

## Sore throat and hoarseness after total intravenous anaesthesia

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**Background.** Sore throat and hoarseness are common complications, but these have not been studied after total i.v. anaesthesia.

**Methods.** We prospectively studied 418 surgical patients, aged 15–92 yr, after total i.v. anaesthesia with propofol, fentanyl and ketamine to assess possible factors associated with sore throat and hoarseness.

**Result.** We found sore throat in 50% and hoarseness in 55% of patients immediately after surgery. This decreased to 25% for sore throat and 24% for hoarseness on the day after surgery. Both sore throat and hoarseness were more common in females and when lidocaine spray had been used. Cricoid pressure during laryngoscopy was inversely associated with the risk of sore throat.

**Conclusion.** Knowledge of these factors may reduce postoperative throat complications, and improve patient satisfaction.

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Cuffed tracheal tubes are often used in general anaesthesia to facilitate positive-pressure ventilation and to protect the airway from aspiration. Intracuff pressure increases when nitrous oxide is used in general anaesthesia,<sup>1</sup> and this pressure may cause postoperative sore throat.<sup>2,3</sup>

Total i.v. anaesthesia is now popular. If nitrous oxide is not used, this may alter postoperative sore throat and hoarseness, but this is not known. We set out to assess patient and operative factors associated with sore throat and hoarseness after total i.v. anaesthesia.

### Methods

After receiving hospital ethics committee approval and informed consent from the subjects, we enrolled 418 surgical patients of ASA class I–III, aged 15–92 yr, over a 20-week period. We preliminarily divided these weeks into four sequential time periods:

1. Water-soluble jelly (K-Y Jelly, Johnson & Johnson, USA) was used as the cuff lubricant, and lidocaine spray

(Xylocaine 8% pump spray, AstraZeneca, Sweden) was applied to the larynx before intubation.

2. Water-soluble jelly was used, but lidocaine spray was not applied.

3. Lidocaine jelly (Xylocaine 2% jelly, AstraZeneca, Sweden) was used as the cuff lubricant, and lidocaine spray was applied.

4. Lidocaine jelly was used, but lidocaine spray was not applied.

Patients were sequentially allocated to the four study groups.

General anaesthesia was induced and maintained with propofol, fentanyl and ketamine, with or without epidural block. Intubation was with one of three types of tracheal tube: routine tracheal tube with standard cuff (Trachelon, Terumo, Japan), a Ring-Adair-Elwyn (RAE) tube with high-volume, low-pressure cuff (Mallinckrodt Medical, Ireland), or a reinforced tube with standard cuff (Phycon, Fuji Systems, Japan). The RAE and reinforced tubes were used mainly in head or neck procedures. The tube cuff was inflated until no air leak could be detected with an airway

**Table 1** Odds ratios of significant predictors of sore throat and hoarseness immediately after surgery by logistic regression analysis

	Odds ratio	95% confidence interval	P-value
Sore throat			
Sex (female/male)	1.62	1.05–2.50	<0.05
Lidocaine spray	2.15	1.39–3.32	<0.001
Hoarseness			
Sex (female/male)	2.97	1.88–4.69	<0.0001
Lidocaine spray	2.94	1.85–4.67	<0.0001
Application of cricoid pressure	0.54	0.29–0.99	<0.05

pressure of 20 cm H<sub>2</sub>O. An artificial nose was used routinely to humidify the gas delivered from a non-rebreathing system (Servo 900C, Siemens Elema, Sweden).

We recorded the following data: age, sex, weight, height, the type of tracheal tube used, patient position during operation, the experience of the doctor in charge of the case, the number of attempts at laryngoscopy, factors causing difficult intubation, application of cricoid pressure by assistant during laryngoscopy to maximally visualize the vocal cords, stylet use, lubricant type, application of lidocaine spray, use of nasogastric tube or oesophageal temperature probe, and duration of intubation.

To determine whether patients had suffered postoperative sore throat and hoarseness, the anaesthetist in charge interviewed each patient before leaving the operating room and on the morning after surgery. At the first evaluation, sedation was assessed with a modified Ramsay sedation score (RSS): 1, patient anxious or agitated or both; 2, patient cooperative, oriented and tranquil; 3, patient responds to commands only; 4, patient responds to a light glabellar tap; 5, patient does not respond.<sup>4</sup> Patients with a modified RSS of 1, 4 or 5 were regarded as inappropriate candidates for this study and were excluded.

We used the variables described above in a logistic regression analysis to identify factors associated with sore throat and hoarseness immediately after surgery.  $P < 0.05$  was considered statistically significant. Statistical analysis was done with StatView version 5.0 (SAS Institute Inc., Cary, NC, USA). Data are given as mean (SD).

## Results

Fourteen patients were excluded because of agitation or inappropriate sedation immediately after surgery. Therefore 404 surgical patients, mean age 58 (range 15–92) yr were enrolled. Fifty-seven percent of patients were female and 43% were male. The mean duration of intubation was 163 (SD 76) min. In the 404 patients, lidocaine spray was used in 54% (217/404) and cricoid pressure was applied in 22% (89/404). Sore throat and hoarseness immediately after surgery were reported by 50% and 55% of patients, respectively. This decreased to 25% and 24%, respectively, on the day after surgery.

Variables considered significant by logistic regression analysis are shown in Table 1. Both sore throat and hoarseness immediately after surgery were more common in females. Application of lidocaine spray also predicted both sore throat and hoarseness after surgery. Cricoid pressure reduced the risk of hoarseness immediately after surgery.

## Discussion

Previous studies when nitrous oxide was used reported sore throat in 14–50% of patients<sup>5–10</sup> and hoarseness in 22–50%.<sup>3,5–7,10</sup> We found sore throat and hoarseness in patients undergoing total i.v. anaesthesia in 50 and 55% of patients, respectively, which is similar to or greater than the incidences reported in studies of nitrous oxide anaesthesia.

An explanation for this high incidence of sore throat and hoarseness may be that i.v. techniques require careful titration of drugs to maintain adequate depth of anaesthesia. Bispectral index monitoring or target-controlled infusion help to provide adequate sedation, but these methods were not always available. Inadequate relaxation or movement may have occurred more frequently in our patients than in the patients in the previous studies who received volatile anaesthesia and nitrous oxide. This could increase sore throat and hoarseness. Although approximately one-half of patients who complained of sore throat and hoarseness recovered spontaneously within 24 h after extubation, sore throat and hoarseness were both still common problems immediately after total i.v. anaesthesia.

Application of lidocaine spray was strongly associated with postoperative sore throat and hoarseness. Lidocaine spray is widely used before intubation; however, its effect on postoperative sore throat and hoarseness is unclear.<sup>6,10</sup> The lidocaine spray we used contains ethanol and l-menthol as additives. These additives may be the cause of higher incidence of sore throat and hoarseness seen in our study.

Consistent with previous reports,<sup>3,5,11</sup> female sex was a strong predictor of postoperative sore throat and hoarseness; females may have been intubated with a relatively tightly fitting tube, which could increase sore throat and hoarseness, as a previous study indicated.<sup>5</sup>

Application of cricoid pressure during laryngoscopy reduces hoarseness immediately after surgery. We often find that application of cricoid pressure facilitates visualization of the vocal cords during laryngoscopy. This manoeuvre helps to avoid damage around the vocal cords caused by forcible intubation, which could lower the incidence of hoarseness.

One limitation of our study is the time of the first evaluation of sore throat and hoarseness. Although we excluded inappropriate candidates with the modified RSS, some patients may not have been able to respond accurately to specific questions about sore throat and hoarseness.

In conclusion, sore throat and hoarseness are common after total i.v. anaesthesia. They are more common in females and after lidocaine spray. Application of cricoid

pressure reduced the risk of sore throat immediately after surgery. Knowing the factors that can cause or reduce postoperative sore throat and hoarseness after i.v. anaesthesia may reduce unnecessary complications and improve patient comfort and satisfaction.

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