
Assessment of the efficacy of dexamethasone, lignocaine or placebo in the prevention of post intubation sore throat

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Abstract

Objective: To assess the incidence of sore throat and hoarseness caused by endotracheal intubation. To observe if lignocaine or dexamethasone throat spray would alter the incidence of sore throat

Materials and methods: Adult patients of either sex who underwent general anaesthesia with endotracheal intubation were included in this randomised double blind study. Three hundred patients who had general anaesthesia with endotracheal intubation were randomly allocated into three groups – Group A, Group B and Group C following block randomisation. Nature of the study was explained to the patient and verbal consent obtained. Group A – 2ml of dexamethasone (8mg) was sprayed Group B – 2ml of 4% lignocaine was sprayed in this group. Group C – 2ml of normal saline was used in this group. Postoperatively between 12-24 hours patients were invited to find out if any sore throat or hoarseness of voice was present. Verbal analogue scoring system was used.

Results: Postoperatively sore throat was present in 26% in group A, 33% in group B and 28% in group C. Hoarseness was present in 20% in group A, 23% in group B and 18% in group C. Sore throat and hoarseness were present in 37% in group A, 45% in group B and 39% in group C.

Conclusion: Neither dexamethasone nor lignocaine throat spray were useful in reducing postoperative sore throat and hoarseness.

Keywords: Intubation, sorethroat, local anaesthesia

1. Introduction

Intubation of trachea is a procedure of great value. It produces assurance of a clear airway and prevents the entry of foreign material into the tracheobronchial tree. Many advances in both surgery and anaesthesia have been made possible by its use. The rapidly acting anaesthetics, muscle relaxing agents permit the skilled operator to induce anaesthesia to insert the endotracheal tube in a short time and without trauma.

The complications of concern to the patient, the surgeon and the anaesthetist are those, which may be manifest during the first few days after intubation. These may be caused by trauma, infection, oedema and inflammatory reaction. The patient notices symptoms, which include difficulty in swallowing, sore throat, hoarseness and aphonia even though these are all minor complications of endotracheal anaesthesia. The incidence of sore throat may be up to 90% depending on the institution [1-6].

Postoperative hoarseness varies from 4 to 43% [7,8]. There have been several studies using topical anaesthetic jelly over the endotracheal tube to reduce these minor complications. All these studies give conflicting results. Therefore we undertook this study to verify if the use of topical anaesthetics and anti-inflammatory agents produced any difference.

1.1 Review of literature

Sore throat and hoarseness have been considered as complications of endotracheal tube intubation as early as 1958 by William Hamerberg *et al* in The Journal of the American Medical Association. Several factors have been implicated in these post intubation complications. Gender, obesity, oral/nasal airway, size of endotracheal tube, presence of cuff, use of stylet, trauma during intubation, type of anaesthesia, site of surgery, position of the patient during surgery, suctioning preoperatively, use of anticholinergic agents, type of muscle relaxant and

cleaning agents used on nondisposable endotracheal tube [9] are some of the factors modifying these minor complications. Minor complications of intubation like sore throat, hoarseness and aphonia can be reduced by using sterilised tubes and appropriate size of the endotracheal tube and avoiding trauma. The use of local anaesthetic by spray, transtracheal injection or the lubricant on the endotracheal tube reduces the depth of anaesthesia required for the tolerance of the tube [10]. If there is pre-existing upper respiratory tract infection with cough, sore throat, hoarseness or sinusitis the postoperative minor complications increase. Also if nasogastric tubes are used it increases. Among the patients who did not have predisposing causes, symptoms (sore throat and hoarseness) arose in 37% in a study done by William Hamelberg [10].

Mechanism contributing to postoperative sore throat are [11]

- a) Trauma to the tonsillar pillars, pharynx, tongue, larynx and trachea
- b) Oedema in the structures of the nasal cavity when this route of intubation is used
- c) Drying out of mucosal membranes in the trachea with endotracheal intubation of upper airway following anaesthesia by facemask.

1.1.2 Sex

Female patients tend to have more sore throat compared to males [1,4,7,11-16]. Gard & Cruickshank found an increase in the percentage of sore throat in women (56%) when compared to men (33%). This correlates with the higher incidence of contact ulcer and granuloma formation in the female [1,12]. Christensen *et al* studied 1325 patients and found the incidence of sore throat to be 14.4% [17]. In their study, women were intubated with an 8 mm tracheal tube and men with a 9 mm tracheal tube. All tubes were lubricated with lignocaine jelly. However, the incidence of sore throat in women (17%) was significantly higher than that in men, which was attributed to the tight fit of the endotracheal tube. Others did not agree with this [6,18]. In a study done by Valentine *et al*, though their primary aim was comparison after premedication with papaveretum/hyoscine or temazepam their data did not show any gender difference in the incidence of post intubation sore throat.

1.1.3 Use of lubricants

Higher incidence of sore throat after difficult intubations was found in the group intubated with dry tubes while this was not the case in the group intubated with jelly-lubricated tubes [7]. In contrast Loeser and colleagues found that lubricating tubes with 5% lignocaine ointment gave the highest incidence of postoperative sore throat whereas the incidence was least with no lubrication. Intermediate

results were recorded when water-soluble jelly was used. Sprague *et al* [19] suggested that incidence of sore throat could be minimised by nonlubricated tubes. Valentine *et al* [6] said that lubricants made no difference to the incidence, but those that contain a local anaesthetic made the problem worse. Christinestock & John Downs [3] found no significant difference in the incidence or severity of sore throats based on the type of lubricant used on the tracheal tube or based on the presence or absence of lignocaine in the lubricant. In fact there was no difference in the incidence or severity of sore throat in patients who were intubated with dry tubes compared with those intubated with lubricated tubes [2].

However, these investigators did not estimate the incidence of sore throat when cuffed endotracheal tubes were lubricated. There is no study therefore that categorically demonstrates that the use of lubricating jelly containing a local anaesthetic is beneficial in the reduction of post operative sore throat after tracheal intubation.

1.1.4 Age and Type of surgery

Many studies have found that the incidence of postoperative sore throat did not correlate with the age of the patient [6,11,14,18, 20]. But Sprague *et al* [19] have found that the postoperative sore throat incidence was greater in the under forty age group than in the older group.

1.1.5 Cough

Hartsel & Stephen [21] found that coughing on the endotracheal tube increased the incidence of sore throat. But another study [4] did not agree with this. In this study 85 patients coughed during intubation and 83 did not cough. The incidence of sore throat was 36.4% and 39.7% respectively, which was not significant.

1.2 Low pressure high volume cuff tubes verses High pressure low volume cuff tubes

The explanations for the high incidence of sore throat with the use of high volume low pressure endotracheal tubes are

- a) Tracheal tube cuffs produce tracheal-mucosal membrane or ciliary damage in direct relation to the cuff-tracheal wall contact area, which is known to be largest when low pressure high-volume cuffs are used.
- b) Bulkier and larger low pressure tubes produce more damage to upper airway structures on intubation or extubation
- c) Low pressure high volume tube cuffs produce grooves in the mucosa because of wrinkling of the cuffs as it is inflated, unlike the inflation of high pressure low volume cuffs [16].

Edward loeser *et al* [11] demonstrated that low pressure high volume endotracheal tube cuffs

were associated with a markedly higher incidence and greater severity of postoperative sore throat than are high pressure low volume cuffs [19]. Use of high-pressure low- volume cuff endotracheal tube resulted in an incidence and severity of postoperative sore throat no significantly different from the incidence and severity in patients whose tracheas were not intubated. When intracuff pressure in the low volume high pressure cuffed tubes was high and allowed to increase the advantage of decreased incidence of sore throat is lost [2]. Although the high volume cuffs caused a greater area of damage to the tracheal mucosa, the damage was more superficial than that caused by the high pressure cuffs [22].

Edward Loeser's study [23] showed that the foam filled cuffs had the highest cuff-tracheal contact area of any of the cuffs studied, and it was associated with the highest incidence and severity of postoperative sore throat.

1.3 Nitrous oxide diffusion

Studies in vitro had shown that if saline was used to inflate the tracheal tube cuff, the pressure rise in the cuff secondary to nitrous oxide diffusion was minimal, whereas under the same experimental conditions there was a 27 fold increase in the pressure of cuffs inflated with air [24]. Both high pressure and low pressure air filled endotracheal tube cuffs sustained significant increases in cuff volume and pressure after exposure to nitrous oxide and oxygen. While low pressure cuffs had lower initial and final cuff pressures than high pressure cuffs, pressure and volume changes were similar with the two types and were primarily caused by diffusion of nitrous oxide into the cuff. So cuff overexpansion during anaesthesia may be a significant cause of tracheal or laryngeal trauma and possibly also postoperative sore throat in intubated patients.

Saarnivara *et al* [1] found increased incidence of sore throat in a group in which the intracuff pressure was allowed to increase freely. So Theodore Stanley suggested that nitrous oxide or a sample of the inspired gas mixture may be a better cuff inflating gas than room air or if room air is used it is important to deflate cuffs periodically to avoid build up of cuff volume and pressure during nitrous oxide anaesthesia. [21].

1.4 Cuff pressure

It is recommended that a cuff inflation pressure of 30 cmH₂O (22mmHg) should not be exceeded [1,25]. Capillary perfusion pressure in man has been recorded as ranging between 22 and 32 mmHg and the upper limit is uncertain. The high volume low pressure cuff can be converted into high volume high pressure cuff by over inflation or during nitrous oxide: oxygen anaesthesia. But these changes did not occur when cuffs were inflated with

anaesthetic gas mixture [22]. Seegobin & Hasselt [25] have found evidence of obstruction to mucosal blood flow at a lateral wall pressure above 30 cmH₂O with total occlusion of flow to the mucosa over the tracheal rings and posterior tracheal wall a lateral wall pressure of 50 cmH₂O (37mmHg).

Patient position and Head movement

Neither head movement nor changing the posture correlated with the incidence of the sore throat in a study by Else Winkel and Julie Knudsen who studied 248 patients undergoing endotracheal intubation for plastic operations. Though their primary aim was to see the effects of 1% cinchocaine jelly for endotracheal intubation on the incidence postoperative sore throat, the data did not find any correlation between head movement and changing the posture with the incidence of the sore throat [7].

1.5 Hydrocortisone cream over endotracheal tube

Hamelberg [10] in his study used topical hydrocortisone ointment on the endotracheal tube and found reduction in the incidence of symptoms from 35% to 26%. Although not statistically significant, this suggested that more prolonged topical application of hydrocortisone might have a more marked effect.

1.6 Local anaesthetic spray

The effect of application of laryngotracheal lignocaine spray on postoperative sore throat has also been investigated. A local anaesthetic sprayed into the larynx did not appear to alleviate sore throat [7, 12]. The application of lignocaine spray before intubation appeared to increase the incidence of sore throat as a result of either mucosal irritation or repeated laryngoscopy [22] but it did make for smoother anaesthesia as it prevented coughing, movements during intubation

2. Material and methods

2.1 Patient selection and methods

Adult patients of either sex who underwent general anaesthesia with endotracheal intubation were included in this randomised double blind study.

2.2 Eligibility criteria

- 1)ASA 1,2 & 3 patients
- 2)Age group above 12
- 3)All requiring endotracheal intubation

2.3 Exclusion criteria

- 1)Patients who are allergic to lignocaine
- 2)Head and neck surgery
- 3)Anticipated difficult intubation
- 4)Patients who need nasogastric tube
- 5)Patients on steroids

The study was conducted on three hundred patients who had general anaesthesia with endotracheal intubation. They were randomly allocated into three groups – Group A, Group B and

Group C following block randomisation. Nature of the study was explained to the patient and verbal consent obtained.

Patients were anaesthetised with thiopentone, nitrous oxide, oxygen, opioid and muscle relaxant – either succinylcholine or nondepolarising muscle relaxant. After ventilating for three minutes (if nondepolarising relaxant was given) or 1 minute (if succinylcholine was given) laryngoscopy was done and 2 ml of the solution was sprayed over the posterior pharyngeal wall, vocal cords and between the vocal cords into the trachea. Patients were ventilated after spraying for some time and then intubated. During laryngoscopy patients’ response – cough, movement of body etc if present was noted. Number of attempts at intubation (other than the laryngoscopy for spraying), any blood on the scope after intubation, external pressure over the larynx, stylet, oral airway if needed, position of the patient during surgery, cough during surgery and extubation, suction during surgery, any anticholinergic drugs used intraoperatively, experience of the anaesthetist, laryngoscopic view, duration of the anaesthesia – all these were noted. Group A – 2ml of dexamethasone (8mg) was sprayed Group B – 2ml of 4% lignocaine was sprayed in this group. Group C – 2ml of normal saline was used in this group.

The size of the endotracheal tube was decided according to the sex, age and size of the patient. For all the patients single use disposable PVC tubes (Portex/Mallincrodt/Rush) with large volume low pressure cuff were used. After surgery was over anaesthesia was reversed with atropine and neostigmine.

Postoperatively between 12-24 hours patients were invited to find out if any sore throat or hoarseness of voice was present. Patients were generally asked about their postoperative condition. If they did not specifically complain about sore throat or hoarseness, direct questioning was done. Verbal analogue scoring system was used.

A person who was blinded to the drug used did the scoring.

2.4 Sore throat

- 0 – No sore throat at any time since operation
- 1–Mild (scratchy throat following operation disappeared within 3-6 hours)
- 2–Moderate (up to 12 hours – sore throat disappearing at the time of interview)
- 3–Severe (sore throat that lasted 24 hours and difficulty in swallowing present)

2.5 Hoarseness

- 0 – None
- 1 – Noted by the patient
- 2 – Obvious to observer
- 3 – Aphonia

3. Results and Analysis

We did logistic regression analysis in this study.

Table 1: Sex and weight distribution in the study groups

			Group A	Group B	Group C	P Value
1	Sex	Male	48%	49%	47%	0.96073
2	Weight	≤ 60 Kg	70%	67%	67%	0.87121

Among the three hundred patients 48% in group A, 49% in group B and 47% in group C were male patients. The rest were female. The percentage distribution was equal in all the three groups.

70% of patients in group A, 67% in group B and group C are below 60kg. The rest of the patients’ weight was above 60kg. The percentage distribution was equal in all the groups.

Table 2: The incidence of preoperative factors, which can contribute to postoperative sore throat and hoarseness

		Group A	Group B	Group C	P Value
1	Smoking	4%	8%	13%	0.06982
2	URI	8%	3%	6%	0.30581

1) 4% in group A, 8% in group B and 13% in group C were smokers. The rest were nonsmokers.

2) 8% in group A, 3% in group B and 6% in group had URI. Others did not have URI.

The percentage of patients with URI and without URI was similar in all the three groups.

The distribution of smokers is not equal in all the three groups. So we did this analysis to remove any confounder.

Table 3: Effect of spray and smoking on the risk of sore throat and hoarseness (Unconditional logistic regression)

Factor	OR (Odds Ratio)	SE (Standard Error)	Sig (p)
No spray	0.88	0.253	0.627
Smoking	1.72	0.423	0.20

The crude odds ratio was 0.92 indicating slight protection against sore throat/hoarseness when no spray is used. When adjusted for smoking the point estimate of odds ratio was 0.88 indicating a mild confounder.

Table 4a: Drug by SH Controlling for (Smoke Value = 1 smoker)

Drug	Sore Throat & Hoarseness	No Sore throat & Hoarseness	ROW Total
No spray (1)	8	5	13
	61.5	38.5	52.0
	61.5	41.7	
Throat spray	5	7	12
	41.7	58.3	48.0
	38.5	58.3	
Column Total	13	12	25
	52.0	48.0	100.0

Table 4b: Drug by SH Controlling for (Smoke Value = 2 non smoker)

Drug	Sore throat & Hoarseness	No Sore throat & Hoarseness	ROW Total
No Spray (1)	31	56	87
	35.6	64.4	31.6
	28.7	33.5	
Throat Spray (2)	77	111	188
	41.0	59.0	68.4
	71.3	66.5	
Column Total	108	167	275
	39.3	60.7	100

Table 4a and 4b

When subjects were stratified according to smoking status, incidence of sore throat and hoarseness among smokers who received no spray was higher compared to those who received spray (relative risk 1.48). Among non smokers ‘no spray’ turned out to be a

protective factor (relative risk 0.85). This is suggestive of interaction between smoking and use of spray in the risk of sore throat. However the sample size was too small to demonstrate any statistically significant interaction.

Table 5: Type of surgery

	Surgery	Group A	Group B	Group C
1	Gynaecological surgery	24	20	19
2	Ear surgery	15	19	10
3	Limb surgery	13	11	21
4	Spine surgery	14	16	15
5	Urological surgery	26	22	18
6	General surgery	8	12	17

We avoided cases where nasogastric tubes or any other intraoral instrumentation was carried out to prevent the cases from having a confounding factor of trauma caused by means other than endotracheal tube.

Table 6: Factors related to endotracheal intubation, which can affect postoperative sore throat and hoarseness

	Factors	Group A (%)	Group B (%)	Group C (%)	P Value	
1	Size of ETT < 7.5	45	46	45	0.98994	
2	Suxamethonium	4	7	2	0.21019	
3	No of attempts ≥ 2	9	6	9	0.66524	
4	Duration of scopy > 30 sec	48	54	45	0.43157	
5	Blood on laryngoscope	4	4	2	0.66114	
6	Laryngoscopic view Grade 2 or 3	13	15	8	0.29198	
7	Airway Stylet External Pressure on larynx	None	43	40	34	0.44312
		Anyone	31	36	44	0.44312
		≥ 2	26	24	22	0.44312
8	Duration of Anaesthesia > 140 min	46	48	53	0.5944	
9	Experience of the anaesthetist < 2 years	65	55	77	0.00460	

1) 45% of patients in group A, 46% in group B and 45% in group C were intubated with more than 7.5 size endotracheal tube. The rest were intubated with 7.5 or less than 7.5 size

endotracheal tube. The percentage distribution was equal in all three groups.

2) 4% of patients in group A, 7% in group B and 2% in group C were intubated with suxamethonium. The rest were intubated with non depolarising

- relaxant. The percentage of patients who received succinylcholine and non depolarising agent for intubation were similar in all groups.
- 3) 9% of patients in group A, 6% in group B and 9% in group C needed in two or more than two attempts for intubation. The rest of the patients were intubated at the first attempt. The percentage who needed two or more than two attempt for intubation was equal in all the three groups.
 - 4) The duration of scopy was more than 30 seconds in 48% of patients in group A, 54% in group B and 45% in group C. For others it was 30 seconds or less. Equal number of patients had more than 30 seconds of laryngoscopic duration in all the three groups.
 - 5) There was blood on the laryngoscope after intubation in 4% of patients in group A and group B and 2% in group C. The percentage of distribution was equal in all three groups.
 - 6) The laryngoscopic view was 2 or 3 in 13% of patients in group A, 15% in group B and 8% in group C. In others it was grade 1. The percentage

- of patients who had laryngoscopic view of grade 1 or grade 2 was similar in all three groups.
- 7) During induction and intubation airway, stylet or external pressure was not needed in 43% of patients in group A, 40% in group B and 34% in group C. 31% of patients in group A, 36% in group B and 44% in group C needed either airway or stylet or external pressure. 26% of patients in group A, 24% in group B and 22% in group C needed any of these two or more than two.
 - 8) 46% of patients in group A, 48% in group B and 53% in group C had duration of anaesthesia of more than 140 minutes. The rest had less than 140 minutes duration of anaesthesia.
 - 9) The experience of the anaesthetist intubating was less than two years in 65% of patients in group A, 55% in group B and 77% in group C. The anaesthetists with more than two years of experience intubated the rest. The p value shows a significant difference in the distribution of these cases intubated by anaesthetists of less than two years experience. But there was no effect of this factor over the outcome of sore throat (Table 8).

Table 7: The incidence of events during anaesthesia and recovery

	Factors	Group A %	Group B %	Group C %	P Value
1	Cough	11	10	12	0.90290
2	Antisialogauge	31	32	24	0.39741
3	NSAID	20	25	16	0.28501

- 1)11% of patients in group A, 10% in group B and 12% in group C coughed during surgery and extubation. The rest did not cough. The percentage of distribution was equal in all the three groups.
- 2)The percentage of people who needed atropine or glycopyrrolate was 31% in group A, 32% in group B and 24% in group C. The distribution was similar in all the three groups.
- 3)The percentage of people who received NSAID for postoperative analgesia was 20% in group A, 25%

in group B and 16% in group C. The rest received opioid. The distribution of cases was equal in all the three groups.

In group A 61 patients had surgery in supine position, 16 in lateral position and 23 patients in prone position. In group B 61 patients had surgery in supine position, 16 patients in lateral position and 24 patients in prone position. In group C 66 patients in supine position, 14 patients in lateral position and 19 patients in prone position had surgery.

Table 8: The incidence of sore throat and hoarseness in the study population

		Group A %	Group B %	Group C %	P Value
1	Sore throat	26	33	28	0.53186
2	Hoarseness	20	23	18	0.67640
3	Sore throat & Hoarseness	37	45	39	0.48663

- 1)Postoperatively sore throat was present in 26% in group A, 33% in group B and 28% in group C.
- 2)Postoperative hoarseness was present in 20% in group A, 23% in group B and 18% in group C.

- 3)Postoperatively sore throat and hoarseness were present in 37% in group A, 45% in group B and 39% in group C.

Statistically no difference was found in the incidence of postoperative sore throat and hoarseness in all three groups.

Table 9: Effect of selected exposure factors on risk of postoperative sore throat and hoarseness

		Sore Throat %	Sig	Hoarseness %	Sig
Spray	Placebo	28.0	0.89265	18.0	0.57692
	Dexa/Ligno	29.5		21.5	
Sex	Male	34.0	0.08607	22.2	0.52385
	Female	24.4		18.6	
Smoking	Smoker	48.0	0.05040	16.0	0.76207
	Nonsmoker	27.3		20.7	
URI	Present	29.4	1.0000	29.4	0.51742
	Absent	29.0		19.8	
Anaesthesia Duration	> 140 min	32.0	0.32462	23.8	0.18588
	≤ 140 min	26.1		17.0	
Size of ETT	> 7.5	35.3	0.03149	22.8	0.42734
	≤ 7.5	23.3		18.4	
Relaxant	Scoline	15.4	0.42325	15.4	0.93865
	Non depolarising agent	29.7		20.3	
No of attempts	≥ 2	25.0	0.82919	25.0	0.74304
	1	29.3		19.9	
Duration of scopy	> 30 sec	33.3	0.13516	19.0	0.68999
	≤ 30 sec	24.8		21.6	
Intubation response	Yes	33.3	0.76579	18.5	1.00000
	No	28.6		20.5	
Blood on laryngoscope	Yes	50.0	0.25675	10.0	0.66996
	No	28.3		20.7	
Cough	Yes	27.3	0.97729	27.3	0.41185
	No	29.2		19.5	
Suction	Yes	41.7	0.50779	25.0	0.96497
	No	28.5		29.1	
Antisialagogue	Yes	36.8	0.07873	20.7	1.00000
	No	25.8		20.2	
Laryngoscopic view (Grade)	2&3	27.8	1.00000	19.4	1.00000
	1	29.2		20.5	
Experience	< 2 years	29.4	0.92102	17.3	0.09320
	≥ 2 years	28.2		26.2	
Analgesia	NSAID	26.2	0.70677	23.0	0.69590
	Opioid	29.7		19.7	
Weight	≤ 60kg	24.5	0.01817	22.2	0.35305
	> 60kg	38.5		16.7	
Induction & Intubation (Airway, Stylet, External laryngeal pressure)	0	27.4		22.7	
	1	28.8		20.7	
	≥ 2	31.9		16.7	

- 1) 48% of smokers and 27.3% of nonsmokers had sore throat. This was statistically significant i.e. smokers are more prone to have sore throat postoperatively.
- 2) The incidence of patients who had sore throat was 35.3% in patients who were intubated with more than 7.5 size endotracheal tube whereas it was 23.3% in patients intubated with 7.5 or less than 7.5 size endotracheal tube. The incidence of sore throat was significantly increased in the group intubated with larger than 7.5 size endotracheal tube.
- 3) 24.5% patients weighing less than 60kg and 38.5% patients weighing more than 60kg developed sore throat. This was also statistically significant.
- 4) The type of the spray, gender, preoperative URI, duration of anaesthesia, relaxant used intubation, number of attempts at intubation, duration of laryngoscopy, response of the patient to intubation, presence of blood on laryngoscope,

use of stylet or airway or external laryngeal pressure, coughing during extubation, use of antisialogauge, laryngoscopic view, experience of the intubating anaesthetist, use of NSAID for postoperative analgesia – all these variables did not affect the incidence of sore throat.

- 5) Type of the throat spray, gender weight of the patient, smoking, preoperative URI, duration of anaesthesia, size of the endotracheal tube, type of the relaxant used for intubation, number of attempts at intubation, duration of laryngoscopy, response of the patient to intubation, presence of blood on laryngoscope, use of stylet or airway or external laryngeal pressure, coughing during extubation, suctioning, use of antisialogauge, laryngoscopic view, experience of the intubating anaesthetist, type of the drug used for postoperative analgesia – all these variables did not affect the incidence of the postoperative hoarseness.

4. Discussion

Sore throat and hoarseness of voice are some of the complications of endotracheal intubation during anaesthesia. Even though they are relatively mild complications, the patients can get distressed by these complaints in the postoperative period. Therefore a need to minimise these side effects have prompted several investigators to evaluate how to combat this problem. There have been several studies evaluating the effect of throat spray or topical anaesthetic jellies over the endotracheal tube to reduce these minor complications. All these studies give conflicting results. Local anaesthetic spray used before intubation has been said to decrease sore throat [22]. El. Hakim [18] used beclomethasone spray before intubation and found it decreased sore throat compared with 10% lignocaine spray. In Hamelberg's study [10] topical hydrocortisone ointment on the endotracheal tube reduced the incidence of symptoms from 35% to 26% though it is not statistically significant. Therefore we undertook this study to ascertain if any of the above preparations would reduce the incidence of sore throat.

After a pilot study, a sample size of 300 patients was calculated. The patients were given throat sprays using either dexamethasone or lignocaine or placebo to evaluate the effect of each drug. We divided them into three groups on random allocation. Each group had either 2ml dexamethasone throat spray or 2ml 4% lignocaine or 2ml normal saline throat spray. Lignocaine is effective for the production of analgesia by topical application. A 4% solution is recommended for topical application to the oropharynx and tracheobronchial tree in adults [36]. Cortisol and the synthetic analogs of cortisol have the capacity to prevent or suppress the development of local heat, redness, swelling and tenderness by which inflammation is recognised. At the microscopic level, they inhibit not only the early phenomena of the inflammatory process (oedema, fibrin deposition, capillary dilation, migration of leukocytes into the inflamed area and phagocytic activity) but also the later manifestations (capillary proliferation, fibroblast proliferation, deposition of collagen and still later cicatrization). Glucocorticoids inhibit release of arachidonic acid from phospholipids and thereby decrease formation of prostaglandins and related compounds such as prostaglandin endoperoxides and thromboxane, which may play an important role in inflammation [37].

The age group in our study varied from 14-70 years. We excluded patients under 12 years of age

because they would not have been able to express the symptoms accurately.

Many studies [1,4,7,11-16] said that female patients tend to have more sore throat. This correlates with the higher incidence of contact ulcer and granuoma formation found in the females [1,12]. This may have been due to tighter tube fit in women. But in our study we did not find any significant gender difference in the incidence of sore throat or hoarseness.

The weight of the patients had a correlation with the postoperative sore throat and hoarseness. In our study we found increased incidence of sore throat in patients over 60kg (38.5%) when compared to patients less than 60kg (24.5%). Probably this could be due to greater technical difficulty in intubating obese patients [8, 14] as shown in studies with similar outcome.

During the preanaesthetic visit we categorised patients as smokers and nonsmokers and people with URI and without URI. Smokers tend to have hyper reactive airway and they are more prone to have respiratory complications in the intraoperative and post operative period. Though many studies [6,13,18] did not find any correlation between smoking and postoperative sore throat, our study showed smoking as a significant predisposing factor for the development of postoperative sore throat. In our study 48% of smokers had sore throat whereas only 27.3% of nonsmokers had sore throat. The incidence of hoarseness was not increased by smoking in this study. 16% of smokers had hoarseness whereas 20.7% of nonsmokers had hoarseness.

Patients with URI tend to have more respiratory problems during surgery and in the postoperative period. It may be an exaggeration of the pre-existing URI. In our study we did not find any increase in the incidence of sore throat in patients who had URI. From this study we can conclude that if the patient with mild URI is accepted for anaesthesia we need not worry about the increase incidence of sore throat or hoarseness as postoperative problems. In our study 29.4% of patients with URI had sore throat whereas 29% patients without URI had sore throat. However the number of cases with URI studied is very small (17 cases). We therefore cannot conclusively state that patients with mild URI have no increased propensity to sore throat or hoarseness.

If the duration of surgery is prolonged the endotracheal tube is insitu for long period. This can produce mucosal injury and we expect more incidence of sore throat in these cases. This was supported by one study [8]. But many studies did not agree with this finding [6,7,11,12,17-20]. In our

study the maximum duration of anaesthesia was 758 minutes. The median duration of anaesthesia was 140 minutes. We did not find any increase in the incidence of sore throat and hoarseness with increased duration of anaesthesia (more than 140 minutes).

Many studies show that the overall incidence of postoperative sore throat was not significantly related to the anaesthetist's experience [4,10]. Hamelberg [10] considers that this may be due to the fact that most intubations done by the staff were those, which the residents were unable to complete because of inexperience or technical difficulty. Patients in whom intubations were done by staff members, therefore had already been subjected to some degree of trauma. Our study did not show any correlation between anaesthetist's experience and the incidence of sore throat.

It has been clearly demonstrated that the use of smaller endotracheal tube decreases the incidence of postoperative sore throat [13]. Our study also agrees with this. In our study people who were intubated with more than 7.5 size endotracheal tube have 35.3% incidence of sore throat whereas people who were intubated with 7.5 or less than 7.5 size endotracheal tube have 23.3% incidence of sore throat. We generally use 7.0 or 7.5 size endotracheal tube for female patients and 8.0 or 8.5 size endotracheal tubes for male patients. But we decide the size of the endotracheal tube depending on the size of the patient also. According to this data it should have increased incidence of sore throat and hoarseness in male patients. But we did not find any gender difference in the incidence of sore throat. This may be due to the fact that we had a younger age group i.e from 14 years onwards who were both male and female. Therefore only the size of the tube is significant. We found lesser incidence of sore throat with the use of 7.5 or less than 7.5 size endotracheal tube. So unless there is specific indication like increased secretions, it is better to use smaller size endotracheal tube.

The role of suxamethonium in the aetiology of sore throat is not clear. Suxamethonium causes skeletal muscle fasciculations. The parapharyngeal muscles contain striated muscle, which may also fasciculate [14]. One of the reasons for using succinylcholine is if we expect any difficulty in intubations like short neck or puffy face where mask ventilation may be difficult. Because of these reasons there should be more sore throat in patients who were intubated with succinylcholine. But our data did not show any increase in the incidence of postoperative sore throat or hoarseness with the use of succinylcholine.

Long duration of laryngoscopy may be a factor, which increases incidence of sore throat. If the duration of laryngoscopy is more, there is possibility of increased mucosal injury leading to postoperative sore throat and hoarseness. The maximum duration of laryngoscopy in our study was 120 seconds (laryngoscopy time for both spraying and intubation). The median duration of laryngoscopy was 30 seconds. We did not find any increase in the postoperative sore throat or hoarseness with the increase in the duration of laryngoscopy.

When there are several attempts at intubation the likelihood of trauma at the larynx and throat is more leading to postoperative sore throat. In this study we have done minimum of two laryngoscopies in all patients – one for spraying and the other for intubation. Out of 300 patients 276 patients have been intubated at first attempt, 21 patients at second attempt, 2 patients at third attempt and one patient at fourth attempt. We did not find any increase in the incidence of sore throat in these patients who had increased number of attempts for intubation. This is similar to the finding of the study done by Mark C. Monroe [4]. But at the same time it has been found that the incidence of sore throat was greater in patients when blood had been noted on the airway instrument [4,18,34]. In our study we analysed the data and we did not find any statistically significant increase in the incidence of sore throat and hoarseness when blood had been noted on the laryngoscopy. The number of cases where multiple scopies had to be performed and where blood was present on the laryngoscope were so few which may be why the results were not significant.

Hartsel and Stephen [21] found that coughing on the endotracheal tube tended to increase the incidence of sore throat. This may be due to increased mucosal injury when patients cough. In our study some patients coughed during intubation though none moved the body as a response to intubation. Some coughed intraoperatively. In spite of this movement of the endotracheal tube during surgery we did not find any correlation between the patients who coughed and the incidence of sore throat and hoarseness.

During intubation if the laryngoscopic view is Grade 1 usually there won't be any difficulty in intubation. If the laryngoscopic view is Grade 2 there may be little difficulty in intubation especially to the inexperienced anaesthetists. In our study only two patients had Grade 3 laryngoscopic view. All other had either Grade 1 or 2 views. That is probably why our study did not show up patients who had higher incidence of sore throat or hoarseness because of poor laryngoscopic view.

During extubation all patients are given oral suction. We noted whether additional suction is given intraoperatively (oral/endotracheal). There is a possibility of increased suctioning producing more injury to the oral mucosa or pharyngeal mucosa and therefore more sore throat. But in our study we did not find any increase in the incidence of sore throat or hoarseness in any patients who required suctioning during surgery.

Patients who have increased oral salivation as well as those undergoing lateral or prone position are given atropine or glycopyrrolate as a routine. Antisialogauges cause dryness of secretions. The smooth jelly like action of secretions on the tracheobronchial tree will be abolished leading to dry throat which may predispose these patients to sore throat. But in our study there is no difference in the incidence of sore throat and hoarseness between patients who did and did not have antisialogauges.

For postoperative analgesia some patient receives NSAID and some patients receive opioids. NSAIDs have anti inflammatory action which may be beneficial in decreasing sore throat and hoarseness. In our study 61 patients received NSAID and 239 patients received opioid as postoperative analgesic. We did not find any decrease in the incidence of sore throat or hoarseness in patients who received NSAID.

The following is the incidence of postoperative sore throat and hoarseness in our study.

	Sore throat	Hoarseness
Group A (Dexamethasone)	26%	20%
Group B (Lignocaine)	33%	23%
Group C (Normal saline)	28%	18%

We did logistic regression analysis and it did not show any significant effect on decreasing the incidence of postoperative sore throat or hoarseness with lignocaine or dexamethasone. The fact that placebo group was no worse shows that lignocaine and dexamethasone have not reduced the incidence of sore throat or hoarseness in our study.

5. Conclusion

Postoperative sore throat and hoarseness are some of the distressing complaints of the patients after intubation. Many studies have been done using lignocaine throat spray, beclomethasone spray and hydrocortisone ointment. All these studies give conflicting results. So we undertook this study in 300 adult patients as three groups using either dexamethasone (Group A) or lignocaine (Group B) or placebo (Group C) throat spray to see the effect of these drugs on sore throat and hoarseness. In this double blinded randomised study after analysis of data (logistic regression analysis) we found that the

incidence of sore throat was 26% in group A, 33% in group B and 28% in group C and the incidence of hoarseness was 20% in group A, 23% in group B and 18% in group C.

We came to the following conclusions.

- 1) Neither dexamethasone nor lignocaine throat spray were useful in reducing postoperative sore throat and hoarseness.
- 2) Smoking predisposed the patient to sore throat.
- 3) If the weight of the patient is more than 60kg the incidence of sore throat is higher.
- 4) With larger size of the endotracheal tube (> 7.5) patients had more sore throat.
- 5) Gender, preoperative URI, duration of anaesthesia, relaxant used for intubation, number of attempts for intubation, duration of laryngoscopy, response of the patient to intubation, blood on the laryngoscope, coughing during intubation, additional suctioning, use of antisialogaugue, laryngoscopic view, experience of the anaesthetist, postoperative use of NSAID – all these did not influence the incidence of sore throat.
- 6) None of the above factors including smoking and size of the endotracheal tube influenced the incidence of hoarseness.

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