ORIGINAL ARTICLE

Fibreoptic Intubation — A Case Series and Brief Review

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Summary

Fibreoptic intubation has been established as a major advance in the management of difficult or failed intubation in the awake patient[1]. If necessary, it may be performed under general anaesthesia with either spontaneous or controlled ventilation. This should be considered early in the management of failed intubation, before multiple attempts with other techniques lead to haemorrhage and oedema in the airway. We describe here selected case reports to illustrate this in 8 different situations. This is followed by a brief review of the technique and indications of fibreoptic intubation.

Key words: Intubation, tracheal: fibreoptic, awake, technique.

Introduction

Anaesthetists occasionally encounter difficult and even failed intubation. Unfortunately, some of these lead to brain damage or death. In the Reports on Confidential Enquiries into Maternal Deaths in England and Wales 1973-1984, approximately 41% of deaths directly ascribable to anaesthesia were caused by difficulties with tracheal intubation[1]. Awake intubation should be considered whenever a difficult airway is encountered[2,3]. Fibreoptic, retrograde guided and blind nasal techniques may be performed under topical analgesia with sedation if required. Fibreoptic intubation is now the technique of choice, with a high success rate and with least trauma to the patient[1]. It can also be performed in the anaesthetised patient, preferably breathing spontaneously which removes the urgency for completing intubation.

Materials

An Olympus bronchofibrescope (BF Type 1T10) with a suction-cum-injection channel was used for the cases described here.

Case Reports

Case 1: previous difficult intubation

EST, a 43 year old male, presented for retinal detachment surgery. He gave a history of systemic lupus erythematosus with Raynaud's syndrome and hypertension. On going through his past anaesthetic records it was found that the previous anaesthetist had difficulty intubating his trachea due to an anterior larynx and limited neck mobility. A decision was made to electively perform an awake fibreoptic intubation. The patient was pre-medicated with papaveretum 20 mg and scopolamine 0.2 mg.

In the induction room, further sedation was titrated to achieve an end point of a drowsy and relaxed patient who could still obey commands promptly — a total dose of midazolam 4 mg and fentanyl 100 mcg was used.

The pharynx was sprayed with 5 squirts of 10% lignocaine (50 mg). A size 8.5 mm RAE oro-tracheal tube was railroaded over the fibreoptic scope after lubrication with KY jelly. The tube was introduced orally through a London prop to protect the scope from being bitten by the patient, with the tip of the scope protruding from the end of the tube. On visualising the epiglottis, the patient was asked to protrude his tongue and the tip of the scope was manouvered behind the epiglottis. On visualising the vocal cords, 5 mls of 1% lignocaine was sprayed through the working channel of the scope. After waiting 15 seconds for the local anaesthetic to take effect, the tip of the scope was manouvered past the vocal cords into the trachea, and a further 5 mls of 1% lignocaine was squirted into the trachea. After waiting another 15 seconds, the endotracheal tube was railroaded into the trachea and the scope removed. Correct placement was assured, since the tracheal rings and carina were visualised through the scope.

Case 2: bilateral mandibular and LeFort fractures

RBA, a 25 year old male, presented for elective internal fixation of bilateral mandibular and LeFort II maxillary fractures. Since intubation might be difficult, an elective awake fibreoptic intubation was planned for. The patient was pre-medicated with oral midazolam 7.5 mg. In the operating room, the chosen nostril was packed with ribbon gauze soaked in 1 ml of 4% cocaine, and the pharynx sprayed with 5 sprays of 10% lignocaine. Fibreoptic intubation was then performed in a similar way as in Case 1, with a size 8.0 mm nasotracheal tube, with 2 aliquots of 4 mls of 1% lignocaine squirted down the working channel of the scope as in Case 1.

Case 3: unstable cervical spine

ZBZ, a 31 year old female, presented for anterior fusion of an unstable tuberculous lesion of her third and fourth cervical spine. She did not have any neurological deficit. She was pre-medicated with pethidine 50 mg and promethazine 12.5 mg i/m. Further sedation was given IV in the operating room, titrating to achieve a very sleepy patient who could still obey commands — a total of 2.5 mg droperidol and 150 mcg of fentanyl was used. Heavier than normal sedation was used in this case to avoid violent coughing, which can cause excessive movement of the cervical spine. Atropine 0.3 mg was also given to reduce the amount of secretions. Oxygen was given via nasal prongs because of the respiratory depression from the heavy sedation. The pharynx was sprayed with 5 sprays of 10% lignocaine and awake oral fibreoptic intubation was performed in the usual manner with a size 7.5 mm reinforced flexible tube. Because of the heavy sedation, the patient did not cough on spraying the lignocaine onto the vocal cords, and only gave 2 very slight coughs when the flexible scope passed through the cords, which did not cause any neck movement. There was no further coughing with the intra-tracheal tube lignocaine and passing of the tracheal tube.

Case 4: neck contractures

ABC, a 30 year old lady, presented 3 months after being burnt, for release of severe contractures of the neck, forearm and sternum. She had very limited extension of her head and neck and intubation was expected to be difficult. She was pre-medicated with oral midazolam 7.5 mg. In theatre, IV droperidol and fentanyl were titrated to a dose of 2.5 mg and 100 mcg respectively. After spraying the pharynx with 10% lignocaine, there was difficulty visualising the epiglottis via the scope, which was overcome by telling the patient to protrude her tongue. Oral fibreoptic intubation was then carried out in a similar manner.

Case 5: previous failed intubation due to tongue flap.

XYZ was a 28 year old man with a previous attempted cleft palate repair and palatal fistula. He had a recent operation where the tongue was stitched onto the palate to close the fistula. He presented at another centre for release of the tongue flap. Unfortunately, intubation via direct laryngoscopy was unsuccessful, and nasal intubation was attempted. This resulted in bleeding, laryngospasm, hypoxia and near-cardiac arrest. The operation was abandoned and the patient referred to this centre.

An elective awake fibreoptic intubation was planned. The patient was pre-medicated with oral midazolam 7.4 mg. In the operating room, the nose was packed with ribbon gauze soaked in 4 mls of 2% cocaine. The gauze was removed after 5 mins and 2 mls of 2% lignocaine was sprayed into the nostril. The pharynx was sprayed with 2 mls of 2% lignocaine. Fibreoptic naso-tracheal intubation was then performed with ease with a size 7.5 mm flexo-metallic tube, with the aid of 5 mls of 2% lignocaine squirted down the working channel of the scope.

Case 6: large goitre with tracheal compression and stridor

DCE was a 59 year old man with a large multinodular goitre with stridor. The chest X-ray showed tracheal shift to the left and narrowing. He presented for thyroidectomy. Elective fibreoptic intubation was planned because of the fear of paralysis causing complete upper airway obstruction, in view of the presence of stridor. No pre-medication was given in view of the existing upper airway obstruction.

In the operating room, the patient was monitored with a pulse oximeter, EEG and Dinamap. The nose was packed with cocaine and then sprayed with lignocaine (as in Case 5). Awake fibreoptic intubation was attempted, but because the patient was not cooperative, he was sent off to sleep with titrated dose of IV midazolam up to 10 mg, oxygen and initially nitrous oxide. Spontaneous respiration was maintained at all times. Fibreoptic nasal intubation was then performed. Intra-operatively, it was found that the goitre enveloped the whole trachea, with retro-sternal extension.

Case 7: intubation more difficult than expected

OPQ was a 56 year old male who was scheduled for a nephrolithotomy. Pre-operatively, the patient was noted to have limited mouth opening and limited neck extension. A usual general anaesthetic induction was carried out with thiopentone 250 mg, alcuronium 17.5 mg and fentanyl 100 mcg. The patient was then ventilated with nitrous oxide, oxygen and halothane. Repeated attempts at direct laryngoscopy and intubation failed because the epiglottis could not be visualised. This resulted in trauma to the pharynx and bleeding, and hypoxia. The airway was now obstructed. Senior anaesthetists were called to help. Bilateral nasal airways were passed which enabled the patient to be ventilated, but intubation was still unsuccessful.

The ENT surgeons were also called in to standby for tracheotomy if necessary. The fibreoptic scope was then brought in and naso-tracheal intubation was performed successfully, with ventilation being performed through a naso-pharyngeal airway on the other side.

Case 8: fixed trismus

RST was a 30 year old lady with fixed trismus presenting for release of bilateral temporo-mandibular joints. Her lower and upper incisors were overlapping, with no significant inter-incisor gap (Fig 1). Elective fibreoptic intubation was planned. Oral midazolam 7.5 mg was the pre-medication. After appropriate preparation, sedation and application of local anaesthetic to the nostril and pharynx, fibreoptic intubation was attempted nasally. However, the patient was uncooperative and kept on coughing and struggling in spite of heavy sedation, resulting in inability to have a good view of the larynx. This problem was solved by having an assistant stabilising the larynx by holding the thyroid cartridge firmly, and fibreoptic intubation was performed in the usual manner.

Technique

Although fibreoptic intubation can be performed as an emergency measure after failed intubation, it is far better and easier to do it as a planned elective procedure. This is because there may be secretions and blood from the trauma of attempts at intubation which will obscure the view through the scope.

During the pre-anaesthetic assessment, the procedure and reason for the awake intubation should be explained to the patient, and reassurance should be given. The chosen route for the intubation should be examined —

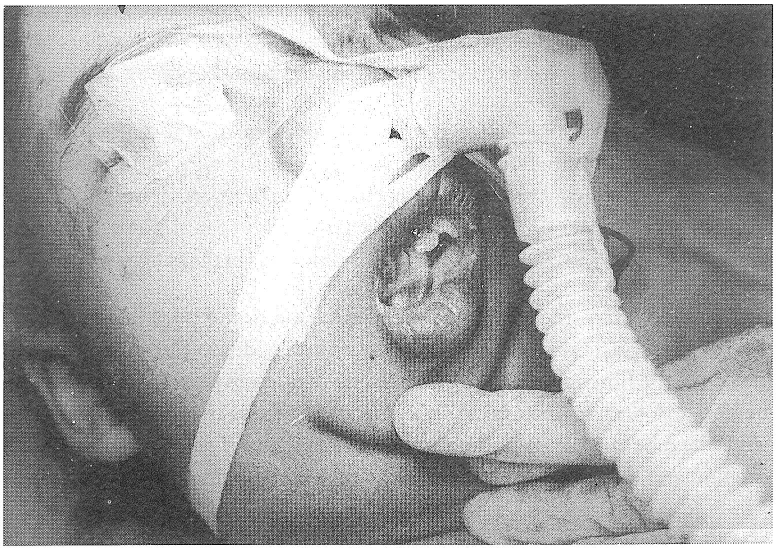

Fig 1: Photograph of a young lady with fixed trismus intubated by the nasal route with flexible fibreoptic scope. Note that there is no gap between her incisors. (Case report no 8)

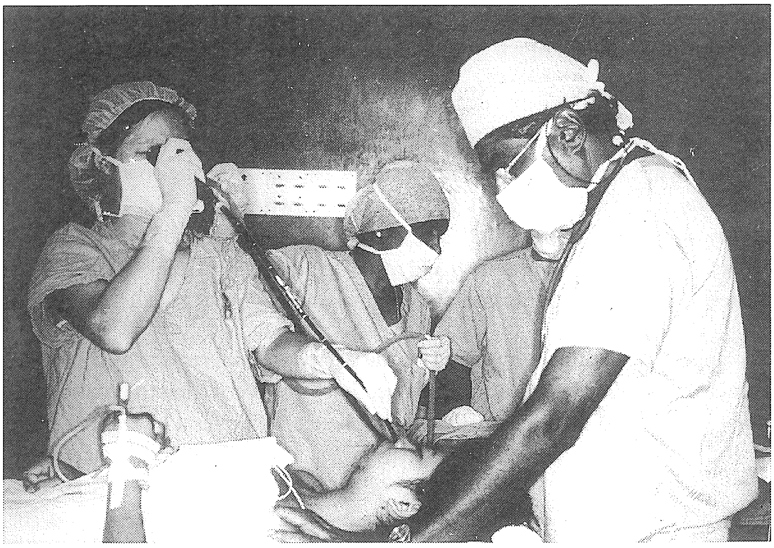

Fig 2: Photograph of fibreoptic intubation being carried out with the operator standing caudad to the patient. The tracheal tube can be seen railroaded onto the scope, and an assistant is supporting the suction tubing. (Technique)

the nares for patency by occluding the opposite nostril and asking the patient to breathe through the nose; polypi and other lesions should be excluded; dentures, loose and chipped teeth should be noted, to be avoided later. Bleeding disorders should be noted — if present, the oral route should be chosen rather than the nasal route. Appropriate pre-medication is ordered — an antisialogogue is recommended but is not mandatory. If there is already airway obstruction or a full stomach, sedative pre-medication should not be given.

In the operating room, an intravenous line is inserted and appropriate monitoring applied; a pulse ozimeter is especially useful. Oxygen is administered via nasal cannulae, unilaterally if the nasal route is chosen for intubation. It can also be administered via the working channel/suction part of the scope. Further sedation can be given as appropriate to obtain a calm and cooperative patient who can still obey commands. Avoid over-sedation, which can cause airway obstruction, which can be disastrous in the patient who is difficult to intubate.

The fibreoptic scope is prepared — the tip cleaned and anti-fog solution applied (if available), and the light and focusing checked. An appropriate size andotracheal tube is chosen, depending on the patient, the route (oral or nasal), and the size of the fibreoptic scope. A size smaller than usual is preferred to facilitate passage of the tube through the larynx. A flexible reinforced ('flexo-metallic') tube may be easier to pass through the larynx than a plastic tube. The tube and the scope are then lubricated with KY jelly and the tube railroaded over the scope. The orientation and direction of the curve of the tube and the tip of the scope are then checked.

Various methods can be used to anaesthesise the upper airway. The traditional method consists of applying cocaine to the nose, spraying the throat with 10% lignocaine, blocking the superior laryngeal nerve by injecting 2% lignocaine at the greater horn of the hyoid bone, and a trans-tracheal injection of lignocaine. If cocaine is not available for the nose, other vasoconstrictors can be used together with a local anaesthetic, e.g., ephedrine or oxymetazoline nose drops. The internal branch of the superior laryngeal nerve can alternatively be blocked by applying sponges soaked with local anaesthetic to the pyriform fossae with curved forceps. For anaesthesising the larynx, we prefer spraying lignocaine down the working channel of the fibreoptic scope at 2 sites: first on visualising the cords, and then into the trachea after passing through the cords[4]. In some patients who still gag after blocking the above, a bilateral block of the lingual branch of the glossopharyngeal nerve (IX) may be required[3].

Whether to stand at the head end or at the side of the patient is a matter of personal preference. The first author of this article prefers to stand at the side of and caudad to the patient so that he does not have to stand on a stool, and so that there is a single curve from the handle of the scope down to the tip (Fig 2). If the oral route is chosen, an intubating airway or London prop should be used to prevent the patient biting onto the scope and causing thousands of dollars worth of damage. For the nasal route, the tracheal tube should be 1 to 2 sizes smaller, and care should be taken not to cause trauma and bleeding, which will make visualisation extremely difficult.

Various methods can be used to provide analgesia for the larynx; we prefer squirting the local anaesthetic down the working channel of the scope over trans-tracheal injection — we feel it is less traumatic. Care should be taken not to exceed the toxic dose of the local anaesthetic — hence we prefer a lower concentration of 1 to 2% lignocaine rather than the higher concentrations used by others. We find that it is just as effective. (e.g., 10 sprays of 10% lignocaine to the pharynx [100 mg] + 2 sprays x 2 ml of 4% lignocaine to the larynx and trachea [160 mg] =260 mg, which is already more than 4 mg/kg for a 60 kg adult, not to mention the cocaine pack to the nose.)

If visualisation is poor, it may be due to secretions, a clouded viewing port, or collapse of the tissues around the tip of the scope. Suction can be applied to the working channel to remove excessive secretions. If the viewing port is clouded over, the scope should be removed and the tip cleaned; use of anti-fog solution will help. If the tongue falls back, an awake patient can be instructed to protrude it. If the patient is asleep, the jaw can be pulled forwards by an assistant, or the tongue can be out.

Discussion

Awake intubation should be considered whenever a difficult airway is encountered[2,3,5]. Fibreoptic intubation enables this to be accomplished with ease and with minimal stress and trauma to the patient if the operator is reasonable experienced. With a patient breathing spontaneously, there need be little urgency to complete the procedure and the risk of hypoxia is minimised[2]. The major disadvantages of awake intubation are the longer time it takes for the procedure and an uncomfortable nervous patient who may gag, bite or adduct the cords. This can largely be overcome by careful explanation, sedation and preparation.

Fibreoptic intubation can also be performed on an anaesthesised patient, preferable breathing spontaneously. In a paralysed patient, loss of muscle tone tends to cause the upper airway structures to collapse toward one another (e.g., the tongue moves posteriorly), which distorts the anatomy[3]. Hence, paralysis is not recommended. However, as illustrated in Case 7, the fibreoptic scope can still save the day in a failed intubation, but an experienced operator is required to perform it quickly after an adequate period of pre-oxygenation.

An area of controversy has been the patient with a full stomach or at risk of aspiration. It can be argued that insensitivity of the larynx caused by topical anaesthesia may permit inhalation of gastric contents[6,7]. Others, however, maintain that a fully awake patient with only topical anaesthesia can still protect his airway from aspiration[8]. An awake patient can usually respond to regurgitation by clearing the pharynx[2]. Even should such a patient subsequently inhale, the lower respiratory tract reflexes should induce coughing, thereby protecting the lower airway and lungs[4,5]. Minimal or no sedation should be used in these patients.

Another area of controversy is the patient with an unstable cervical spine. In such patients, lateral neck X-rays should be obtained to assess the extent of disease or fracture prior to attempted intubation. Oral intubation under anaesthesia by direct pharyngoscopy, with an assistant holding the head in a neutral position, is usually possible, but visualisation is usually incomplete. Awake fibreoptic intubation allows the patient to retain control of neck musculature, thus providing protection against excessive movement[2]. Adequate sedation and analgesia of the airway should be provided to avoid excessive coughing, which can cause excessive movement at the cervical spine.

The fibreoptic scope we used was actually a bronchoscope (Olympus BF Type 1T10), which could only accommodate tracheal tubes with diametres 7.0 mm or larger. Flexible scopes specially designed for tracheal intubation are available (e.g., Olympus LF-2, Pentax FI-10P for adults; and Olympus LF-P for children). The Olympus LF-P has an external diametre of 2.2 mm and should accommodate a tracheal tube of 3.0 mm diametre.

Conclusion

We have illustrated, with a few case reports, how useful and even essential a tool a flexible fibreoptic intubating scope is to an anesthetist. We agree with R.S. Vaughan[5] that, "... it is of paramount importance that anesthetists learn to use a fibreoptic bronchoscope competently," and propose that it be included in a standard difficult intubation set or trolley. Unfortunately, to achieve this goal requires a great deal of investment in both training and equipment, but we believe that this is justified to achieve greater safety in anaesthesia, reducing mortality and morbidity due to railed intubation. Using simulators or models in the initial training period may improve the skill of trainees[9].

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