A Study of Flexible Fiberoptic Bronchoscopy Aided Tracheal Intubation for Patients Undergoing Elective Surgery Under General Anesthesia

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Received: 9 May 2012 / Accepted: 5 October 2012 / Published online: 17 October 2012
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Abstract A difficult airway complicates up to one tenths of cases of elective general anesthesia. Such situations can be anticipated and tackled by fiberoptic flexible bronchoscopy (FFB) assisted tracheal intubation. To study the indications and outcomes of FFB assisted tracheal intubation in patients with anticipated difficult airway, who are undergoing surgery under general anesthesia. Cases who were intubated using FFB assistance were included in the study. Detailed examination was done pre operatively to be able to predict the difficult airway. Intubation was done with the help of a FFB after induction of general anesthesia. There were total 52 cases. Majority were male and in the fourth decade of life. Oral submucous fibrosis was the commonest indication for the procedure. There were two cases of failure, but no significant mortality or morbidity. A difficult airway can be encountered across specialties. It can be anticipated by simple or multi factorial methods. Awake FFB aided intubation is the gold standard in cases of anticipated difficult airway. Failure rates of 4–66 % have been reported. In the present study the failure rate was less than 4 % with no morbidity or mortality. FFB assisted intubation is safe and effective in paediatric patients too. FFB assisted intubation done in an organised and skilled manner is a very important skill to have to

tackle cases of difficult intubation. Hence it should be included in training programmes of anesthesia.

Keywords Difficult airway · Tracheal intubation · Flexible fiberoptic bronchoscopy · General anesthesia

Introduction

A difficult airway is defined as “the clinical situation in which a conventionally trained anesthetist experiences difficulty with mask ventilation of the upper airway, tracheal intubation, or both” [1]. Difficult laryngoscopy and/or difficult airway are encountered in 1.5–8.5 % of the cases taken up for surgery under general anesthesia. This concludes in failed intubation in 0.13–0.3 % of the cases causing morbidity and sometimes even mortality [2]. There are many devices and procedures reported for assistance in achieving intubation and ventilation in such cases. Out of these the fiberoptic flexible bronchoscope (FFB) assisted tracheal intubation is a very popular and effective method, where there is optimum visualization of the airway and proper positioning of the tube can be secured under vision, comfortably. There is also the added advantage in being able to train students in the procedure by using video attachment to the scope.

Here we have studied the indications, methods and results of using the FFB for tracheal intubation in patients with difficult airway.

Aim

To study the indications and outcomes of FFB assisted tracheal intubation in patients with anticipated difficult airway, who are undergoing surgery under general anesthesia.

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Materials and Methods

The study was approved by the institutional ethics committee. It was conducted in the 3-year period May 2009 to April, 2012. All patients who underwent tracheal intubation with the help of FFB were included in the study. A detailed history and examination was done during the pre anesthetic check up. Special note was made of any past history of surgery under general anesthesia and difficulty in intubation at that time. In examination the first thing noted was the amount of mouth opening. A minimum of three finger breadths or 5 cm mouth opening was considered as normal. Any other factors which compromise the accessibility of the airway either by reducing the visibility of the laryngeal inlet or by distorting the normal anatomy like huge goiter, oral and oropharyngeal space occupying lesions were noted.

Intubation was done with the help of flexible bronchoscope by standard technique. In 18 cases the FFB assisted intubation was done by the pulmonologist whereas the remaining cases were managed by the ENT surgeons. Oro-tracheal intubation was routinely attempted. Wherever the surgical field included the oral cavity and/or oropharynx, naso-tracheal intubation was done. An appropriate sized tracheal tube was threaded on to the FFB as high as possible (Fig. 1). After induction of general anesthesia, an attempt was made at blind intubation by a senior and experienced anaesthetist. If this attempt failed, the FFB was inserted and manoeuvred to identify the laryngeal inlet (Fig. 2). The bronchoscope was advanced till the carina and then the tracheal tube was threaded till it reached optimum position of 3–4 cm proximal to the carina. The positioning of the tube was confirmed and the bronchoscope was withdrawn.

All data were collected, tabulated and analysed.

Observations

A total of 52 cases were intubated using this method during the period of the study. A further 106 cases had been prepared for intubation using the FFB; however blind intubation was successful and hence these cases were not included in the study. All the cases were elective. There were no emergency cases, or cases where in FFB assisted intubation was resorted to after failure of routine laryngoscopic intubation.

Majority of the cases (39 cases, 75 %) were male. The age distribution showed that the maximum number of patients (28) were in the 31–40 year age group. There were only two cases below 10 years of age. There were four cases between 11 and 20 years of age and one case each in the fifth and sixth decades of life.

The whole list of indications which lead to the need for assisted intubation is listed in Table 1. The commonest indication was oral submucous fibrosis (OSMF) (Fig. 3).

Fig. 1 Tracheal tube threaded over FFB before intubation

Fig. 2 FFB being introduced with tracheal tube

Two of the cases could not be intubated even with the help of the FFB and finally the airway was secured by tracheostomy. Thus there was a failure rate of 3.85 %. However this failure didn't lead to any precipitant situation or significant long lasting morbidity or mortality.

Discussion

Difficult tracheal intubation has been reported in cases from all specialties with varying rates of incidence [3]. There are many methods suggested for the identification and anticipation of such cases. One of the most widely used methods is the Mallampati classification [4]. But its reliability is suspect mainly because it takes into consideration

Table 1 List of indications for FFB assisted tracheal intubation

Indication	Cases (<i>n</i> = 52)	Percentage (%)
OSMF	24	46.15
Short and thick neck	7	13.46
Submandibular abscess	6	11.54
Le Fort fractures	6	11.54
Parapharyngeal abscess	3	5.77
Temporomandibular joint ankylosis	3	5.77
Huge goiter	2	3.85
Retrognathia	1	1.92
Total	52	100

Fig. 3 Patient of OSMF

only one aspect of causative factor for difficult airway i.e. intra oral disproportion [5]. Various other methods have been suggested like the multivariate airway risk index with logical regression proposed by el Ganzouri and the 6 D method of James Rich [3, 6]. Even though methods which take into consideration multiple factors are in general more reliable than those which don't [2], none of the methods are infallible, each having its own drawbacks. Everything said and done it is the clinical acumen and judgement of the assessing anesthetist which is supreme when it comes to anticipation of a difficult airway [7].

In the present study the primary method of assessing the airway was according to Mallampati classification. Patients with Class III and Class IV airway were considered as candidates for FFB (Fig. 4). However this objective assessment was also supplemented by a subjective assessment before the final decision was made regarding the use of FFB. But the subjective assessment was used more to screen out patients with poor Mallampati grades who could still be intubated by the conventional method than to include more patients for FFB who had otherwise favourable Mallampati grades of airway.

Fig. 4 Photo showing reduced mouth opening. A case of difficult intubation

Anticipating a difficult airway is very important because each unsuccessful attempt at intubation increases airway edema and bleeding rapidly leading to a situation of – cannot mask ventilate, cannot intubate. Such a situation also makes it difficult to impossible to do a subsequent FFB assisted intubation or use of any such device [3]. However in our study an attempt at blind intubation was always made by a senior experience anesthetist before the FFB was brought into the picture. This approach did not lead to any significant morbidity and mortality in the present study. There were two cases of failure to intubate even with the FFB. One case had severe retrognathia and temporomandibular joint ankylosis and the other was a case of parapharyngeal abscess. Though the bleeding caused by the attempt at blind intubation did make it difficult to use the FFB, it was the severe distortion of the airway which caused the failure to intubate. These cases were finally taken up after doing a tracheostomy. Tracheostomy has been advocated as the method to secure the airway in deep neck space infections [7]. This failure rate of less than 4 % is less than that reported in contemporary literature which varies from 4.3 to 66 % [7, 8].

In cases of anticipated difficult airway, the awake intubation using FFB is considered the gold standard [9]. But in our present study we have used the FFB for intubation after induction of general anesthesia. Though this approach can cause problems if one comes up against a cannot mask ventilate case we never had to face such a situation during the course of our study. Mortality and morbidity have been reported in the use of FFB for intubation [10] but there were no such incidents in our study. This technique can also be used effectively even in paediatric cases [8]. We had two paediatric cases which were managed successfully.

From the transmission of a recognisable image through a fibre optic bundle by Hopkins and Kapany in 1954 to the first reported tracheal intubation by fibre optics using a choledochoscope by Murphy was a long journey [11, 12]. Since

then many devices and techniques have been developed for easing the task of intubation. These include the laryngeal mask airway, retrograde intubation, indirect rigid fiberoptic laryngoscopy, FFB, the lightwand, videolaryngoscopic devices and the malleable fiberoptic stylet [3]. Devices like various kinds of fiberoptic compatible oral airways have also been made which facilitate the process of FFB aided intubation while keeping the airway patent [13]. Out of all these methods the FFB assisted tracheal intubation is very safe and effective in the trained hands not only electively but also as back up when routine rigid laryngoscopic intubation fails [8, 14–16]. An organised approach and adequate expertise in FFB are the corner stones of success [7].

Conclusion

The FFB is an able ally in securing the airway in cases of difficult airway due to a variety of reasons. Each unsuccessful attempt at intubation not only compromises the patient but also scuttles the chances of a successful intubation using the flexible bronchoscope too. Hence it is important to be able anticipate these cases pre operatively itself using the various algorithms and clinical judgement. Also the anesthetic training programme should include exposure to flexible bronchoscopy so as to prepare the anesthetist for situations of the difficult airway [2, 17].

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