever alert for the signs of volutrauma and resulting barotrauma to the airway.


Planning

1. Cooperative patient.

2. Informed consent

3. Discussion with Surgical & Theatre teams as early as possible.

4. Alternate airway plan if the AFOI fails. *This can include cancellation or postponement or tracheostomy under local.*

5. Appropriate assistance +/- another Anaesthetist especially if using sedation.

6. All equipment & medication ready to go

- Ventilator checked and airway circuit ready to be connected to the endotracheal tube.
- Suction.
- IV induction agents / Volatile inhalation agents /Muscle relaxants ready.
- Checked & focus the fibrescope. Load the ETT. *Warming ETT if nasal intubation planned.*
- Theatre layout relative to patient.
- Large TV screen if possible for viewing.
- Monitoring.
- Emergency Airway Equipment & Drugs / Difficult Intubation Trolley.
- LA drawn up in correct doses
- Oxygen

7. Glycopyrrolate is administered 30 - 45 minutes prior to the AFOI. *It is the ideal antimuscarinic, as it does not cross the blood brain barrier (no confusion) and is less likely to cause a tachycardia than atropine. The recommended dose is 4 mcg/kg (2mcg/kg in high risk patient) up to a maximum of 400 mcgs.*

The ideal scenario is for the patient to be wheeled into theatre with cannula in situ, glycopyrrolate in for 30 - 45 minutes, nebuliser just finishing (if used), local anaesthetic drawn up in labelled syringes to the dosage appropriate for the patient's weight, ETT loaded on scope, connector available, stack in correct position, oxygen attached, circuit and bag to hand with O_2 on and monitoring ready for connection. If sedation is required, this should be ready to administer.. Anaesthetic drugs should be drawn up and include muscle relaxants.

Positioning

AFOI may be performed with the patient in the semi-recumbent or where not practical, the supine position. Ideally practitioners need to be proficient at both. When using a fibreoptic stack system, the light cable to the fiberscope is relatively short and also relatively heavy. This becomes more noticeable when presented with a time consuming, difficult airway. Having the equipment optimally positioned will help reduce operator fatigue and improve success.

Semi recumbent

The preferred position for an AFOI is with the patient sitting up and the anaesthetist approaching the patient from the front. Many patients with airway compromise are most comfortable in this position as it avoids airway obstruction and aids drainage of secretions. Situational awareness is improved and the operator is able to maintain eye contact and reassure the patient throughout. Topicalisation is also more effective since gravity aids local anaesthetic migration into the trachea and surrounding structures. If the operator scopes right- handed (operator utilizes the thumb of their right hand to flex the scope), it is simplest to have the monitor and operator on the same side of the patient i.e. both on the patient's right. If the operator scopes left-handed, then it is easiest to have the monitor on the right hand side of the patient whilst they stand on the patient's left.

Supine

Sitting is not always possible e.g. Trauma, C-spine injury. In the supine position, the operator approaches from behind the patient. *A variation on this theme is to have a reverse Tredenleburg so that the head is still slightly above the body and so the anaesthetist can still be positioned facing the patient if so desired.* As mentioned previously, it is important to keep the scope tort and avoid loop formation. The trolley or operating table should be lowered as necessary and a step or platform available if required. It is easiest to have the monitor on the left hand side of the patient regardless of whether they scope right or left handed. This is because the light cable attaches to the left side of all fibreoptic bronchoscopes. To avoid the light cable crossing in front of the scope and patient, it is better to have the light source on the left of the anaesthetist.

You should always practice a technique for elective AFOIs that you can reproduce if required in an emergency scenario. This allows you to develop confidence in your technique which you can rely on in the emergency scenario when failure will possibly lead to a lost airway rather than just cancellation of surgery. Developing a fixed plan with a sheet to remind you of the steps is a very valuable resource, no matter how many AFOIs you have performed.

Performing the Procedure

Theatre Noise Environment and Patient Psychology

Unnecessary noise and chatter in the theatre should be eliminated and your patient should be focusing on your voice. It is important that your voice is audible and you have a continuous communication with your patient to reassure them. If you become silent, the patient's mind is allowed to conjure up worst case scenarios and the endoscopist risks losing the patient's cooperation. It is crucial that your narrative is not constructed in such a way that the patient feels the need to talk back or answer. This will dynamically change the airway geometry, cause loss of view, add time and complexity to your procedure. Questions such as "how you doing" with a scope in the airway, are neither helpful nor productive.

For Oral AFOI

The use of a Berman airway is recommended. This is similar to a Guedel airway but has a slit in the side. Berman airways come in 3 lengths: 8cm for children, 9cm and 10cm for adults.

Anecdotally, a smaller size may be better tolerated.

If possible ask the patient to insert the airway for you. If they then fail to tolerate the airway, then ask them where it is causing discomfort. If it is posteriorly use a shorter one, if it is base of tongue use a longer one. Similar questioning can be used if you attempt to insert. If after 2 attempts they are still not tolerating the Berman, then switch to a bite guard. Attempting to persevere with a poorly tolerated adjunct risks losing patient cooperation.

Once the airway is placed in the patient's mouth and they are then asked to bite on it. It is important to ensure that it stays in the midline. The fibrescope (tube loaded at top) is then introduced into the Berman airway. Ideally the vocal cords will be visible on exiting the distal end of the Berman airway. The flange of the airway can be tilted back and forth to improve the view.

Once the tip of the endooscope has been delivered a short distance into the trachea, the Berman airway can be prized open (lateral opening right side, hinge on left).

The endotracheal tube can then be guided into trachea over the endoscope.

Often it can be difficult to advance the endoscope while maintaining the midline position in an oral intubation. This can be overcome by holding the endoscope between the ring and little finger and advancing/withdrawing the endoscope with the index finger and thumb of the proximal hand

If a Berman airway is not available, the following maneuvers can assist in getting a good view of cords:

1. Jaw thrust from the front: fingers of both hands under the angles of the mandible, thumbsopening mouth

2. Lingual traction: using forceps or gauze

3. Deep breaths: anecdotally asking the patient to take deep breaths appears to elevate the tongue from the posterior pharyngeal wall and significantly improve the airway view

4. Jaw thrust and lingual traction done together requires two extra operators.

For Nasal AFOI

Assess both nostrils to determine which has the largest diameter /gap between the floor of the nose and inferior turbinate. The nasal passage should be topicalised utilizing vasoconstrictive medication to minimize the risk of bleeding with either co-phenylcaine / lignocaine or cocaine.

Ensure the endoscope, tube and nostril are all well lubricated. Take care not to get lubricant onto the tip of the endoscope. The fibrescope should be inserted and navigated posteriorly, below the inferior turbinate and along the floor of the nose under vision. Care should be taken not to tear the nasal mucosa or vessels, specifically the posterior ethmoidal vessels which tend to bleed a lot if damaged. The main passage is below the inferior turbinate.

Correct positioning of ET tube in trachea.

The tip of the endotracheal tube should be positioned at least 2 cm above the carina. This is checked by moving the tip of endoscope to the carina, gripping and holding the endoscope with the index finger and thumb at the proximal end of ETT. The endoscope is then withdrawn until the distal end of the ET tube is in view. The distance at this point between the proximal end of the tube and where the index finger and thumb are gripping the endoscope is the height of the tube tip above the carina.

Troubleshooting

Warming endotracheal tubes in warm water makes them softer and easier to manipulate.

Lubricate well. Good nasal prep and use of the best nostril. Check both nostrils with the fibreoptic scope.

Maneuvers that enlarge the oropharyngeal space or helps to open up the airway passage

- Get patient to stick their tongue out, or have an assistant gently pull the tongue forward.
- Jaw thrust
- Flexion or extension of the head and neck
- Get patient to sniff / deep inspiration

The nasal cavity is a triangular space. Navigate your scope through the medial base of this triangle as this has the greatest dimensions.

Change patient position.

Secretions

Antisialogogue

Get patient to blow nose before you begin.

Suction via Yankauer or soft Y-suction catheter (or Scope). Get patient to swallow the secretions.

O_2 up to 2 1/min via scope channel.

Fogging

Dip in warm water.

Alcohol wipe every time you come out.

Get the patient to lick the scope.

HANG-UP

Incidence: 25% of cases with oral intubation vs 6 % nasal

Usually caught on the arytenoids, most commonly the right arytenoid. Withdraw the bronchoscope to eliminate any excessive loops in the airway, disimpact the tube tip off the mucosa and then rotate the scope so that the tip rotates 90 degrees anticlockwise. The bevel of the tube then faces posteriorly and will slide over the posterior commissure. Force will cause trauma to the larynx. Remember, the airway is topicalised and not anaesthetized. The choice and size of endotracheal tube is important since the incidence of hang-up is increased with a large gap between tube and scope.

Can’t get the scope out

Has the scope been well lubricated?

Desiccation of water-based gel. Can happen with long & difficult endoscopy and when using blowing O_2 as this dries it out. (Try dripping saline down the tube so it runs along the bronchoscope and reactivates the gel)

Scope through Murphy’s eye?

- Can happen if the tube has been placed in the nose first. *NB - follow the blue line.*

If all else fails withdraw tube and scope, start again

Withdraw scope under vision to

- Prevent accidental stimulation of the carina
- Avoid inadvertent extubation when removing bronchoscope.

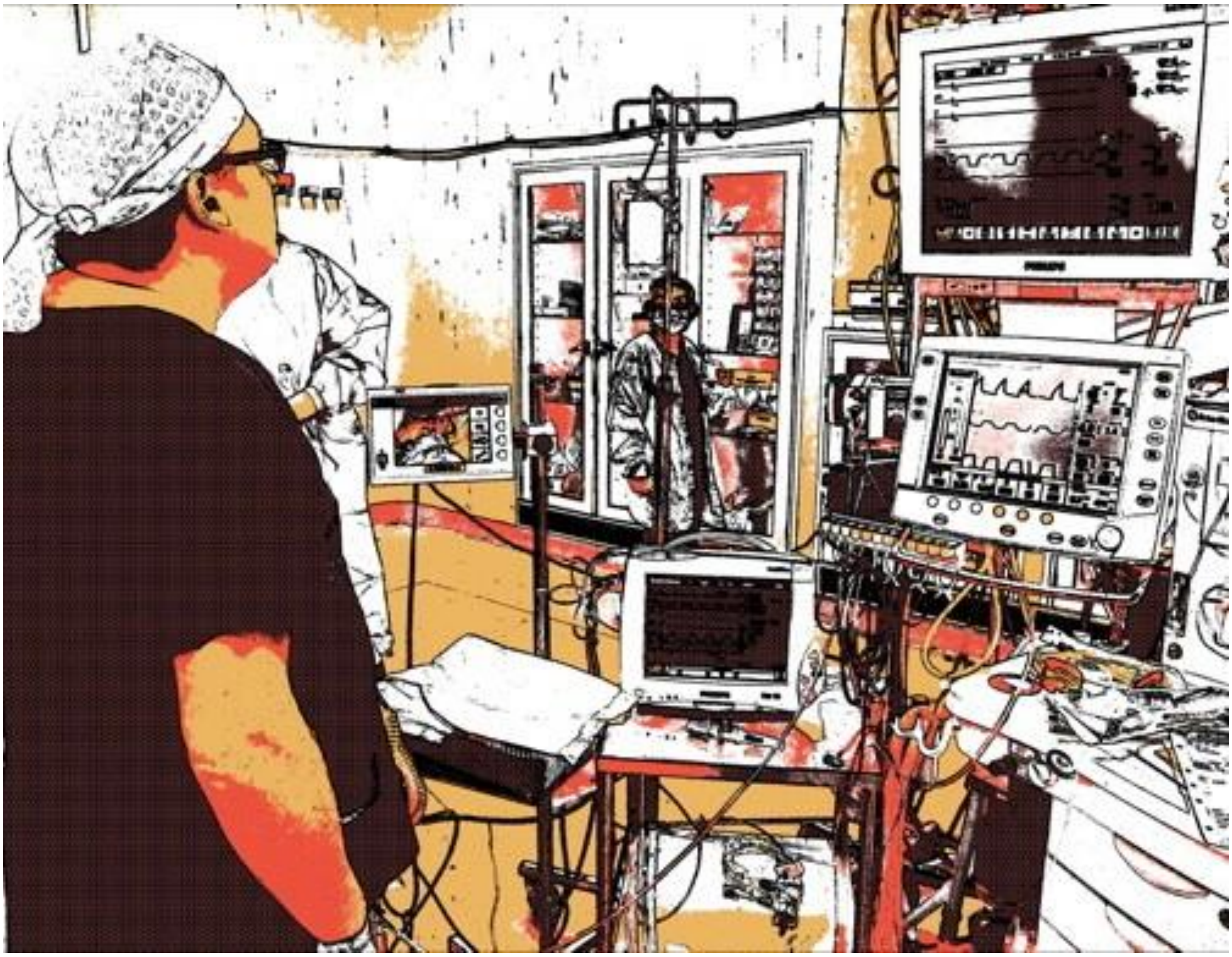
What if I can see epiglottis but can’t get through?

Distorted anatomy around the larynx may prevent scope from entering the glottis

Consider using a guide wire (any wire that will fit down the channel and is at least 110 cm long will do) i.e. Cook retrograde wire or a cardiac cath wire

- Lube wire/ put down channel /tip flush with scope
- Position the scope as close to the cords as possible
- Get assistant to feed the wire while you aim tip of scope between the cords
- Advance scope over wire (could use an Aintree catheter)

It may be time to use a different approach i.e. change of hands, Videolaryngoscope, Bonfils scope or an awake tracheostomy.



Extubation Strategy

Approximately 20% of airway issues occur at extubation or in PACU. So it is important to consider a plan for extubation based on the degree of difficulty encountered on intubation and appropriate extubation parameters. It is important when planning extubation to take into account postoperative issues which may further compromise the airway e.g. swelling from a submandibular abscess

Considerations

- Increase FiO_2.
- Immediate or Delayed Extubation. *If Delayed Extubation planned, you will need to make an airway extubation plan in liaison with the ICU Team.*
- Use of a LMA as an intermediate conduit.
- Use of an Airway Exchange Catheter (Caution should be used if considering JetVentilation and it is essential that the AEC is in appropriate position within the trachea. Be careful of Barotrauma).
- Transtracheal cannula.
- Tracheostomy.

PACU & Postoperative Review

Airway reflexes may be depressed for a variable time following topicalisation and awake fibreoptic intubation. Patients should be encouraged to remain nil by mouth in recovery since they are at risk of aspiration as well as scalding of their upper airways with hot drinks due to decreased upper airway sensation. Patients should not eat or drink for 4 hours following topicalisation and longer where necessary.

Documentation for the next anaesthetic

Patients requiring an awake fibreoptic intubation often require multiple procedures and intubations over time. Many of the indications for a specific patient requiring an AFOI remain unchanged and so they may undergo multiple attempts at AFOI. Where this has worked well in the past, patients are often easily reassured and comfortably compliant. Poorly tolerated attempts however, make future attempts more challenging.

Communication and documentation of these often complex cases should be clear and concise. An accurate description of events is considered standard anaesthetic care. Some consideration should however, be given for future anaesthetics. Specifically, what worked well, what worked less well and why, and where the operator thought improvements could be made in future. A note regarding the anatomy is considered helpful and what the Cormack and Lehane grade was with a Macintosh blade post intubation. Normal anatomy is quietly reassuring and may provide for a suitable training opportunity. Where the anatomy is distorted or completely unrecognisable, this should signal the prompt availability of senior and experienced clinicians. Knowledge that the glottis was located to one side is also useful. Notes on the effect of topicalisation, use of adjuncts, sedation, difficulties during the procedure and how the patient tolerated the experience may be helpful in future when planning a repeat procedure.

Stress

Too much stress can reduce performance, and there can be many additional stresses to an AFOI.

Specifically you are dealing with a suspected difficult airway and may not be doing enough regular endoscopy to maintain a degree of confidence with the scopes.

In fact doing an AFOI is probably more stressful than a RSI, given that RSIs usually becomes second nature by the time you finish your training and certainly are a lot less complicated from an organizational perspective.

Ideally, only staff required for the AFOI should be in theatre and the background noise levels should be kept to a minimum.

Obvious ways to reduce the stresses is to have an extra pair of skilled hands to assist and to try to have everything planned before hand and to use the same technique frequently.

Also consider that we advocate that gastroenenterologists, thoracic physicians and other interventionists requires anaesthetists to provide sedation during their procedures for patient safety. Is it not therefore logical that two anaesthetists should be involved with AFOI; one to provide patient monitoring and manage the level of sedation while the other performs the AFOI? This team approach can provide both the technical and non-technical assistance for an advanced airway technique.

And finally allow yourself time to prepare for it.

Airway Education

Other options to increase your confidence in the use of flexible brochoscopy is to attend educational and dexterity based courses with Anaesthetic Facilitators skilled in their use.

There are a number of these courses that can be found on the ANZCA website under events.

http://www.anzca.edu.au/events

The Annual Advanced Airway Management Refresher Course – The Alfred, Melbourne
Fibreoptic Airway Workshops – Royal Melbourne Hospital, Melbourne
Difficult Airway Management Workshop – Royal Brisbane & Women's Hospital
WAAG – Western Australia Airway Group

The Annual Advanced Airway Management Refresher Course

Training the Trainer

Don't waste time learning the "tricks of the trade" - instead, learn the trade (attributed to both James Charlton and H. Jackson Brown, Jr.).

It is important that the trainer avoids providing just a few tips of AFOI with the assurance that this will ensure a high success rate for the student. Practically there is no one technique or tip that will be applicable to all situations. Anaesthetists who frequently perform AFOI on elderly patients on a regular Head and Neck operating list may find their technique performs poorly when applied to an anxious young patient with Ludwig's angina requiring AFOI.

Ultimately there are **three key aspects for teaching AFOI**. These include the **dexterity** of handling a bronchoscope as well as the **application of safe sedation and local anaesthetic techniques**. The dexterity component is best achieved by attending one of the Dexter workshops that are conducted in Australia and New Zealand. There is simply no substitute for this style of training. Although the Dexter manikin is non-anatomical, the participant is required to drive a bronchoscope expertly over several hours through a variety of difficult manoeuvres. These workshops therefore provide a strong foundation that is directly applicable to the clinical situation. As mentioned it is important for participants to follow the basic requirements: STOP, CENTRE and MOVE. Instructors should emphasis the avoidance of hitting the sidewalls of the manikin's airway passage. The translation of this to the clinical scenario is that patients will tolerate AFOI as long as the operator avoids hitting the mucosa with the bronchoscopic tip. Speed is not the key to success but ensuring the bronchoscopic tip is centred in the airway passage.

Two teaching techniques that help facilitate the participant moving from skills learnt in the Dexter workshop to AFOI in the clinical situation.

1) Asleep nasal fibreoptic intubation (after obtaining patient consent):

Patients with fractured mandibles who require nasal intubation are anaesthetized and paralysed. The patient is ventilated through an LMA. The trainee sets up for an AFOI and performs nasal bronchoscopy with a preloaded ET on the bronchoscope. Once the LMA is viewed with the bronchoscope, the LMA is removed and the assistant provides jaw thrust while the trainee completes the fibreoptic intubation. This technique allows time for teaching while the trainee manoeuvres through the first part of the airway passage. The trainee's fine motor skills can be improved while the patient is anaesthetized and well oxygenated.

2) Asleep Aintree catheter technique (after obtaining patient consent):

Patients who require tracheal intubation may be anaesthetized and paralysed. An LMA is inserted and the trainee uses a bronchoscope with a preloaded Aintree intubation catheterTM (Cook Critical Care, Bloomington, IN, USA) for oral intubation purposes. Although this technique does not require a high level of dexterity, it familiarizes the trainee with the setup process and basics of driving the bronschoscope.

Essential to these teaching techniques is that the whole team, including the Anaesthetic Assistant, is familiar, and ultimately comfortable, with AFOI.

Important elements to emphasis include the importance of patient psychological preparation and consent. The setup process starts with focusing the eyepiece and camera, orientating the camera on the eyepiece and finally zooming the camera out to eliminate the "honey combing" of the video image. The trainee needs to be able to perform and trouble-shoot the setup process as well as performing the AFOI. The trainee then becomes the true professional with a ground up approach to all aspects of AFOI.

This application refers to a number of sedation and local anaesthetic techniques. Although it is our belief that most trainees do not get enough exposure to AFIO and hence an institution should have a standardised technique for the basic trainee, it is also our belief that the advanced trainee should be taught all these modalities and not just those commonly used by a particular instructor. The advanced trainee then becomes a true professional who can draw on a variety of learnt techniques as required by the scenario.

Teaching these techniques skills frequently is important but what is equally important is insisting that they are performed properly every time - not "practice makes perfect" rather **"perfect practice makes perfect"**. Repeating small errors over and over simply instills bad habits that are then difficult to change.

Standardised AFOI Topicalisation Technique for the Basic Trainee

The ideal scenario is for the patient to be wheeled into theatre with cannula in situ, glycopyrollate in for 30 - 45 minutes, nebuliser just finishing (if used), local anaesthetic drawn up in correct and labelled syringes to the dosage appropriate for the patient's weight, ETT loaded on scope, connector available, stack in correct position, oxygen attached, circuit and bag to hand with O2 on and monitoring ready for connection. If sedation is required, this should be prepared and ready to administer. Anaesthetic drugs should also be drawn up and ready to give including muscle relaxants.

Examples worked for a 70kg person using 9mg/kg limit = 630mg max

Oral

Monitoring IV
Cannulae

Glycopyrrolate 4 mcgs/kg

Nebuliser 4% lignocaine 4 mls oral nebuliser 4L/min (encourage deep inspiration)	(160mgs)
Attach nasal prongs with 2 l/min oxygen	
Atomiser (MAD) 5.5 mls 4% Lignocaine (guided oral)	(220mgs)
Down Scope spray 2 mls 4% Lignocaine (x 3)	(240mgs)

Epiglottis, vocal cords – left and right. Repeat as necessary if cords react.
No further LA required below the cords as this will have already trickled down from previous sprays

Total:	**(620 mgs)**

Conduit: try Berman first, if not tolerated then use bite guard.

Oral Sedation Variation

Add in conscious sedation

- Remifentanil 0.01 – 0.1 mcg/kg/minute

Forgo or limit nebulised lignocaine and use the extra LA as a swish and swallow with the viscous Lignocaine. The combination of remifentanil and the viscous lignocaine swish and swallow is particularly useful in patients with a persistent gag reflex.

Nasal

Easier to topicalise as you don't have to obtund the gag reflex Monitoring
IV Cannulae Glycopyrrolate
4mcgs/kg

Nebuliser 4L/min (taped holes) 4% Lignocaine 4mls (160mgs)
Encourage nasal breathing. Patients should not speak to anyone until it has finished

Attach nasal prongs with 2 l/min oxygen in mouth
Identify best nostril using fibrescope (identify largest space below the inferior turbinate)
Co-phenylcaine: 3 sprays to best nostril (15mgs)
MAD 4 mls 4% Lignocaine (160mgs)
Patient sniffing on spraying. Aliquots of 0.5mls advancing slowly posteriorly!

MAD 2.5 mls 2% Lignocaine (Oral) (50mgs)
U-bend the plastic so sprays are directed down towards the vocal cords!

Down Scope sprays 2 mls 4% Lignocaine (x3) (240mgs)
Epiglottis, vocal cords – left and right. Repeat as necessary if cords react.
No further LA required below the cords as this will have already trickled down from previous sprays

Total: **(625mgs)**

Nasal Sedation Variation

Add in conscious sedation
- Remifentanil 0.01 – 0.1 mcg/kg/minute

De Vilbiss Atomiser model 163 Technique

Airway anaesthesia using the DeVilbiss Atomiser.

This is a simple and effective technique using an atomiser to 'spray' a very fine mist of 4% lignocaine to 'coat' the appropriate naso-oropharyngeal mucosa and the lower airway mucosa below the vocal cords. The atomiser model suggested is the De Vilbiss atomiser model 163 (Glass atomizer with a metal top) because it has an adjustable tip at end of a long nozzle. The adjustable tip allows directional spraying by pointing the tip into the trachea, therefore enabling direct spraying of the lower airways from the mouth. There is no need for a trans- tracheal injection nor additional 'spray-as-you-go' technique as this method can be used as a "stand-alone" technique. The atomiser generates very small particle size local anaesthetic droplets (50% of droplets less than 20 microns) that easily penetrate the trachea below the vocal cords. Synchronising the spray of the atomiser with the early phase of inspiration is important to capture the highest air flow rate during the inspiratory phase of respiration to enhance the entrainment of local anaesthetic into the tracheo-bronchial tree. Dose conservation occurs during exhalation as the spraying of the atomiser is stopped.

The local anaesthetic component of the technique:

Fill the De Vilbiss atomiser with 20 ml 4% lignocaine. With oral awake fibreoptic intubation, the average volume required is less than 7 ml. With nasal awake fibreoptic intubation, the average volume required is less than 12 ml. The end points for completion of airway topicalisation are firstly, loss of gag, and finally a voice change.

Suggested topicalisation process for the oral route:

4 'sprays' of the atomiser to the posterior oropharynx (posterior 1/3 tongue, posterior oropharyngeal wall) – test for loss of gag reflex

With the adjustable tip pointing downwards, 4-8 sprays of the atomiser synchronised with inspiration to topicalise the cords and trachea – test for voice change

Suggested topicalisation process for the nasal route:

4 sprays of the atomiser to the selected side of the nose, sweeping the sprays to cover the midline septum, floor of nose and inferior turbinate (lateral).

Also use co-phenylcaine spray for vasoconstriction, then continue with oral route topicalisation process.

The medical adjuvant component of the technique:

This is a very important part of the process.

200 mcg of glycopyrrolate 30 minutes before the start of the topicalisation. fentanyl vs midazolam

Opioids are good at gag suppression, benzodiazepines are good for amnesia.

Combining opioids and benzodiazepine creates excessive respiratory depression and may loose patient cooperation. Avoid use of midazolam. A titrating dose of fentanyl up to 3 mcg/kg may be used to suppress the gag reflex. The first dose can be bolus just prior to the topicalisation process and titrated during the topicalisation of the oropharyngeal cavity. Once the 2 end points are achieved, then instrumentation of the airway with the bronchoscope can begin with minimal discomfort for the patient.

Suggestion is to use fentanyl alone as a bolus dose at the start of topicalisation. A fentanyl dose up to 3 mcg/kg provides good gag suppression for successful oral awake intubation in less than 6 minutes and successful nasal awake intubation in less than 10 minutes.

The combination of glycopyrrolate, fentanyl and the atomiser provides a very effective 'block' of the airway for the purpose of an awake fibreoptic intubation with minimal sedation and no amnesia. The pain associated with this technique is minimal and patients generally report a 'neutral' experience, rather than a 'terrible' or 'pleasurable' experience. This technique will result in minimal/nil gagging or coughing.

NASAL AFOI TOPICALISATION		
Weight Range 35 - 39 Kg		
Give 140 mcg IV Glycopyrrolate Ideally 30 minutes before procedure in a monitored area. Use with caution or reduced doses in patients with cardiac conditions.		
Nose preparation		
Spray 6 metered dose of Co-phenylcaine (5mg per spray) down the best nostril.		
Draw up 3 mls of 4% lignocaine and spray 0.5ml at a time via the nostril using a Mucosal Atomiser Device (MAD). Advance slowly posteriorly and aim to get the atomier all the way back to the nasopharynx.		
Spray as you go		
Lignocaine "spray-as-you-go" down fibre-optic scope suction channel. Use 3 x 5 ml syringe with an air chaser, one for for each spray.		
Epiglottis	2mls	4% Lignocaine
Left Cord	2mls	2% Lignocaine
Right Cord	2mls	2% Lignocaine
Total dose of Lignocaine used was 310 mg.		
There are many different ways to topicalise an airway for a nasal AFOI and this is one sample spray as you go formulae which can be applied to the emergency situation with limited specialised equipment. The dosing regime may need to be modified according to the current medical condition and physical status of the patient.		

NASAL AFOI TOPICALISATION		
Weight Range 40 - 44 Kg		
Give 160 mcg IV Glycopyrrolate. Ideally 30 minutes before procedure in a monitored area. Use with caution or reduced doses in patients with cardiac conditions.		
Nose preparation		
Spray 6 metered dose of Co-phenylcaine (5mg per spray) down the best nostril.		
Draw up 3 mls of 4% lignocaine and spray 0.5ml at a time via the nostril using a Mucosal Atomiser Device (MAD). Advance slowly posteriorly and aim to get the atomier all the way back to the nasopharynx.		
Spray as you go		
Lignocaine "spray-as-you-go" down fibre-optic scope suction channel. Use 3 x 5 ml syringe with an air chaser, one for each spray.		
Epiglottis	2mls	2% Lignocaine
Left Cord	2mls	4% Lignocaine
Right Cord	2mls	4% Lignocaine
Total dose of Lignocaine used was 350 mg		
There are many different ways to topicalise an airway for a nasal AFOI and this is one sample spray as you go formulae which can be applied to the emergency situation with limited specialised equipment. The dosing regime may need to be modified according to the current medical condition and physical status of the patient.		

NASAL AFOI TOPICALISATION		
Weight Range 45 - 49 Kg		
Give 180 mcg IV Glycopyrrolate. Ideally 30 minutes before procedure in a monitored area. Use with caution or reduced doses in patients with cardiac conditions.		
Nose preparation		
Spray 6 metered dose of Co-phenylcaine (5mg per spray) down the best nostril.		
Draw up 3 mls of 4% lignocaine and spray 0.5ml at a time via the nostril using a Mucosal Atomiser Device (MAD). Advance slowly posteriorly and aim to get the atomier all the way back to the nasopharynx.		
Spray as you go		
Lignocaine "spray-as-you-go" down fibre-optic scope suction channel. Use 3 x 5 ml syringe with an air chaser, one for each spray.		
Epiglottis	2mls	4% Lignocaine
Left Cord	2mls	4% Lignocaine
Right Cord	2mls	4% Lignocaine
Total dose of Lignocaine used was 390 mg.		
There are many different ways to topicalise an airway for a nasal AFOI and this is one sample spray as you go formulae which can be applied to the emergency situation with limited specialised equipment. The dosing regime may need to be modified according to the current medical condition and physical status of the patient.		

NASAL AFOI TOPICALISATION

Weight Range 50 - 54 Kg

Give 200 mcg IV Glycopyrrolate.

Ideally 30 minutes before procedure in a monitored area.

Use with caution or reduced doses in patients with cardiac conditions.

Nebuliser

Nebulise 4 mls of 1% lignocaine.

Time this to finish just prior to starting procedure

Nose preparation

Spray 3 metered dose of Co-phenylcaine (5mg per spray) down the best nostril.

Draw up 3 mls of 4% lignocaine and spray 0.5ml at a time via the nostril using a Mucosal Atomiser Device (MAD).

Advance slowly posteriorly and aim to get the atomier all the way back to the nasopharynx.

Oral-pharynx preparation

Draw up 1.5 mls of 2% lignocaine and spray 0.5ml aliquots via the mouth using a Mucosal Atomiser Device (MAD).

Aim at the tonsillar pillars, then the posterior pharyngeal wall, then inferiorly towards larynx.

Spray as you go

Lignocaine "spray-as-you-go" down fibre-optic scope suction channel.

Use 3 x 5 ml syringe with an air chaser, one for each spray.

Epiglottis	2mls	4% Lignocaine
Left Cord	2mls	4% Lignocaine
Right Cord	2mls	4% Lignocaine

Total dose of Lignocaine used was 445 mg.

There are many different ways to topicalise an airway for a nasal AFOI and this is one sample spray as you go formulae which can be applied to the emergency situation with limited specialised equipment. The dosing regime may need to be modified according to the current medical condition and physical status of the patient.

NASAL AFOI TOPICALISATION

Weight Range 55 - 59 Kg

Give 220 mcg IV Glycopyrrolate.

Ideally 30 minutes before procedure in a monitored area.

Use with caution or reduced doses in patients with cardiac conditions.

Nebuliser

Nebulise 4 mls of 2% lignocaine.

Time this to finish just prior to starting procedure

Nose preparation

Spray 3 metered dose of Co-phenylcaine (5mg per spray) down the best nostril.

Draw up 3 mls of 4% lignocaine and spray 0.5ml at a time via the nostril using a Mucosal Atomiser Device (MAD).

Advance slowly posteriorly and aim to get the atomier all the way back to the nasopharynx.

Oral-pharynx preparation

Draw up 2 mls of 2% lignocaine and spray 0.5ml aliquots via the mouth using a Mucosal Atomiser Device (MAD).

Aim at the tonsillar pillars, then the posterior pharyngeal wall, then inferiorly towards larynx.

Spray as you go

Lignocaine "spray-as-you-go" down fibre-optic scope suction channel.

Use 3 x 5 ml syringe with an air chaser, one for each spray.

Epiglottis	2mls	4% Lignocaine
Left Cord	2mls	4% Lignocaine
Right Cord	2mls	4% Lignocaine

Total dose of Lignocaine used was 495 mg.

There are many different ways to topicalise an airway for a nasal AFOI and this is one sample spray as you go formulae which can be applied to the emergency situation with limited specialised equipment. The dosing regime may need to be modified according to the current medical condition and physical status of the patient.

NASAL AFOI TOPICALISATION

Weight Range 60 - 64 Kg

Give 240 mcg IV Glycopyrrolate.

Ideally 30 minutes before procedure in a monitored area.

Use with caution or reduced doses in patients with cardiac conditions.

Nebuliser

Nebulise 4 mls of 2% lignocaine.

Time this to finish just prior to starting procedure

Nose preparation

Spray 3 metered dose of Co-phenylcaine (5mg per spray) down the best nostril.

Draw up 3.5 mls of 4% lignocaine and spray 0.5ml at a time via the nostril using a Mucosal Atomiser Device (MAD).

Advance slowly posteriorly and aim to get the atomier all the way back to the nasopharynx.

Oral-pharynx preparation

Draw up 2.5 mls of 2% lignocaine and spray 0.5ml aliquots via the mouth using a Mucosal Atomiser Device (MAD).

Aim at the tonsillar pillars, then the posterior pharyngeal wall, then inferiorly towards larynx.

Spray as you go

Lignocaine "spray-as-you-go" down fibre-optic scope suction channel.

Use 3 x 5 ml syringe with an air chaser, one for each spray.

Epiglottis	2mls	4% Lignocaine
Left Cord	2mls	4% Lignocaine
Right Cord	2mls	4% Lignocaine

Total dose of Lignocaine used was 525 mg

There are many different ways to topicalise an airway for a nasal AFOI and this is one sample spray as you go formulae which can be applied to the emergency situation with limited specialised equipment. The dosing regime may need to be modified according to the current medical condition and physical status of the patient.

NASAL AFOI TOPICALISATION

Weight Range 65 - 69 Kg

Give 260 mcg IV Glycopyrrolate.

Ideally 30 minutes before procedure in a monitored area.

Use with caution or reduced doses in patients with cardiac conditions.

Nebuliser

Nebulise 4 mls of 4% lignocaine.

Time this to finish just prior to starting procedure

Nose preparation

Spray 3 metered dose of Co-phenylcaine (5mg per spray) down the best nostril.

Draw up 3 mls of 4% lignocaine and spray 0.5ml at a time via the nostril using a Mucosal Atomiser Device (MAD).

Advance slowly posteriorly and aim to get the atomier all the way back to the nasopharynx.

Oral-pharynx preparation

Draw up 2.5 mls of 2% lignocaine and spray 0.5ml aliquots via the mouth using a Mucosal Atomiser Device (MAD).

Aim at the tonsillar pillars, then the posterior pharyngeal wall, then inferiorly towards larynx.

Spray as you go

Lignocaine "spray-as-you-go" down fibre-optic scope suction channel.

Use 3 x 5 ml syringe with an air chaser, one for each spray.

Epiglottis	2mls	4% Lignocaine
Left Cord	2mls	4% Lignocaine
Right Cord	2mls	4% Lignocaine

Total dose of Lignocaine used was 585 mg

There are many different ways to topicalise an airway for a nasal AFOI and this is one sample spray as you go formulae which can be applied to the emergency situation with limited specialised equipment. The dosing regime may need to be modified according to the current medical condition and physical status of the patient.

NASAL AFOI TOPICALISATION		
Weight Range 70 -74 Kg		
Give 280 mcg IV Glycopyrrolate. Ideally 30 minutes before procedure in a monitored area. Use with caution or reduced doses in patients with cardiac conditions.		
Nebuliser		
Nebulise 4 mls of 4% lignocaine. Time this to finish just prior to starting procedure		
Nose preparation		
Spray 3 metered dose of Co-phenylcaine (5mg per spray) down the best nostril.		
Draw up 4 mls of 4% lignocaine and spray 0.5ml at a time via the nostril using a Mucosal Atomiser Device (MAD). Advance slowly posteriorly and aim to get the atomier all the way back to the nasopharynx.		
Oral-pharynx preparation		
Draw up 2.5 mls of 2% lignocaine and spray 0.5ml aliquots via the mouth using a Mucosal Atomiser Device (MAD). Aim at the tonsillar pillars, then the posterior pharyngeal wall, then inferiorly towards larynx.		
Spray as you go		
Lignocaine "spray-as-you-go" down fibre-optic scope suction channel. Use 3 x 5 ml syringe with an air chaser, one for each spray.		
Epiglottis	2mls	4% Lignocaine
Left Cord	2mls	4% Lignocaine
Right Cord	2mls	4% Lignocaine
Total dose of Lignocaine used was 625 mg		
There are many different ways to topicalise an airway for a nasal AFOI and this is one sample spray as you go formulae which can be applied to the emergency situation with limited specialised equipment. The dosing regime may need to be modified according to the current medical condition and physical status of the patient.		

NASAL AFOI TOPICALISATION		
Weight Range 75 - 79 Kg		
Give 300 mcg IV Glycopyrrolate. Ideally 30 minutes before procedure in a monitored area. Use with caution or reduced doses in patients with cardiac conditions.		
Nebuliser		
Nebulise 5 mls of 4% lignocaine. Time this to finish just prior to starting procedure		
Nose preparation		
Spray 3 metered dose of Co-phenylcaine (5mg per spray) down the best nostril.		
Draw up 4 mls of 4% lignocaine and spray 0.5ml at a time via the nostril using a Mucosal Atomiser Device (MAD). Advance slowly posteriorly and aim to get the atomier all the way back to the nasopharynx.		
Oral-pharynx preparation		
Draw up 3 mls of 2% lignocaine and spray 0.5ml aliquots via the mouth using a Mucosal Atomiser Device (MAD). Aim at the tonsillar pillars, then the posterior pharyngeal wall, then inferiorly towards larynx.		
Spray as you go		
Lignocaine "spray-as-you-go" down fibre-optic scope suction channel. Use 3 x 5 ml syringe with an air chaser, one for each spray.		
Epiglottis	2mls	4% Lignocaine
Left Cord	2mls	4% Lignocaine
Right Cord	2mls	4% Lignocaine
Total dose of Lignocaine used was 675 mg		
There are many different ways to topicalise an airway for a nasal AFOI and this is one sample spray as you go formulae which can be applied to the emergency situation with limited specialised equipment. The dosing regime may need to be modified according to the current medical condition and physical status of the patient.		

NASAL AFOI TOPICALISATION

Weight Range 80+ Kg

Give 320 mcg or 4 mcg/kg (max 400 mcg) IV Glycopyrrolate.

Ideally 30 minutes before procedure in a monitored area.

Use with caution or reduced doses in patients with cardiac conditions.

Nebuliser

Nebulise 5 mls of 4% lignocaine.

Time this to finish just prior to starting procedure

Nose preparation

Spray 3 metered dose of Co-phenylcaine (5mg per spray) down the best nostril.

Draw up 4 mls of 4% lignocaine and spray 0.5ml at a time via the nostril using a Mucosal Atomiser Device (MAD).

Advance slowly posteriorly and aim to get the atomier all the way back to the nasopharynx.

Oral-pharynx preparation

Draw up 4 mls of 2% lignocaine and spray 0.5ml aliquots via the mouth using a Mucosal Atomiser Device (MAD).

Aim at the tonsillar pillars, then the posterior pharyngeal wall, then inferiorly towards larynx.

Spray as you go

Lignocaine "spray-as-you-go" down fibre-optic scope suction channel.

Use 3 x 5 ml syringe with an air chaser, one for each spray.

Epiglottis	2mls	4% Lignocaine
Left Cord	2mls	4% Lignocaine
Right Cord	2mls	4% Lignocaine

Total dose of Lignocaine used was 695 mg

There are many different ways to topicalise an airway for a nasal AFOI and this is one sample spray as you go formulae which can be applied to the emergency situation with limited specialised equipment. The dosing regime may need to be modified according to the current medical condition and physical status of the patient.

ORAL AFOI TOPICALISATION		
Weight Range 35 - 39 Kg		
Give 140 mcg IV Glycopyrrolate. Ideally 30 minutes before procedure in a monitored area. Use with caution or reduced doses in patients with cardiac conditions.		
Oral-pharynx preparation		
Draw up 5 mls of 2% lignocaine and spray 0.5ml at a time via the nostril using a Mucosal Atomiser Device (MAD). Advance slowly posteriorly and aim to get the atomier all the way back to the nasopharynx.		
Spray as you go		
Lignocaine "spray-as-you-go" down fibre-optic scope suction channel. Use 3 x 5 ml syringe with an air chaser, one for each spray.		
Epiglottis	2mls	4% Lignocaine
Left Cord	1.5mls	4% Lignocaine
Right Cord	1.5mls	4% Lignocaine
Total dose of Lignocaine used was 300 mg		
There are many different ways to topicalise an airway for a nasal AFOI and this is one sample spray as you go formulae which can be applied to the emergency situation with limited specialised equipment. The dosing regime may need to be modified according to the current medical condition and physical status of the patient.		

ORAL AFOI TOPICALISATION		
Weight Range 40 - 44 Kg		
Give 160 mcg IV Glycopyrrolate. Ideally 30 minutes before procedure in a monitored area. Use with caution or reduced doses in patients with cardiac conditions.		
Oral-pharynx preparation		
Draw up 6 mls of 2% lignocaine and spray 0.5ml at a time via the nostril using a Mucosal Atomiser Device (MAD). Advance slowly posteriorly and aim to get the atomier all the way back to the nasopharynx.		
Spray as you go		
Lignocaine "spray-as-you-go" down fibre-optic scope suction channel. Use 3 x 5 ml syringe with an air chaser, one for each spray.		
Epiglottis	2mls	4% Lignocaine
Left Cord	2mls	4% Lignocaine
Right Cord	2mls	4% Lignocaine
Total dose of Lignocaine used was 360 mg		
There are many different ways to topicalise an airway for a nasal AFOI and this is one sample spray as you go formulae which can be applied to the emergency situation with limited specialised equipment. The dosing regime may need to be modified according to the current medical condition and physical status of the patient.		

ORAL AFOI TOPICALISATION		
Weight Range 45 - 49 Kg		
Give 180 mcg IV Glycopyrrolate. Ideally 30 minutes before procedure in a monitored area. Use with caution or reduced doses in patients with cardiac conditions.		
Nebuliser		
Nebulise 4 mls of 1% lignocaine. Time this to finish just prior to starting procedure		
Oral-pharynx preparation		
Draw up 6 mls of 2% lignocaine and spray 0.5ml at a time via the nostril using a Mucosal Atomiser Device (MAD). Advance slowly posteriorly and aim to get the atomier all the way back to the nasopharynx.		
Spray as you go		
Lignocaine "spray-as-you-go" down fibre-optic scope suction channel. Use 3 x 5 ml syringe with an air chaser, one for each spray.		
Epiglottis	2mls	4% Lignocaine
Left Cord	2mls	4% Lignocaine
Right Cord	2mls	4% Lignocaine
Total dose of Lignocaine used was 400 mg		
There are many different ways to topicalise an airway for a nasal AFOI and this is one sample spray as you go formulae which can be applied to the emergency situation with limited specialised equipment. The dosing regime may need to be modified according to the current medical condition and physical status of the patient.		

ORAL AFOI TOPICALISATION		
Weight Range 50 - 54 Kg		
Give 200 mcg IV Glycopyrrolate. Ideally 30 minutes before procedure in a monitored area. Use with caution or reduced doses in patients with cardiac conditions.		
Nebuliser		
Nebulise 4 mls of 1% lignocaine. Time this to finish just prior to starting procedure		
Oral-pharynx preparation		
Draw up 4 mls of 4% lignocaine and spray 0.5ml aliquots via the mouth using a Mucosal Atomiser Device (MAD). Aim at the tonsillar pillars, then the posterior pharyngeal wall, then inferiorly towards larynx.		
Spray as you go		
Lignocaine "spray-as-you-go" down fibre-optic scope suction channel. Use 3 x 5 ml syringe with an air chaser, one for each spray.		
Epiglottis	2mls	4% Lignocaine
Left Cord	2mls	4% Lignocaine
Right Cord	2mls	4% Lignocaine
Total dose of Lignocaine used was 440 mg		
There are many different ways to topicalise an airway for a nasal AFOI and this is one sample spray as you go formulae which can be applied to the emergency situation with limited specialised equipment. The dosing regime may need to be modified according to the current medical condition and physical status of the patient.		

ORAL AFOI TOPICALISATION		
Weight Range 55 - 59 Kg		
Give 220 mcg IV Glycopyrrolate. Ideally 30 minutes before procedure in a monitored area. Use with caution or reduced doses in patients with cardiac conditions.		
Nebuliser		
Nebulise 4 mls of 2% lignocaine. Time this to finish just prior to starting procedure		
Oral-pharynx preparation		
Draw up 4 mls of 4% lignocaine and spray 0.5ml aliquots via the mouth using a Mucosal Atomiser Device (MAD). Aim at the tonsillar pillars, then the posterior pharyngeal wall, then inferiorly towards larynx.		
Spray as you go		
Lignocaine "spray-as-you-go" down fibre-optic scope suction channel. Use 3 x 5 ml syringe with an air chaser, one for each spray.		
Epiglottis	2mls	4% Lignocaine
Left Cord	2mls	4% Lignocaine
Right Cord	2mls	4% Lignocaine
Total dose of Lignocaine used was 480 mg		
There are many different ways to topicalise an airway for a nasal AFOI and this is one sample spray as you go formulae which can be applied to the emergency situation with limited specialised equipment. The dosing regime may need to be modified according to the current medical condition and physical status of the patient.		

ORAL AFOI TOPICALISATION		
Weight Range 60 - 64 Kg		
Give 240 mcg IV Glycopyrrolate. Ideally 30 minutes before procedure in a monitored area. Use with caution or reduced doses in patients with cardiac conditions.		
Nebuliser		
Nebulise 3.5 mls of 4% lignocaine. Time this to finish just prior to starting procedure		
Oral-pharynx preparation		
Draw up 4 mls of 4% lignocaine and spray 0.5ml aliquots via the mouth using a Mucosal Atomiser Device (MAD). Aim at the tonsillar pillars, then the posterior pharyngeal wall, then inferiorly towards larynx.		
Spray as you go		
Lignocaine "spray-as-you-go" down fibre-optic scope suction channel. Use 3 x 5 ml syringe with an air chaser, one for each spray.		
Epiglottis	2mls	4% Lignocaine
Left Cord	2mls	4% Lignocaine
Right Cord	2mls	4% Lignocaine
Total dose of Lignocaine used was 540 mg		
There are many different ways to topicalise an airway for a nasal AFOI and this is one sample spray as you go formulae which can be applied to the emergency situation with limited specialised equipment. The dosing regime may need to be modified according to the current medical condition and physical status of the patient.		

ORAL AFOI TOPICALISATION

Weight Range 65 - 69 Kg

Give 260 mcg IV Glycopyrrolate.

Ideally 30 minutes before procedure in a monitored area.

Use with caution or reduced doses in patients with cardiac conditions.

Nebuliser

Nebulise 4 mls of 4% lignocaine.

Time this to finish just prior to starting procedure

Oral-pharynx preparation

Draw up 4.5 mls of 4% lignocaine and spray 0.5ml aliquots via the mouth using a Mucosal Atomiser Device (MAD).

Aim at the tonsillar pillars, then the posterior pharyngeal wall, then inferiorly towards larynx.

Spray as you go

Lignocaine "spray-as-you-go" down fibre-optic scope suction channel.

Use 3 x 5 ml syringe with an air chaser, one for each spray.

Epiglottis	2mls	4% Lignocaine
Left Cord	2mls	4% Lignocaine
Right Cord	2mls	4% Lignocaine

Total dose of Lignocaine used was 580 mg

There are many different ways to topicalise an airway for a nasal AFOI and this is one sample spray as you go formulae which can be applied to the emergency situation with limited specialised equipment. The dosing regime may need to be modified according to the current medical condition and physical status of the patient.

ORAL AFOI TOPICALISATION

Weight Range 70 -74 Kg

Give 280 mcg IV Glycopyrrolate.

Ideally 30 minutes before procedure in a monitored area.

Use with caution or reduced doses in patients with cardiac conditions.

Nebuliser

Nebulise 4 mls of 4% lignocaine.

Time this to finish just prior to starting procedure

Oral-pharynx preparation

Draw up 5.5 mls of 4% lignocaine and spray 0.5ml aliquots via the mouth using a Mucosal Atomiser Device (MAD).

Aim at the tonsillar pillars, then the posterior pharyngeal wall, then inferiorly towards larynx.

Spray as you go

Lignocaine "spray-as-you-go" down fibre-optic scope suction channel.

Use 3 x 5 ml syringe with an air chaser, one for each spray.

Epiglottis	2mls	4% Lignocaine
Left Cord	2mls	4% Lignocaine
Right Cord	2mls	4% Lignocaine

Total dose of Lignocaine used was 620 mg

There are many different ways to topicalise an airway for a nasal AFOI and this is one sample spray as you go formulae which can be applied to the emergency situation with limited specialised equipment. The dosing regime may need to be modified according to the current medical condition and physical status of the patient.

ORAL AFOI TOPICALISATION		
Weight Range 75 - 79 Kg		
Give 300 mcg IV Glycopyrrolate. Ideally 30 minutes before procedure in a monitored area. Use with caution or reduced doses in patients with cardiac conditions.		
Nebuliser		
Nebulise 5 mls of 4% lignocaine. Time this to finish just prior to starting procedure		
Oral-pharynx preparation		
Draw up 5.5 mls of 4% lignocaine and spray 0.5ml aliquots via the mouth using a Mucosal Atomiser Device (MAD). Aim at the tonsillar pillars, then the posterior pharyngeal wall, then inferiorly towards larynx.		
Spray as you go		
Lignocaine "spray-as-you-go" down fibre-optic scope suction channel. Use 3 x 5 ml syringe with an air chaser, one for each spray.		
Epiglottis	2mls	4% Lignocaine
Left Cord	2mls	4% Lignocaine
Right Cord	2mls	4% Lignocaine
Total dose of Lignocaine used was 660 mg		
There are many different ways to topicalise an airway for a nasal AFOI and this is one sample spray as you go formulae which can be applied to the emergency situation with limited specialised equipment. The dosing regime may need to be modified according to the current medical condition and physical status of the patient.		

ORAL AFOI TOPICALISATION		
Weight Range 80+ Kg		
Give 320 mcg or 4 mcg/kg (max 400 mcg) IV Glycopyrrolate. Ideally 30 minutes before procedure in a monitored area. Use with caution or reduced doses in patients with cardiac conditions.		
Nebuliser		
Nebulise 5 mls of 4% lignocaine. Time this to finish just prior to starting procedure		
Oral-pharynx preparation		
Draw up 6.5 mls of 4% lignocaine and spray 0.5ml aliquots via the mouth using a Mucosal Atomiser Device (MAD). Aim at the tonsillar pillars, then the posterior pharyngeal wall, then inferiorly towards larynx.		
Spray as you go		
Lignocaine "spray-as-you-go" down fibre-optic scope suction channel. Use 3 x 5 ml syringe with an air chaser, one for each spray.		
Epiglottis	2mls	4% Lignocaine
Left Cord	2mls	4% Lignocaine
Right Cord	2mls	4% Lignocaine
Total dose of Lignocaine used was 700 mg		
There are many different ways to topicalise an airway for a nasal AFOI and this is one sample spray as you go formulae which can be applied to the emergency situation with limited specialised equipment. The dosing regime may need to be modified according to the current medical condition and physical status of the patient.		

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