Review Article

Preparation of the patient and the airway for awake intubation

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ABSTRACT

Awake intubation is usually performed electively in the presence of a difficult airway. A detailed airway examination is time-consuming and often not feasible in an emergency. A simple 1-2-3 rule for airway examination allows one to identify potential airway difficulty within a minute. A more detailed airway examination can give a better idea about the exact nature of difficulty and the course of action to be taken to overcome it. When faced with an anticipated difficult airway, the anaesthesiologist needs to consider securing the airway in an awake state without the use of anaesthetic agents or muscle relaxants. As this can be highly discomforting to the patient, time and effort must be spent to prepare such patients both psychologically and pharmacologically for awake intubation. Psychological preparation is best initiated by an anaesthesiologist who explains the procedure in simple language. Sedative medications can be titrated to achieve patient comfort without compromising airway patency. Additional pharmacological preparation includes anaesthetising the airway through topical application of local anaesthetics and appropriate nerve blocks. When faced with a difficult airway, one should call for the difficult airway cart as well as for help from colleagues who have interest and expertise in airway management. Preoxygenation and monitoring during awake intubation is important. Anxious patients with a difficult airway may need to be intubated under general anaesthesia without muscle relaxants. Proper psychological and pharmacological preparation of the patient by an empathetic anaesthesiologist can go a long way in making awake intubation acceptable for all concerned.

Key words: Awake intubation, monitoring, pharmacological preparation, psychological preparation, topical anaesthesia

INTRODUCTION

Endotracheal intubation is one of the earliest skills that anaesthesiologists learn during their training period. As an anaesthesiologist or intensivist, we are often called upon to perform endotracheal intubation either in a planned manner or as an emergency. Historically, the first intubation for purposes of providing anaesthesia was reported by Dr. William Macewan, a surgeon, in 1878. Since then, endotracheal intubation has been the mainstay of airway management not only to provide anaesthesia but also for emergency medical care and during resuscitation.

Endotracheal intubation

Performance of endotracheal intubation can be viewed as several interconnected steps. These include assessment of the airway; psychological preparation of the patient; pharmacological preparation of the airway; and preparation of equipment and personnel. The procedure of endotracheal intubation is itself divided into essential monitoring, preoxygenation, and general or local anaesthesia as indicated. While the majority of endotracheal intubations are performed in an elective manner, a small number may be done in an emergency.

Airway assessment

All intubations are potentially difficult, but some are more difficult than others.[1] During the preoperative visit, the anaesthesiologist must elicit the history of possible airway difficulty in the past. An in-depth study of prior anaesthetic records will give an idea as to the exact nature of difficulty encountered on previous occasions, what was done to overcome this

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difficulty and how mask ventilation or endotracheal intubation was eventually achieved.[2] Armed with this information, the anaesthesiologist must then perform a focused airway examination to elicit signs and symptoms that predict a possible difficult airway.

The airway can be rapidly assessed (even in an emergency situation) by a simple 1-2-3 rule. The ability to insinuate the tip of 1 finger into the temporomandibular joint (TMJ) space in front of the tragus is assessed during opening and closing of the mouth. It indicates adequate mobility of the TMJ. An interincisor gap of at least 2 fingerbreadths between the upper and lower incisors (or the upper and lower gingival margins in edentulous patients) indicates adequate space between the jaws for introduction of a laryngoscope blade, thereby facilitating exposure of the glottis and ensuring sufficient room for the passage of an endotracheal tube. A thyromental distance (TMD) of more than 3 fingerbreadths measured between the thyroid notch and the symphysis menti is used to evaluate the space available for displacement of the tongue during laryngoscopy and intubation. This simple 1-2-3 rule, which can be performed in less than a minute, should be considered as mandatory minimum airway examination to be done prior to performing endotracheal intubation (including in an emergency situation). Other aspects of airway examination that could predict a possible difficulty in endotracheal intubation include modified Mallampati class, head and neck movements, subluxation of the mandible, a receding mandible and neck circumference. Though a complete description of airway assessment is beyond the scope of this review, it is a mandatory component of preparation prior to performing elective endotracheal intubation.

A detailed examination of the airway permits the anaesthesiologist to decide whether the patient has a normal airway that would permit endotracheal intubation under general anaesthesia with muscle relaxation. On the other hand, there may be obvious difficulty anticipated when the decision to achieve intubation in the awake state under topical anaesthesia might be appropriate. There is a third category of patients whose airway is borderline. In such patients, one cannot be sure whether one would continue to have control of the airway following induction of general anaesthesia. This category of patients may need ongoing airway assessment in a spontaneously breathing anaesthetised state and avoidance of muscle paralysis until endotracheal intubation is completed and confirmed.

Psychological preparation

It is important for the anaesthesiologist to recognise the fact that every patient admitted to hospital goes through a complex series of feelings, most important among them being the feeling of anxiety and fear of the unknown. Anxiety results not only from the state of illness but also from the new surroundings and the myriad procedures that are performed on them, each resulting in varying degrees of discomfort.

The preanaesthetic interview is the first (and often the only) time that the anaesthesiologist will meet the patient. The anaesthesiologist should seize this opportunity to win over the confidence and cooperation of the patient. An empathetic anaesthesiologist is one who is capable of identifying the patient's thoughts, feelings and behaviour, including those that are distressing and disturbing. One should have the ability to internalise the entire hospital experience that the patient is going through so that one can offer appropriate reassurance to quell the patient's anxieties. Once the patient perceives the anaesthesiologist to be empathetic and understanding, the major portion of the "battle" is won.[3]

Winning the patient's confidence and cooperation is particularly important when endotracheal intubation is planned in the awake state. It is the first step towards making awake intubation under topical anaesthesia an acceptable option. The anaesthesiologist must describe to the patient in a careful and unhurried manner (using as few medical terms as possible), the reason why securing the airway in the awake state is of utmost importance despite the conventional technique following induction of anaesthesia being more comfortable for the patient. The patient must be given the opportunity to choose from the options available, with intubation after induction of anaesthesia being the last, albeit less safe, option.[4] It must be made amply clear that endotracheal intubation in the awake state under topical anaesthesia is ideal because of its inherent safety. The patient must be informed that (s)he will experience some degree of discomfort while the airway is being secured in the awake state. A realistic description of the degree of discomfort and unpleasantness to be anticipated during awake intubation will go a long way in obtaining the trust and cooperation of the patient. A written informed consent detailing the entire procedure of endotracheal intubation in the awake state will complete the preoperative psychological preparation of the patient.

Pharmacological preparation of the patient and airway

When endotracheal intubation is planned in an awake state under topical anaesthesia, a combination of premedicant drugs is used to allay anxiety, provide a clear and dry airway, and prevent aspiration of gastric contents.[5] Intravenous (IV) midazolam in a dose of 20 to 40 μg/kg, repeated every 5 min as needed, is used to achieve the desired level of sedation (maximum dose of 100 to 200 μg/kg). Midazolam provides excellent anxiolysis and anterograde amnesia. Alternate drugs for producing sedation/anxiolysis include IV fentanyl (1 to 2 μg/kg) or IV remifentanil 0.05 to 0.5 μg/kg. Dexmedetomidine, an alpha-2 adrenoceptor agonist, has sedative, analgesic and anaesthetic-sparing effects. It produces sedation without affecting ventilation. Dexmedetomidine also has potent antisialogogue action. It is used in a loading dose of 1 μg/kg IV over 10 min, followed by a continuous infusion of 0.2–0.7 μg/kg/hour. Propofol administered in incremental doses of 0.25 mg/kg IV can produce adequate sedation for performing endotracheal intubation under good topical anaesthesia.

An antisialogogue such as glycopyrrolate (7 to 10 μg/kg IV) has an onset of action within 1 to 2 min with a peak effect around 1 hour. Atropine (7 to 10 μg/kg IV) has less antisialogogue action as compared to glycopyrrolate. Both drugs cause vagolysis, with atropine producing a greater increase in heart rate than glycopyrrolate. Use of antisialogogues ensures a relatively dry field that facilitates good visibility during flexible fibreoptic-aided intubation. By reducing salivary secretions, it also ensures that local anaesthetic agents used for topical anaesthesia do not get diluted or suctioned out along with salivary secretions. A dry field ensures better quality of topical anaesthesia by allowing the local anaesthetic to act on the mucosal surfaces in appropriate concentrations.

Vasoconstriction of the highly vascular mucosa in the nose and nasopharynx forms another essential aspect of pharmacological preparation. Application of phenylephrine along with lignocaine produces vasoconstriction as well as topical anaesthesia. Other vasoconstrictors include 0.025–0.05% oxymetazoline hydrochloride nasal drops for nasal decongestion.

A combination of an H_2-receptor blocker such as ranitidine or cimetidine, along with a prokinetic agent such as metoclopramide by the oral or IV route, helps in preventing aspiration of gastric contents. Addition of a non-particulate antacid (15 to 30 mL of 0.3 M sodium citrate solution) improves the degree of such protection.

Preparation of equipment and personnel

Though the majority of endotracheal intubations are routine and are achieved by conventional techniques, a small number may turn out to be difficult airways (anticipated, or what is more distressing to all concerned, an unanticipated difficult airway). All operating suites should be geared to deal with an anticipated or unanticipated difficult airway. Staff working in the operating rooms should be familiar with a well-rehearsed algorithmic approach that they will follow by reflex when faced with a difficult airway. Specially trained personnel should be alerted as soon as airway difficulty is encountered. This is true irrespective of the number of years of experience that the primary caregiver might have. Two heads (and four hands) have a greater chance of succeeding, especially when the going gets tough. The availability of more skilled assistants will go a long way in enhancing safety and success. The assistant(s) should be knowledgeable and skilful enough to assist the primary operator. He or she should be capable of helping with two-person mask ventilation. Experience in handling alternative airway equipment would be a bonus.[6]

After "calling for help", one should next call for the "difficult airway cart". In concept, this is a portable airway workstation on wheels that can be quickly moved into location as soon as one comes across a difficult airway. The contents of the difficult airway cart depend on the type of patient that one comes across at a particular centre. The difficult airway cart should ideally include a range of oropharyngeal and nasopharyngeal airways, an assortment of endotracheal tubes of various sizes, the entire family of laryngeal mask airways (including LMA-Classic, Intubating-LMA and ProSeal LMA), other supraglottic airways, different types of laryngoscope blades/handles, lighted stylet, rigid/flexible fibreoptic laryngoscopes, malleable stylets, tube exchangers, and a surgical airway kit. This list is by no means exhaustive, as individual centres and anaesthesiologists can and will add airway equipment of their choice to the cart.

Monitoring

In addition to basic monitors such as electrocardiograph, noninvasive blood pressure and pulse oximeter, operating rooms dealing with patients with difficult airways should have the means of confirming proper

location of the endotracheal tube within the trachea. While seeing the endotracheal tube pass between the vocal cords is a simple method of confirming proper tracheal location, it is not always possible, especially when the laryngoscopic view obtained is poor. Other clinical methods include misting and demisting of the endotracheal tube during expiration and inspiration; and five-point auscultation (both infraclavicular regions, both upper axillary regions and epigastrium) to confirm bilateral air entry over the chest and absence of gurgling sounds over the epigastrium. Capnography, Wee's oesophageal detector device (or its modifications) and Scoti device are other techniques for confirming tracheal intubation. The gold standard for confirming tracheal intubation is identification of tracheal rings and carina beyond the tip of the endotracheal tube using a flexible fibrescope. A chest X-ray can be used for confirming tracheal intubation in locations outside the operating room such as an intensive care unit (ICU).

Preoxygenation

The process of replacing the nitrogen present in the functional residual capacity with oxygen is known as preoxygenation. The alternate term is denitrogenation. In principle, preoxygenation is aimed at building up a reserve of oxygen in the lungs to tide over a prolonged period of apnoea that might be occasionally encountered during airway management (especially if one were to come across an unanticipated difficult airway). Various techniques have been described for preoxygenation.[7] While it is possible to administer 100% oxygen in the operation theatre or ICU using an anaesthesia machine or an ICU ventilator, this cannot be done easily unless the patient is intubated. It is possible to perform effective preoxygenation using a mask that is contoured to achieve an airtight fit over the patient's face. Various preoxygenation techniques include traditional tidal volume breathing for 3–5 min, single vital capacity breath (either alone or followed by tidal volume breathing), four deep inspiratory capacity breaths (or eight such breaths as described by some authors). In terms of efficacy, there is little to choose from between these various techniques of preoxygenation.

Irrespective of the technique used, the adequacy of preoxygenation can be ensured using an oxygram (a graphic record of the concentration of oxygen in the respired gases, similar to a capnogram for carbon dioxide). An end-expiratory oxygen concentration of at least 95% while breathing 100% oxygen is taken as an indication of adequate preoxygenation.[8]

Intubation under general anaesthesia

Endotracheal intubation is best performed under general anaesthesia with or without muscle relaxation. Patients with a clinically normal airway can be safely intubated under general anaesthesia with muscle paralysis. Patients who have a doubtful airway can also be intubated under general anaesthesia, but without concurrent use of muscle relaxants. As one may come across patients with a difficult airway who are too anxious to permit intubation in the awake state, it may be appropriate to review the relevant aspects of endotracheal intubation under general anaesthesia without muscle relaxant.

General anaesthesia can be induced using either inhalation or intravenous agents (or a combination of the two). Inhalational agents have the unique advantage of being applicable in paediatric patients with a difficult airway, as well as adult patients with a difficult airway who are uncooperative for awake intubation under topical anaesthesia. Agents that are commonly used include sevoflurane and desflurane. Sevoflurane has a slight edge over desflurane as it can produce smooth anaesthetic induction with minimal cough, breath holding, secretions and laryngospasm. It has a rapid onset and offset of action. Induction of anaesthesia with desflurane is often associated with coughing and breath holding. However, desflurane has a much quicker offset of action. Patients with a borderline difficult airway who are uncooperative for awake intubation under topical anaesthesia can be induced with sevoflurane in oxygen. Once an adequate depth of anaesthesia has been achieved, sevoflurane is turned off and anaesthesia maintained with desflurane so that the advantage of rapid offset of action can be used if required. At this point, anaesthesia can also be deepened using a small dose of propofol (1 mg/kg). A gentle laryngoscopy can then be performed to assess the ease of intubation. Should a good view of the larynx be obtained, intubation may be performed without the use of muscle relaxants. Opinion is divided among anaesthesiologists about intubating patients under general anaesthesia without inducing muscle paralysis. Most believe that intubating without muscle relaxants can produce more laryngeal trauma. However, when one is faced with a potentially difficult airway in a very anxious patient, intubation under general anaesthesia without muscle relaxant might still be an acceptable option in the hands of the expert.

Propofol in a dose of 2–2.5 mg/kg has an advantage over other intravenous induction agents in that it attenuates

airway responses, thereby facilitating laryngoscopy and intubation. Other intravenous induction agents such as thiopentone, etomidate and ketamine have all been used with equally good results. Choice of muscle relaxants is dictated by the anaesthesiologist's judgement of the ease of intubation. Succinylcholine hydrochloride in a dose of 1–1.5 mg/kg provides by far the best intubating conditions within 60 sec. The short duration of intense muscle paralysis that succinylcholine produces is a distinct advantage over other muscle relaxants. Though it has been proposed that rocuronium is a good alternative for providing muscle paralysis prior to endotracheal intubation, the quality and intensity of muscle paralysis produced by rocuronium or any of the other nondepolarising muscle relaxants is inferior compared to that produced by succinylcholine. Current literature suggests that sugammadex could be used to reverse the effects of a nondepolarising relaxant within minutes of the need to do so. However, the prohibitive cost of sugammadex (approximately Rs 50,000 for a single use) precludes its routine use in clinical practice even in affluent countries.

Topical anaesthesia for awake intubation

Should the decision be taken to perform endotracheal intubation in the awake state, the patient should undergo psychological and pharmacological preparation as described earlier. Topical anaesthesia can be provided either through surface analgesia or using appropriate nerve blocks.[5]

The oral cavity can be topicalised using 2% lignocaine viscous that is swished around in the mouth for a period of 5–10 min. Lignocaine can also be applied to the mucosa by using a 10% spray supplied in pressurised bottles (10 mg lignocaine per activation). When nasal intubation is planned, the nasal mucosa can be anaesthetised using two pledgets soaked in 4% topical lignocaine introduced gently under vision as far as they will go. The first one is applied at a 45-degree angle to the hard palate to anaesthetise the sphenopalatine ganglion while the second is introduced parallel to the dorsal surface of the nose to block the anterior ethmoidal nerve.

Glossopharyngeal nerve block anaesthetises the posterior third of the tongue and the oropharynx and laryngopharynx up to the vallecula including the anterior surface of the epiglottis. The glossopharyngeal nerve can be blocked through the intraoral route at the base of the palatoglossal and palatopharyngeal folds. The major part of this area also gets anaesthetised when the patient gargles 2% lignocaine viscous as described above. Blocking the glossopharyngeal nerve provides the added advantage of preventing retching that often occurs when the posterior third of the tongue is lifted during laryngoscopy to facilitate visualisation of the glottis.

The posterior surface of the epiglottis and the glottic inlet up to the level of the vocal cords is supplied by the superior laryngeal nerve, a branch of the vagus. The area below the vocal cords is supplied by the recurrent laryngeal nerve, again a branch of the vagus. While the superior laryngeal nerve is blocked at the level of the hyoid bone, the area supplied by the recurrent laryngeal nerves is anaesthetised using a translaryngeal injection of 2% or 4% lignocaine injected at the end of a deep inspiration through an intravenous canula introduced in a caudad direction through the cricothyroid membrane. The vigorous cough that follows literally sprays the local anaesthetic solution onto the vocal cords from below.

When fibreoptic intubation is performed in the awake state, the operator can use a technique of "spray as you go" through the suction channel. A continuous flow of oxygen (2–3 litres per min) helps to maintain oxygenation while at the same time clears secretions away from the optical system of the fibrescope. When lignocaine is injected through the suction channel along with a flow of oxygen, the latter creates a fine spray of local anaesthetic that gets deposited under vision onto the structures distal to the fibrescope.

In any technique that employs a local anaesthetic solution, the anaesthesiologist should keep a close track of the total amount of local anaesthetic drug used to prevent inadvertent drug toxicity. Patient comfort is achieved using pharmacological options described earlier.

SUMMARY

Endotracheal intubation is one of the basic lifesaving skills that an anaesthesiologist possesses. Its performance begins with a detailed airway assessment for identifying a difficult airway. Based on the findings of the airway examination and a focused medical history, the anaesthesiologist decides whether the intubation is best performed safely in the awake state or the patient could be given the benefit of general anaesthesia without muscle relaxation. Essential monitoring and preoxygenation

constitute a part of the sequence of endotracheal intubation. The details of providing topical anaesthesia (when awake intubation is considered) or general anaesthesia without muscle relaxation (in an extremely anxious individual with a potentially difficult airway) are covered in the latter part of this review. Proper patient preparation by an empathetic anaesthesiologist goes a long way in making the procedure of awake intubation acceptable for all concerned.

REFERENCES

1. Shorten GD, Roberts JT. The prediction of difficult intubation. Anesthesiol Clin North America 1991;9:63-7.
2. Rosenblatt WH, Sukhupragarn W. Airway management. In: Barash PG, Cullen BF, Stoelting RK, Cahalan MK, Stock MC, Editors. Clinical Anesthesia, 6th ed. Philadelphia: Lippincott Williams and Wilkins; 2009. p. 751-92.
3. Farsad P, Galliguez P, Chamberlin R, Roghmann KJ. Teaching interviewing skills to pediatric house officers. Pediatrics 1978;61:384-8.
4. Reed AF, Han DG. Preparation of the patient for awake intubation. Anesthesiol Clin North America 1991;9:69-81.
5. Sanchez A, Iyer RR, Morrison DE. Preparation of the patient for awake intubation. In: Hagberg CA, Editor. Benumof's Airway Management: Principles and Practice. Philadelphia: Mosby-Elsevier 2007. p. 255-80.
6. Practice Guidelines for Management of the Difficult Airway: An updated report by the American Society of Anesthesiologists Task Force on Management of the difficult airway. Anesthesiology 2003;98:1269-77.
7. Baraka A, Salem MR. Preoxygenation. In: Hagberg CA, Editor. Benumof's Airway Management: Principles and practice. Philadelphia: Mosby-Elsevier 2007. p. 303-18.
8. Berry CB, Myles PS. Preoxygenation in healthy volunteers: A graph of oxygen "washin" using end-tidal oxygraphy. Br J Anaesth 1994;72:116-8.

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