DISCUSSION

Endotracheal intubation has been known for long time and has firmly established its place in modern anaesthetic practice and also in resuscitation. Apart from so many glittering gains, that it provides, endotracheal intubation is also associated with several major and minor complications and side effects.

Minor sequelae of endotracheal intubation include postoperative sore throat, is still the problem. True etiology to this common problem has so far been eluding the present anaesthetist although several factors have been blamed as possible culprits.

Etiology of postoperative sore throat is still not clear but numerous factors have been known responsible like infection, reaction to the material of tube, dry gases, local anaesthetics, lubricants, pressure of tubal cuff etc.

Contributory factors blamed are unsterilized endotracheal tube, trauma by laryngoscope, pharyngeal airway, pharyngeal throat gauze packing, ryle's tube, type of muscle relaxant used for intubation, skill of anaesthetists, difficult intubation, extent of movement of patient's head after intubation etc.

So the present study is carried out to know the effect of various types of endotracheal tubes, effect of lubrication (normal saline 0.9%) and effect of cuff
(high volume low pressure) on incidence of postoperative sorethroat. The 160 in-patients were studied of either sex and of each group ranging from 5-70 years coming for various routine surgeries of A.S.A. Grade I & II only.

Patients were divided into two groups as mentioned earlier and minimum duration of anaesthesia was 60 minutes. Inhalational agent used in each patient was ether. Each selected patient was interrogated postoperatively about sorethroat and examined by laryngeal mirror upto one week for any evidence of laryngotracheitis and graded according to severity of sorethroat.

AGE/SEX DISTRIBUTION

Higher incidence of postoperative sorethroat has been reported in females (Wolfson 1958, Hortsell & Stephen 1964, Jensen et al 1982, Shah & Mapleson 1984, Gard and Cruick shank 1961). Table no. 1 indicates higher incidence of sorethroat in females (61%) as compared to males (39%). There is no difference in age on incidence of postoperative sorethroat. Possible explanation for higher incidence in females is high cuff tracheal contact area and more tendency of contact ulcer and granuloma formation due to difference in anatomical conformity of trachea in females.
Group A (Mask Group) -

Lasser et al (1976) have shown the fact that mask technique is followed by sore throat is usually due to the drying of mucous membrane after ventilation with dry gases, to the irritant property of inhalational agent and to the use of antisialagogues.

Table 2 indicates that out of 160 patients studied, 29 patients were given anaesthesia by mask, out of which 10 patients developed sore throat giving an incidence of sore throat 34.3%. This is taken as control cases. The fact that mask technique is followed by sore throat is ascribed to the drying of mucous membrane of larynx and trachea and irritant property of ether.

Group B (Intubated Group) -

Infection in the postoperative period remains a formidable problem. The altered defence mechanism and impaired mucociliary clearance is reported to be the cause of frequent respiratory tract infection after general and topical anaesthesia (Corsen 1973). Salivary and other respiratory tract secretions contain vast numbers of commercial bacteria, some of these are potential pathogens (Cruickshank, R. 1968) transmission of infection through anaesthetic equipment remains a distinct possibility (Joseph 1952, Kund et al 1962, Jain 1980). As such
respiratory infection in the postoperative period is probably caused by commercial bacterial flora acting as pathogens due to changes in the local defence mechanism produced by anaesthetic agents used.

Histopathological changes in trachea and larynx were reported more early with cuffed tube than with plain tubes (Kripiani T. C., R.P. Singh, Chansoriya I.J.A.). Same authors noted on experimental animals that changes are more severe under ether anaesthesia and least with trichloroethylene, with halothane, gas-oxygen and methoxyflurane in between.

Table 2 shows that 131 patients were given anaesthesia through endotracheal tubes, out of which 63 patients developed sore throat of varying severity giving an incidence of 48%. Possible explanations for development of sore throat are altered defence mechanism of upper and lower respiratory tract following anaesthesia and ciliostasis, mucociliary impedance leading to more chances of infection due to both endogenous (normal bacterial flora) and exogenous (transmitted via anaesthetic machine) and also due to mucosal erosion caused by ischaemia and pressure necrosis of tracheal mucosa caused by endotracheal tube and its cuff leading to development of postoperative laryngotracheitis. Ether as irritant to tracheal mucosa and effect of antispasmodics (Atropine) used may be contributory factor in increasing postoperative sore throat in intubated group.
MATERIAL OF TUBE

The effect of the material of the tube on postoperative sorethroat, is controversial. Shah and Mapleson (1984) reported higher incidence of sorethroat with red rubber tubes than with P.V.C. tubes whereas Jansen and Colleagues (1982) have shown higher incidence with P.V.C. tubes.

Table nos. 6-35, (6-9) indicates higher incidence of sorethroat in P.V.C. tubes followed by red rubber and white rubber in that decreasing order. In white rubber tubes incidence is 41.4%, in red rubber tubes it is 46.4% and in P.V.C. tubes 48.7%, cause of this difference is not clear, probably it may be due to difference in composition of material of tubes leading to difference in reaction with tracheal mucosa and/or inhalational agent (ether) used.

EFFECT OF LUBRICATION

Various workers have studied effects of lubricants using normal saline, lidocaine viscous, jelly, cream, ointment and suggested different views regarding their use. Creams are generally more desirable than jellies, because jellies tend to dry out quickly and become hard and sticky on the endotracheal tubes when applied any length of time prior to operation (Gard & Cruickshank 1961).
Conway et al (1960) reported that cinchocaine
1% ointment was associated with high incidences of sorethroat
but Winkel and Knudsen (1971) have shown that patient
might benefit from lubrication of tracheal tubes with 1%
cinchocaine jelly. Conway et al (1960) have given possible
explanation that greasy base of the preparation might dissolve
some irritant substance from the rubber of endotracheal tube.

So varying are the results of lubrication that
Jensen et al (1982) suggested lubrication of tracheal tubes
provide no advantage in terms of reducing sorethroat after
operation.

On the other hand Loeser, Stanley et al (1980)
reported that lubrication with 4% lignocaine jelly containing
polyethylene and propylene glycol was associated with
increased complaints after operation.

Christine Stock and Downs (1980) studied the effect
of lubrication of endotracheal tubes with many lubricants
which include water soluble jelly, normal saline solution,
lidocaine 2% jelly and lidocaine 2½% ointment. They concluded
that sorethroat and hoarseness occurred to the same
extent as those who received non-lubricated tubes.
Lidocaine present in lubricants do not appear to decrease incidence
of sorethroat.
So controversial is the effect of lubrication that many investigators have reported that intubation was mechanically easier when some form of lubrication was applied to the tube.

Method of lubrication used in the present study is sterile normal saline 0.9%. Incidence of sorethroat with lubricated group, both with plain and cuffed tubes was lower than un lubricated group (Table no. 4 (6-9)). In plain lubricated group incidence of sorethroat is 17.8% as compared to plain un lubricated tube in which an incidence as high as 72.7% was achieved. Likewise the incidence of sorethroat in cuffed lubricated group is 39.4% as compared to cuffed un lubricated group where it is 71.43% (Table no. 4 (6-9)).

In this study normal saline 0.9%, as lubricant appear to be the agent which has decreased the incidence of sorethroat. The reason for this may be isotonicity of normal saline making homeostasis constant and no reaction with the material of tube and mechanical advantage of lubrication with normal saline.

**EFFECT OF CUFF**

Effect of endotracheal cuff on incidence of postoperative sorethroat has been studied by several workers from time to time and they have given controversial result
regarding its effect. Although cuff anchors the tubes and thereby decreases movement of tube within trachea but cuff can cause mucosal erosion of trachea leading to post-operative sore throat. More so, when cuff is inflated to beyond the just seal point it causes pressure necrosis leading to postoperative sore throat. Nitrous-oxide has the ability to diffuse into cuff and so causing the over-expansion of cuff leading to increased pressure necrosis of tracheal mucosa (Stanley et al 1974, 1975 & 1978).

Cuff tracheal contact area is an important factor in the development of postoperative sore throat. Many authors have studied this fact. High volume low pressure cuff caused higher incidence of postoperative sore throat than high pressure low volume cuff (Stanley et al 1978, Loeser et al 1980, Erikenson, Jensen et al 1982, Shah and Mapleson 1984). Possible explanation given are (1) That many large volume cuff wrinkles inspite of proper inflation and wrinkles result in a deep mucosal grooves. (2) Tracheal mucosal membrane or ciliary damage in direct relation to the cuff tracheal wall contact area. (3) Bigger and larger low pressure tubes produce more damage to upper airway structures on intubation or extubation (Loeser, Hodges et al 1975, Jensen et al 1982).
But when intra-cuff pressure in low volume high pressure cuff tube was high and allowed to increase, the advantage of low cuff tracheal contact area disappeared (Erikensen, Jensen et al 1982).

Type of cuff used in the present study was high volume, low pressure and cuff is inflated to just seal point with room air.

In this work incidence of sorethroat in plain lubricated tube is 13.8% as compared to 29.4% in cuffed lubricated tube (Table no. 4) showing the effect of cuff on incidence of sorethroat.

Explanation for above result may be that tracheal cuff produce more damage to tracheal mucosa or ciliary activity in direct relation to the cuff tracheal wall contact area leading to ciliostasis, mucociliary impedance, stagnation of secretions, ischaemia and pressure necrosis of tracheal mucosa leading to altered defence mechanism of tracheal mucosa giving good ground for the development of infection, thereby causing laryngotracheitis in postoperative period.

Hence in the end it can be concluded that the use of plain white rubber tube lubricated with 0.9% sterile normal saline would provide minimum incidence of postoperative sorethroat.