Comparison between tracheal tubes for orotracheal fibreoptic intubation

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We have compared impingement of the tracheal tube against the larynx using a standard preformed tube, warmed preformed tube or two flexible spiral-wound tracheal tubes with different tip designs, in 100 adult patients undergoing orotracheal fibreoptic intubation under general anaesthesia, in a prospective, randomized study. The rates of impingement were 20 of 30 with the standard tube, 12 of 30 with the warmed standard tube (P = 0.07) and eight of 20 with both spiral tubes. However, impingement with the spiral tubes took longer to overcome if a sharp tipped rather than an obtuse tipped tube was used. Manipulations after impaction led to oesophageal intubation in one patient, and in one patient fibreoptic intubation failed. We conclude that resistance to the tracheal tube occurred frequently when the spiral-wound tubes were used.

Impingement of the tracheal tube on the larynx is a well known problem associated with fibreoptic intubation. The incidence of resistance has been reported as 5% to almost 90%.1–8 According to Brull and colleagues, a flexible, spiral-wound tracheal tube is easier to advance over the fibrescope than a standard tracheal tube.1 The design of the tip of the tracheal tube has also been suggested to affect ease of fibreoptic intubation.9 The flexibility of a standard preformed intubation tube changes when warmed, but the efficacy of the simple procedure of warming the tube has not been tested during fibreoptic intubation.

Methods and results

The study was approved by the Ethics Committees of the First Department of Surgery and the Neurosurgical Clinic of Helsinki University Central Hospital, and informed consent was obtained from patients.

We studied prospectively 100 adult patients undergoing surgery under general anaesthesia. All those with previous or anticipated difficulties in tracheal intubation were excluded. At the preoperative visit, Mallampati grade,10 mouth opening and thyromandibular distance were assessed.

The tracheal tube was selected randomly by drawing a numbered card indicating the tube to be used: (1) standard, preformed tube (Portex) (PR); (2) standard preformed tube (Portex) warmed in a water bath at 34°C for at least 10 min (PW); (3) flexible spiral-wound tracheal tube (Rüsch) with a sharp tip of 45° (SS); (4) flexible spiral-wound tracheal tube (Rüsch) with an obtuse tip of 15° (SO). The standard preformed tube had a tip with an angle of 37.5°.

Patients were anaesthetized and paralysed before the start of fibreoscopy and tracheal intubation. Before fibreoscopy, an Ovassapian intubating airway was placed into the patient’s mouth. The tracheal tube (7.0 mm for women, 8.0 mm for men) was mounted over the fibrescope (Pentax FB-15P, diameter of the insertion cord 4.9 mm). During fibreoscopy, the patient’s jaw was pushed forward by an assistant so that the larynx could be seen. The tip of the fibrescope was advanced close to the bifurcation of the trachea. Before intubation, the intubating airway was removed because we found that the cuff of the spiral-wound tracheal tube tended to get caught in the slit of the intubating airway. If resistance to passage of the tracheal tube was encountered, the tube was manipulated, the patient’s neck was flexed or cricoid pressure was applied. Resistance was defined simply as ‘yes’ when the tube could not be advanced freely, and ‘no’ when the tube was advanced easily into the trachea. If the manipulations did not lead to tracheal intubation, intubation was performed with the aid of a rigid laryngoscope. Intubations were performed by one of the authors, all being experienced with the fibreoptic technique.

Reasons for difficulty in fibreoscopy were recorded. Fibreoscopy time (starting fibreoscopy to the tip of the fibrescope being close to the carina) and intubating time (starting to advance the tracheal tube to withdrawing the fibrescope from the mouth) were recorded using a stopwatch.
The high rate of impaction may be removal of the intubating airway before advancing the tube into the trachea. Although the Ovassapian intubating airway does not guide the tube to the trachea, it may keep the tongue from falling towards the posterior pharyngeal wall and pushing the tube away from the vocal cords. Our results are in accord with those of Jones, Pearce and Moore. Also, our study suggests that the design of the tip may affect ease of advancement of the tube into the trachea when impingement has occurred. In our recent study, we demonstrated that intubation time correlated well with ease of fiberoptic intubation evaluated by the manipulations needed to complete tracheal intubation and thus can be used to grade intubation difficulties.

However, an intubation time indicating the severity of impingement should be used with caution because it depends on the experience and temperament of the anaesthetist.

Our study was carried out in patients without anticipated intubation difficulties. However, the sensitivity and specificity of the commonly used bedside tests are far from optimal and there may have been some 'difficult laryngoscopies' among the subjects. In clinical practice, orotracheal fiberoptic intubation in anaesthetized patients is often performed when laryngoscopy unexpectedly proves difficult. The anatomical features that cause impingement of the tube are not known and how impingement can be avoided during fiberoptic orotracheal intubation is not known.

**References**

5. Katsnelson T, Frost E, Farcon E, Goldiner P. When the endotracheal tube will not pass over the flexible fiberoptic bronchoscope. *Anesthesiology* 1992; 76: 151–2

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**Table 1** Median [range] fibreoscopy and intubating times, rates of impingement of the tracheal tube against the larynx, and intubations which lasted longer than 10 s (numbers of patients). PR=Standard preformed tube, PW=warmed standard preformed tube, SS=spiral-wound tube with sharp tip, SO=spiral-wound tube with obtuse tip. *P=0.07, **P=0.05 (chi-square with continuity correction)

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