

Treatment of postoperative sore throat after endotracheal intubation in third molar surgery

Fadi Titinchi¹, Jean A Morkel² and Sanjay Ranchod³

Abstract

Objectives: The aim of this study was to evaluate the efficacy of honey and lemon juice in tea versus Strepsils® versus no pain remedy in relieving postoperative sore throat (POST). **Methods and materials:** Sixty American Society of Anesthesiologists (ASA) physical status I, non-smoking patients scheduled to undergo removal of third molars under general anesthesia were enrolled after obtaining signed informed consent. Participants were randomly divided into three groups to receive no medication, honey and lemon in tea, or Strepsils® lozenges at the following intervals: at 30 minutes after surgery; before going to sleep on the first night; and the following morning. The incidence and severity of POST were evaluated using a four-point scale at three different intervals i.e. prior to administering medication and 30 minutes and 24 hours after surgery. **Results:** POST scores for the groups given honey and lemon in tea ($P < 0.01$) and Strepsils® ($P < 0.001$) were significantly lower after administration of the first dose. The severity of POST significantly decreased for 24 hours after surgery for all three groups ($P < 0.05$). Overall, Strepsils® were the most effective in relieving POST. **Discussion:** POST was reduced significantly with the administration of honey and lemon in tea and Strepsils® immediately after surgery. Likewise, a 24-hour follow-up of patients confirmed the effectiveness of honey and lemon in tea and Strepsils® lozenges in relieving POST. **Conclusions:** Postoperative use of honey and lemon in tea and Strepsils® lozenges reduces sore throat after third molar surgery, especially if administered within 30 minutes postoperatively. **Clinical significance:** Early postoperative administration of honey and lemon in tea or Strepsils® lozenges reduces postoperative sore throat after endotracheal intubation for third molar surgery.

Short title: Treatment of postoperative sore throat

Keywords: Postoperative sore throat; Strepsils®; Honey; Third molar surgery.

¹ Fadi Titinchi, BChD, Department of Maxillo-Facial and Oral Surgery, Faculty of Dentistry, University of the Western Cape, South Africa

² Jean A Morkel, BChD, MBChB, MChD, FCMFOS(SA), Prof and Academic Head, Department of Maxillo-Facial and Oral Surgery, Faculty of Dentistry, University of the Western Cape, South Africa

³ Sanjay Ranchod, BChD, PDD, Department of Maxillo-Facial and Oral Surgery, Faculty of Dentistry, University of the Western Cape, South Africa

Corresponding author:

Prof. JA Morkel
Academic Head, Department of Maxillo-Facial and Oral Surgery
Faculty of Dentistry, University of the Western Cape
Private Bag X1, Tygerberg 7505, South Africa
Tel: +27 21 937 3087
Fax: +27 21 931 2287
E-mail: jamorkel@uwc.ac.za

Introduction

Postoperative sore throat (POST) is a frequent complaint following endotracheal intubation with incidence rates varying from 14.4% to 61%.¹⁻³ It ranks along nausea as the most common complaint after endotracheal intubation for general anaesthesia.⁴ Regardless of the incidence or duration, POST is rated as a patient's 8th most undesirable outcome in the postoperative period,⁵ and is certainly an opportunity to improve patient outcomes.⁶ In order to improve patient satisfaction, avoiding POST is a major priority in patients undergoing endotracheal intubation.⁵ Drugs such as clonidine, betamethasone gel, benzydamine hydrochloride and chamomile extract spray have been used to reduce POST with varying degrees of success.⁷⁻¹⁰ Simple, safe, and inexpensive therapies to reduce or eliminate POST would be helpful and could improve patient satisfaction significantly.

Honey has been used as a medication throughout the ages and in more recent times has been 'rediscovered' by the medical profession for its medicinal properties. It has antimicrobial, antioxidant, anaesthetic and wound healing properties. Although the actual mechanism responsible for the healing power of honey is not well understood, it has proven to be effective in healing nearly all types of wounds including abrasions, ulcerations, burns and septic wounds.¹¹ Honey and lemon juice in tea are thought to coat the pharyngeal mucosa thus soothing inflammation and reducing irritation.¹²

Strepsils® (Amyl-m-cresol) have also been successfully used to treat oral inflammation and pain and more recently to reduce the incidence of POST when administered preoperatively.¹³ However, the efficacy of these two medications in the treatment of POST postoperatively is unknown, especially in patients undergoing third molar surgery. Therefore, the aim of this study was to evaluate the efficacy of honey and lemon juice with tea and Strepsils® versus no medication in relieving postoperative sore throat.

Materials and methods

Patients

This prospective, randomised, controlled study was approved by the senate research committee of the University of the Western Cape (ref no.11/8/27) and written informed consent was obtained from all patients prior to enrolment in the study. Sixty American Society of Anesthesiologists (ASA) physical status I, non-smoking patients were randomly selected from patients undergoing surgical removal of third molars under general anaesthesia. Patients with a history of throat problems, associated third molar pathology, and those who were using homeopathic or alternative medication were excluded from the study.

Patients were randomly divided into three groups after completion of the procedure. Group 1 formed the control group and did not receive any palliative medication. Group 2 were administered 200 ml tea with honey and lemon juice (5 ml of honey and 5 ml of lemon juice added to unsweetened English tea). Group 3 were administered honey and lemon-flavoured Strepisils® (Boots, Nottingham, UK) containing 2,4-dichlorobenzyl alcohol 1.2 mg, amylmetacresol 0.6 mg, sucrose, glucose syrup, honey, tartaric acid, peppermint oil, terpeneless lemon oil, and quinolone yellow.

Dosages of tea with honey and lemon juice were measured and standardized at 200 ml for all patients. The medications for all patients in groups 2 and 3 were administered at the following time intervals: Interval 1: 30 minutes after surgery before taking analgesics (Ramsay Sedation Score of 2 i.e. patient was cooperative, oriented and tranquil); Interval 2: before going to sleep on the first night before taking any analgesics; and Interval 3: the following morning before taking any analgesics. Patients were instructed to drink the total 200 ml of tea at each interval.

Method of Anaesthesia

Surgery was performed under standardised general anaesthesia protocol. Patients had an intravenous catheter inserted. At induction they received Propofol 2 mg/kg and Fentanyl 3-5 mcg/kg. Rocuronium bromide (Esmeron®) 0.6 mg/kg was administered as a non-depolarising neuromuscular blocker. This was followed by atraumatic placement of a north facing cuffed nasotracheal tube and placement of moist throat pack

with McGill's forceps using a laryngoscope under direct vision by the anaesthetist. A standard surgical procedure, for the removal of impacted third molars was followed. During the procedure, head movement was kept to a minimum. No local anaesthesia was administered as to allow for postoperative pain assessment.

After the surgery, the throat pack was removed by the anaesthetist with McGill's forceps under direct vision and pharyngeal toilet was performed with soft tip sucker (Yankur).

All patients received the same antibiotic and analgesic regime i.e. preoperative, 1.2 g amoxicillin with clavulanic acid IV followed up with 500 mg amoxicillin 8-hours orally for 48 hours, 75 mg of diclofenac IM was administered at the start of surgery, 1 gram paracetamol orally 6-hourly for five days, 400 mg Ibuprofen orally 8-hourly for five days and 15ml, 0.2% chlorhexidine gluconate mouth rinse after meals.

Demographic data, duration of anaesthesia (time from intubation to extubation), complications with surgery, difficulty with intubation and the presence of clinical throat injuries were recorded. The Cormack-Lehane classification¹⁴ used to describe laryngeal view during direct laryngoscopy was applied and only Cormack-Lehane grade 1-2 cases were included in the study.

Parameters Measured

For all three groups POST was evaluated immediately after surgery (prior to giving any medication); after administering the first dosage of medication for groups 2 and 3 (approximately 30 minutes); and 24 hours after surgery. POST was evaluated using a four-point grading scale as suggested by Harding and McVey¹⁵ for Sore Throat: 0 – no sore throat at any time since your operation; 1 – minimal sore throat, less severe than a cold; 2 – moderate sore throat, similar to that noted with a cold; 3 – severe sore throat, more severe than noted with a cold.

Statistical Analysis

The data are presented as means and percentages and was analysed using SPSS package (14.0, SPSS Inc., Chicago, IL, USA). Comparison of the POST score at different time intervals for each group was performed using the student's t-test. The scores of groups 2 and 3 were compared with the control group using the Fisher exact test. Findings were considered statistically significant when $P < 0.05$.

Results

Each group consisted of 20 patients of similar age range and duration of anaesthesia (Table 1). None of the patients complained of any discomfort after being administered either, honey and lemon in tea, or Strepsils®.

The score of POST immediately after surgery and prior to administering any medication was comparable in all three groups (Figure 1). However, the score of POST after administration of the first dose of medication differed among the three groups. The score of POST for group 1 (control group) was unchanged ($P > 0.05$). For group 2 the POST score was significantly lower after administration of the first dose ($P < 0.01$). For group 3, the POST score was also significantly lower after administration of the first dosage ($P < 0.001$) compared to the baseline POST score.

The severity of POST significantly decreased 24 hours after surgery for all three groups ($P < 0.05$). A comparison of POST scores between the control group and the honey and lemon in tea group showed no statistically significant differences ($P > 0.05$). However, when the Strepsils® group was compared to the control group, a statistically significant ($P < 0.02$) difference was found between the POST scores, hence indicating the high efficacy of Strepsils® in relieving postoperative throat symptoms.

Discussion

Postoperative sore throat is a minor but common postoperative complaint with an estimated incidence of 14.4% to 61%.¹⁻³ Routine endotracheal intubation for elective surgical procedures, such as third molar surgery, can result in pathological changes to the surrounding tissues, trauma and nerve damage which may also account for postoperative throat symptoms.¹⁶

In this study, the overall incidence of POST in the immediate postoperative period was very high at 93.3%. This complication was shown to be reduced significantly with the administration of honey and lemon in tea and Strepsils® immediately after surgery. Likewise, a 24-hour

follow-up of patients confirmed the effectiveness of honey and lemon in tea and Strepsils® lozenges in relieving POST in patients undergoing third molar surgery.

In this study, patient characteristics and duration of anaesthesia were comparable among the three groups. We excluded patients who underwent anaesthesia of long duration as well as those with difficult intubation and any other surgical complications. A standardized anaesthetic protocol was also followed. Consequently, it is safe to conclude that the observed reduction in the POST scores among the three groups can be attributed to the use of Strepsils® and honey and lemon in tea, respectively.

There has recently been a revival in the use of honey as a medicine. Zumla and Lulat¹⁷ referred to honey as 'a remedy rediscovered', and stated the view that the therapeutic potential of honey is largely underexploited. It is readily available in most communities and although the exact healing mechanism of honey is not well understood, its medicinal properties need to be further explored. To the best of our knowledge, this is one of the first studies to report on the use of honey to treat postoperative throat complications after endotracheal intubation.

A major cause of discomfort and pain in wounds is the inflammation of surrounding tissue due to tissue damage. The mechanical irritation of the pharyngeal and tracheal mucosa occurs during laryngoscopy, throat pack placement, the endotracheal tube cuff and during the process of intubation and extubation.¹⁸⁻²⁰ Other factors contributing to POST include large tracheal tube size, cuff design, increased intra-cuff pressure, use of succinylcholine and prolonged laryngoscopy.^{16, 21-23} Conway et al.³ and Hartsell and Stephen²⁴ found that the incidence of sore throat doubled when a nasogastric tube was used.

The placement of protective throat packs following endotracheal intubation is commonly used in oral surgery and otolaryngology. Their function is to prevent aspiration, pharyngeal and tracheal contamination and the passage of blood into the stomach.

Table 1: Characteristics of patients in the three groups

	Control	Honey and lemon in tea	Strepsils®
Mean age (years)	22.70	22.65	24.45
Male: female	10:10	5:15	8:12
Mean duration of anaesthesia (minutes)	39.75	39.50	44.00

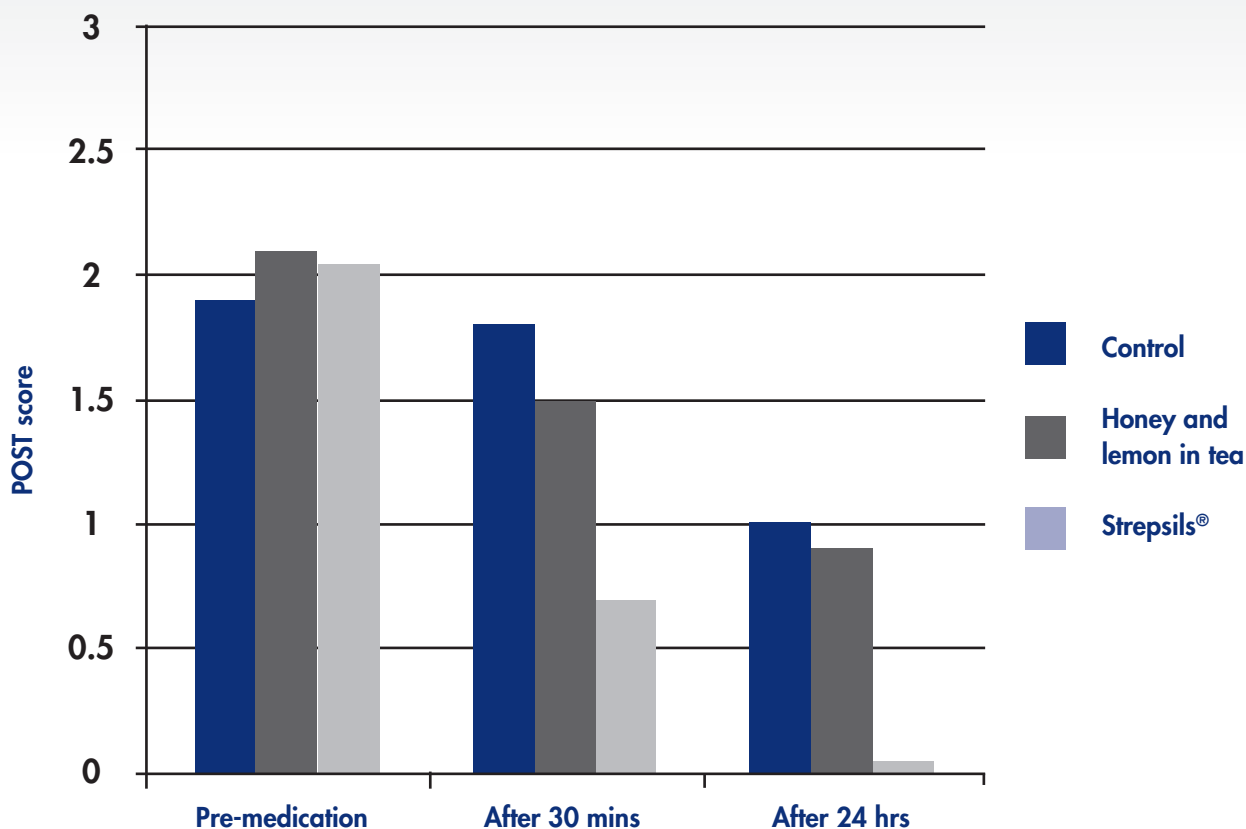


Figure 1: POST scores prior to administering any medication, 30 minutes after surgery and 24 hours after surgery for all three groups.

Various materials have been used as a throat pack including ribbon gauze, tampons, bandage roll, Raytex® swabs, tapered sponge and pharyngeal foam packs made from polyurethane. Throat packs inadvertently induce POST due to mechanical irritation of tracheal and pharyngeal tissues.¹⁸⁻²⁰ A study by Parker²⁵ compared dry tampons to ribbon gauze soaked in sterile saline in relation to the severity and incidence of POST. The study showed that there was no significant difference in pain experienced in the immediate postoperative interval, but at the 24 hour postoperative interval, symptoms of POST decreased by 50% in patients in which dry tampons were used instead of saline soaked ribbon gauze.

It is hypothesised that POST is mediated by an aseptic inflammatory process caused by the removal of protective mucous from the pharyngeal and tracheal mucosal surface.¹⁸ In addition, low pressure, high volume cuffs produce grooving in the mucosa because of wrinkling of the cuff as it is inflated which is markedly reduced when inflating with a high pressure, low volume cuff.²⁶

Histologically, the inflammatory process involves leukocyte migration to the site of irritation and the

release of cytokines by inflammatory cells. It is possible that fibroblast proliferation may also be induced.²⁷ The formation of arachidonic acid produces leukotriene-B4 leading to increased levels of interleukin-2 and therefore contributing to the inflammatory process.

In a study by Peppard and Dickens²⁸, indirect laryngoscopic examination of 475 patients who had been intubated for elective operations showed that only a small proportion (6%) has traumatic lesions of the larynx and hypopharynx. The injury resulted in haematoma formation on the glottis in most of the cases.²⁸

Honey has been reported to reduce inflammation, oedema and exudation.^{29,30} This would account for the soothing effect observed when honey is applied to wounds and the associated reduction of pain.³¹ Honey and lemon juice in tea are thought to coat the pharyngeal mucosa, reducing inflammation and irritation.¹²

Strepisils® have previously been used for the treatment of oral inflammatory conditions by Gaspar et al.³² It was reported in this study that Strepisils® may be effective in the prophylaxis and treatment of oral inflammation. In

another study by Gaspar et al.³³, Strepsils® were administered to patients with oral inflammatory diseases and it was found that the healing time was shortened by 30% while pain levels were reduced by 30% in patients treated with Strepsils® compared with controls. More recently Ebneshahidi and Mohseni¹³ evaluated the efficacy of Strepsils® in reducing the incidence of POST. They were able to show that the use of Strepsils® peri-operatively reduced the incidence of POST and hoarseness of voice. Along with the findings of this study, Strepsils® is an effective anti-inflammatory agent for treating mucosal damage and relieving POST.

A possible limitation of this study may be the responsiveness of patients in the immediate postoperative period. Only patients with Ramsey sedation score of 2 i.e. patient was cooperative, oriented and tranquil were included to ensure that accurate POST scores were recorded. Another possible limitation is that patient satisfaction was not evaluated, which could be a significant indicator of the efficacy of our intervention.

Studies have shown various ways to decrease the incidence of POST. The use of a smaller endotracheal tube (ETT)^{4,6,16,34} without causing a compromise in the ventilation of a patient has been indicated to decrease POST.¹⁶ Studies support the use of 7 mm ETT for women and 7.5 mm ETT for men.^{4,6,16,35,36} Smaller ETT (6.5 mm for women and 7 mm for men) have also been successfully used in adults.¹⁶

In addition to the size of ETT, by limiting ETT cuff pressure the incidence of POST decreases.^{6,7,16,34,37-39} Determination and maintenance of the minimum pressure for an effective cuff seal during positive pressure ventilation is an effective way to decrease POST.¹⁶

The use of pharmacological agents has been used in various ways to decrease POST. Filling ETT cuffs with 2 or 4% lidocaine, 90 minutes prior to tracheal intubation, allows for the continuous diffusion of lidocaine to the tracheal mucosa. This has been shown to safely reduce POST.⁴⁰⁻⁴²

Bagchi et al.⁴³ showed that by administering a bolus of dexamethasone 0.2 mg/kg IV (diluted to total volume of 4 ml with normal saline) just before induction, decreased the incidence and severity of POST by around 30%.⁴³

Benzydamine hydrochloride is a topical, non-steroidal, anti-inflammatory agent with analgesic, antipyretic, and antimicrobial properties. When sprayed onto the ETT cuff, a significant reduction in the incidence and severity of POST for up to 24 hours occurred.¹⁹

Rashwan et al.⁴⁴ deduced that preoperative gargling with Tramadol (2mg/kg in 30ml apple juice for 1min) reduced

the incidence and severity of POST compared to placebo group (30ml apple juice only for 1min).⁴⁴ In a study by Elkahim et al.⁴⁵, patients were randomly assigned to have either a 0.2% tenoxicam or a 0.9% saline-impregnated gauze pack in the oropharynx after the endotracheal tube was placed.⁴⁵ The study concluded that the incidence and severity of POST was reduced by the use of a gauze pack moisturised in a 0.2% tenoxicam solution compared to saline-impregnated gauze packs in patients during general anaesthesia with endotracheal intubation.⁴⁵

Conclusions

We demonstrated in this study that the postoperative use of honey and lemon in tea and Strepsils® lozenges may aid in eliminating sore throat after third molar surgery. Strepsils® reduced sore throat scores significantly more when compared to the control group. Based on the findings of this study, it is recommended that patients undergoing third molar surgery be administered Strepsils® or honey and lemon in tea immediately postoperatively and for a period of up to 24 hours postoperatively to relieve postoperative throat complications and improve patient satisfaction.

References

1. Christensen AM, Willemoes-Larsen H, Lundby L, Jakobsen KB. Postoperative throat complaints after tracheal intubation. *Br J Anaesth* 1994; 73: 786-787.
2. Stride PC. Postoperative sore throat: topical hydrocortisone. *Anaesthesia* 1990; 45: 968-971.
3. Conway CM, Millar JS, Sugden, FL. Sore throat after anaesthesia. *Br J Anaesth* 1960; 32: 219-223.
4. Biro P, Seifert B, Pasch T. Complaints of sore throat after tracheal intubation: a prospective evaluation. *Eur J Anaesthesiol* 2005; 22: 307-311.
5. Macario A, Weinger M, Carney S, Kim A. Which clinical anesthesia outcomes are important to avoid? The perspective of patients. *Anesth Analg* 1999; 89: 652-658.
6. Agarwal A, Nath SS, Goswami D, et al. An Evaluation of the Efficacy of Aspirin and Benzydamine Hydrochloride Gargle for Attenuating Postoperative Sore Throat: A Prospective, Randomized, Single-Blind Study. *Anesthesia and Analgesia*. 2006; 103: 1001-1003.
7. Maruyama K, Yamada T, Hara K. Effect of clonidine premedication on postoperative sore throat and hoarseness after total intravenous anesthesia. *J Anesth* 2006; 20: 327-330.
8. Kazemi A, Amini A. The effect of betamethasone gel in reducing sore throat, cough, and hoarseness after laryngotracheal intubation. *Middle East J Anesthesiol* 2007; 19: 197-204.
9. Turnbull RS. Benzydamine hydrochloride (Tantum) in the management of oral inflammatory conditions. *J Can Dent Assoc* 1995; 61: 127-134.
10. Kyokong O, Charuluxananan S, Muangmingsuk V, Rodanant O,

Subornsug K, Punyasang W. Efficacy of chamomile-extract spray for prevention of post-operative sore throat. *J Med Assoc Thai* 2002; 85: 180-185.

11. Bansal V, Medhi B, Pandhi P. Honey—a remedy rediscovered and its therapeutic utility. *Kathmandu Univ Med J* 2005; 3: 305-309.

12. Marshal S. Over the counter advice for cough. *Pharm J* 2007; 278: 85-89.

13. Ebneshahidi A, Mohseni M. Strepisils® tablets reduce sore throat and hoarseness after tracheal intubation. *Anesth Analg* 2010; 111: 892-894.

14. Cormack RS, Lehane J. Difficult tracheal intubation in obstetrics. *Anaesthesia* 1984;39:1105-11.

15. Harding CJ, McVey C. Interview method affects incidence postoperative sore throat. *Anaesthesia* 1987; 42:1104-7.

16. McHardy FE, Chung F. Postoperative sore throat: cause, prevention and treatment. *Anaesthesia* 1999; 54: 444-453.

17. Zumla A, Lulat A. Honey a remedy rediscovered. *J R Soc Med* 1989; 82: 384-385.

18. Park SH, Hang SH, Do SH, Kim JW, Rhee KY, Kim JH. Prophylactic dexamethasone decreases the incidence of sore throat and hoarseness after tracheal extubation with a double lumen endotracheal tube. *Anesth Analg*. 2008; 107: 1814-1818.

19. Huang YS, Hung NK, Lee MS, Kuo CP, Yu JC, Huang GS, et al. The effectiveness of benzydamine hydrochloride spraying on the endotracheal tube cuff or oral mucosa for postoperative sore throat. *Anesth Analg*. 2010; 111: 887-91.

20. Rudra A, Ray S, Chatterjee S, Ahmed A, Ghosh S. Gargling with ketamine attenuates the postoperative sore throat. *Indian J Anaesth*. 2009; 53: 40-43.

21. Jensen PJ, Hommelgaard P, Sondergaard P, Eriksen S. Sore throat after operation: influence of tracheal intubation, intracuff pressure and type of cuff. *Br J Anaesth* 1982; 54: 453-457.

22. Combes X, Schaulvliege F, Peyrouset O, et al. Intracuff pressure and tracheal morbidity: influence of filling with saline during nitrous oxide anesthesia. *Anesthesiology* 2001; 95: 1120-1124.

23. Higgins PP, Chung F, Mezei G. Postoperative sore throat after ambulatory surgery. *Br J Anaesth* 2002; 88: 582-584.

24. Hartsell CJ, Stephen CR. Incidence of sore throat following endotracheal intubation. *Can Anaesth Soc J* 1964; 11: 307-312.

25. Parker E. Efficacy of two different types of throat packs. A mini-thesis submitted in partial fulfilment of the requirements for the degree of Magister Chirurgiae Dentium in the Department of Maxillo-facial and Oral Surgery at the University of the Western Cape, May 2009.

26. Loeser EA, Bennet GM, Orr DL, Stanley TH. Reduction of postoperative sore throat with new endotracheal tube cuffs. *Anesthesiology* 1980; 52: 257.

27. Scuder PE. Postoperative sore throat: More answers than questions. *Anesth Analg*. 2010; 111: 831-832.

28. Peppard SB, Dickens JH. Laryngeal injury following short term intubation. *Otol Rhinol Laryngol* 1983; 92: 327-330.

29. Subrahmanyam M. A prospective randomised clinical and histological study of superficial burn wound healing with honey and

silver sulfadiazine. *Burns* 1998; 24: 157-161.

30. Efem SE. Clinical observations on the wound healing properties of honey. *BJS* 1988; 75: 679-681.

31. Subrahmanyam M. Honey Impregnated gauze versus polyurethane film (OpSite(r)) In the treatment of burns - a prospective randomised study. *Br J Plast Surg* 1993; 46: 322-323.

32. Gaspar L, Turi J, Toth BZ, Suri C, Vago P. The use of benzyl alcohol and amyl-m-cresol (Strepisils) in the oral cavity: review of the literature and first clinical experiences. *Fogorv Sz* 1998; 91: 143-150.

33. Gaspar L, Szmrttyka A, Turi J, et al. Clinical experience with the use of benzylalcohol and amyl-m-cresol (Strepisils) in stomatological diseases. *Fogorv Sz* 2000; 93: 83-90.

34. Edomwonyi NP, Ekwere IT, Omo E, Rupasinghe A. Postoperative throat complication after tracheal intubation. *Annals of African Medicine*. 2006; 5: 28-32.

35. Brandt L. The history of endotracheal anesthesia, with special regard to the development of the endotracheal tube. *Der Anaesthesist*. 1986; 35: 523-530.

36. Brimacombe J. The advantages of the LMA over the tracheal tube or facemask: a meta-analysis. *Canadian J Anaesthesia*. 1995; 42: 1017-1023.

37. Oczenski W, Krenn H, Dahaba AA, et al. Complications following the use of the Combitube, tracheal tube and laryngeal mask airway. *Anesthesia*. 1999; 54: 1161-1165.

38. Radu AD, Miled F, Marret E, et al. Pharyngo-laryngeal discomfort after breast surgery: comparison between orotracheal intubation and laryngeal mask. *The Breast*. 2008; 17: 407-411.

39. Mizutamari E, Yano T, Ushijima K, et al. A comparison of postoperative sore throat after use of laryngeal mask airway and tracheal tube. *J Anesthesia*. 2004; 18: 151-157.

40. Navarro RM, Baughman VL. Lidocaine in the endotracheal tube cuff reduces postoperative sore throat. *J. Clinical Anesthesia*. 1997; 9: 394-397.

41. Tanaka Y, Nakayama T, Nishimori M, et al. Lidocaine for preventing postoperative sore throat (Review). *The Cochrane Collaboration*. 2009; 1-40

42. Hung NK, Wu CT, Chan SM, et al. Effect on postoperative sore throat of spraying the endotracheal tube cuff with benzydamine hydrochloride, 10% lidocaine, and 2% lidocaine. *Anesthesia and Analgesia*. 2010; 111: 882-886.

43. Bagchi D, Mandal MC, Das S, Sahoo T, Basu SR, and Sarka S. Efficacy of intravenous dexamethasone to reduce incidence of postoperative sore throat: A prospective randomized controlled trial. *J Anaesthesiol Clin Pharmacol* 2012 Oct-Dec; 28(4): 477-480.

44. Rashwan S, Abdelmawgoud A, Badawy A. Effect of tramadol gargle on postoperative sorethroat: A double blinded randomized placebo controlled study. *Egyptian J Anaes*. 2014. Article in Press. <http://dx.doi.org/10.1016/j.egja.2014.01.010>

45. Elhakim M, Siam A, Rashed I, Hamdy MH. Topical tenoxicam from pharyngeal pack reduces postoperative sore throat. *Acta Anaesthesiol Scand* 2000; 44: 733-736.