

SORE THROAT FOLLOWING SHORT TERM ENDOTRACHEAL INTUBATION

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SYNOPSIS

200 patients undergoing general anaesthesia requiring endotracheal intubation were studied. They were divided into 2 groups. In the control group, the cuff of the endotracheal tube was inflated by the anaesthetic nurse using a fixed volume of air (5 cc or more). In the study group, the cuff was inflated by the anaesthetist using 'minimal occlusion technique'. Although larger volume of air was used in the control group, there was no difference between the two groups in terms of the post-operative incidence of sore throat, hoarseness of voice and cough. It was concluded that the volume of air in the cuff did not alter the incidence of these post intubation complications.

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INTRODUCTION

Post-operative sore throat due to endotracheal intubation has always been a common problem and the incidence is very high. This problem has been studied extensively during the last few decades and various techniques had been used to minimize the incidence of sore throat after endotracheal intubation.

The objective of this prospective study was to determine the incidence of post-intubation sore throat among the local population and to study the efficacy of minimal occlusion technique of cuff inflation in reducing the incidence of sore throat.

MATERIALS AND METHODS

This study was conducted at the Departments of Anaesthesia in Tan Tock Seng Hospital and Alexandra Hospital. 200 consecutive patients undergoing general anaesthesia were included. Excluded from the study were patients who had nasogastric tube insertion, head and neck surgery, and those with whom the anaesthetists encountered difficulty in endotracheal intubation.

All the patients studied received a standard pre-anaesthetic medication of pethidine and atropine. Anaesthesia was induced with thiopentone (3-4 mg/kg) and endotracheal intubation was facilitated with succinylcholine (1.5 mg/kg). Red rubber endotracheal tubes with low residual volume and high pressure cuffs (Rusch, Leyland) were used in all cases. All were reusable tubes and were sterilized by autoclaving before use. Size 9 mm I.D. tubes were used for all adult male patients and size 8 mm I.D. tubes were used for all adult female patients. The tubes

were lubricated with K-Y (Johnson & Johnson) water soluble lubricating jelly. Anaesthesia was maintained with non-depolarizing neuro-muscular relaxant and 6 litres of nitrous oxide-oxygen mixture. Fentanyl or halothane was used to supplement the anaesthesia.

The patients were divided into two groups.

All the intubations were performed by trained anaesthetic doctors. Cuffs were inflated with 5 ml or more of air by the assisting anaesthetic nurses in the first group of 91 patients (control group). The volume of air used in each patient was recorded. There was no record of intra-cuff pressure in this group of patients. In the study group of 109 patients, the cuffs were inflated by the anaesthetists using the 'minimum occlusion' technique. By this technique, the cuff was inflated, and a small quantity of air was gradually withdrawn from the cuff until a leak was detected. Then a small volume of air was put back into the cuff just sufficient to eliminate the leak. The volume of air needed to inflate the cuff was noted. The intracuff pressure was also noted by connection of the pilot tube to a 3-way stop cock and to an aneroid manometer. The duration of the tube in-situ in both groups was noted. No oropharyngeal airway was inserted during anaesthesia.

The interview was conducted 24 to 48 hours after surgery by an anaesthetist who did not refer to the intubation data. The interview began by asking the general well being of the patient. The patient was given every opportunity to complain of a sore throat should it exist. Direct questioning about the sore throat would be asked if the patient did not volunteer this information. If sore throat existed, the patients were asked to describe the severity of the sore throat and whether it was associated with cough and hoarseness.

RESULTS

The clinical parameters of the two groups of patients were summarised in Table 1. There was no difference in terms of sex, age and duration of operation. In other words, the two groups were comparable. In the control group the mean volume of air inflated was 6.0 ml. This was significantly more than that used in the study group (mean volume 3.9 ml). The mean intracuff pressure measured in the study group was 118.9 mmHg (SD = 54.3).

The results of the interview are shown in Table II. Compared to the study group control patients had higher incidence of sore throat (49.5% vs 45.9%), hoarseness of voice (36.3% vs 27.5%) and post-operative cough (34.1% vs 29.4%). However the differences were not statistically significant, ($P > 0.05$).

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TABLE I
THE CLINICAL DATA BETWEEN THE CONTROL AND STUDY PATIENTS

Clinical data	Control group N = 91	Study group N = 109	Statistical Significance
Age : Mean SD	40.6 yr 16.3	43.3 yr 16.6	N.S.
Sex Male Female	47 44	45 64	N.S.
Volume of air inflated Mean SD	6.0ml 1.3	3.9ml 1.9	p < 0.01
Duration of operation Mean SD	87.3 min 45.4	97.8min 64.8min	N.S.

TABLE II
INCIDENCE OF POST-OPERATIVE SORE THROAT

	Control group N = 91	Study group N = 109	Statistical Significance
Sore throat	49.5%	45.9%	p > 0.05
Hoarsness of voice	36.3%	27.5%	p > 0.05
Coughs	34.1%	29.4%	p > 0.05

TABLE III
INCIDENCE OF POST-OPERATIVE SORE THROAT
AMONGST THE MALE AND FEMALE PATIENTS

Sore throat	Control group		Study group	
	Male	Female	Male	Female
Present	23 (49%)	22 (50%)	21 (47%)	29 (45%)
Not Present	24 (51%)	22 (50%)	24 (53%)	35 (55%)
Total	47 (100%)	44 (100%)	45 (100%)	64 (100%)

Table III showed the incidence of post-operative sore throat amongst the male and female patients. There was no difference in incidence between the two sexes.

DISCUSSION

Sore throat following endotracheal intubation remains a problem for many patients after surgery. Though mild sore throat is usually inconsequential more severe sore throat can be very distressing to the patients after surgery. The problem is compounded if it is associated with hoarseness of voice and irritating cough in addition to the pain caused by thoracic or abdominal incision.

Post-operative sore throat has been explained by various mechanisms. It can even occur in patients who were not intubated during anaesthesia.(1,2). A non-cuff tube can cause higher incidence of sore throat than a cuff tube.(2).

Female patients were shown to have higher incidence of sore throat than male patients in some studies.(1,2) However the results of this study (table III) showed that there was no difference in the incidence between males and females amongst the local patients. The use of lubricants on the tube did not lower the incidence of sore throat. In fact, the use of local anaesthetic ointment was even associated with a higher incidence of sore throat.(3,4,5) Coughing and bucking during anaesthesia and the presence of oropharyngeal or intra-gastric tubes lead to a higher incidence of sore throat.(1,2) Surprisingly, traumatic intubation was not necessarily associated with higher incidence of sore throat.

Tracheal epithelial damage after prolonged endotracheal intubation with high-pressure cuff endotracheal tube has led to the development of endotracheal tubes with low pressure high volume cuffs. Presumably, low-pressure cuffed endotracheal tubes should be less traumatic and thus reduce the incidence of post-intubation sore throat. However, studies done have shown that the low pressure cuffed endotracheal tubes did not lower the incidence of post-operative sore throat and these tubes did not provide advantage for short term endotracheal intubation.(6,7,8).

Red rubber high-pressure cuffed endotracheal tubes are commonly used for intubation during surgery in the general hospitals in Singapore. While the intubation is

done by the anaesthetist, the cuff of the tube generally is inflated by an assistant nurse with 5 mls or more of air. Such practice of uncontrolled cuffing should lead to a higher incidence of post-operative sore throat. However, the results of this study have shown that there is no significant difference in the incidence of sore throat between the group where a usual 5 ml of air is injected and the group where minimal occlusion method of cuffing is employed.

The use of endotracheal tube causes certain degree of mucosal damage at two main sites, i.e., the posterior larynx and the anterior and lateral aspect of the trachea between the third and tenth rings.(9) The standard endotracheal tube acts as a curved lever and the posterior larynx, especially the arytenoid and cricoid acts as a fulcrum when the tube is introduced into the trachea.(10) Very high pressure, about 200-400 mmHg, can be exerted over the posterolateral larynx.(11) Most severe trauma is thus usually at the posterior larynx. Mild laryngeal injury is usually associated with post-operative sore throat and hoarseness. Severe damage can lead to development of granulomas which may produce dysphonia lasting for extended periods of time. Vocal cord paralysis and tracheal stenosis has been described even after relatively short period of endotracheal intubation. Finally, post-intubation laryngeal dysfunction can result in both airway compromise and aspiration.

The duration of endotracheal intubation is an important factor in cuff site injury. Due to the physical nature of small cuffs, pressure changes inside the cuff is very sensitive to small changes in volume of injected air.(12) An alarmingly high pressure at the tracheal wall can result through the use of standard inflation volume. Typical inflation pressure on red rubber cuffs range from 80 to 300 mmHg.(12) The inflation pressure in our study was 118.9 mmHg. Though cuff inflation pressure does not necessarily equate with pressure at the tracheal wall,(12) the perfusion pressure, which is about 30 mmHg, can easily be exceeded with resulting pressure ischaemia. Pressure ischaemia from long term endotracheal intubation can lead to complications such as tracheal ulceration, haemorrhage, dilatation, rupture, fistula formation and stenosis. However, such complications are rare after short duration of intubation. Sore throat, hoarseness, subglottic oedema, subglottic membranes can nevertheless follow after brief

duration of intubation.(9)

Inflation of cuff was enough to stop ciliary streaming and to dam the respiratory secretions.(9) The pressure and shearing effects from endotracheal intubation are ample to cause considerable epithelial loss. Excess secretions may be produced by tracheal stimulation and damming effect of the cuff. This may result in an irritating cough in patient post-operatively.

CONCLUSION

Post-operative sore throat is a result of laryngeal and tracheal injury due to the mere presence of the standard endotracheal tube in the airway. Laryngeal injury seems inevitable, but the recent introduction of an anatomically shaped tube, which conforms better to the anatomical shape of the airway, is said to exert less pressure at the larynx, and thus may decrease the pressure damage at that site.(13) Tracheal wall injury can be minimized by

care in avoiding excessive tube movement, excessive high cuff pressure and proper anchoring of tube. Excessive high cuff pressure may lead to deeper mucosa injury and prolonged irritating cough.

The results of this study show that the incidence of post- intubation sore throat in Singapore is high (about 50%). It is not related to the methods of cuff inflation as minimal occlusion techniques does not reduce the incidence significantly. There is no difference in the incidence between males and females among the local populations.

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