ORIGINAL ARTICLE ASIAN JOURNAL OF MEDICAL SCIENCES

Prophylactic zinc versus placebo lozenges in preventing post-operative sore throat following intubation using king vision video laryngoscope: A comparative study

Anas Parappurath[1], Arpana Kedlaya[2], Anjali T M Ollapally[3]

[1]Senior Resident, [2]Associate Professor, [3]Assistant Professor, Department of Anesthesiology, St. John's Medical College Hospital, Bengaluru, Karnataka, India

Submission: 24-06-2024 Revision: 23-08-2024 Publication: 01-10-2024

ABSTRACT

Background: Post-operative sore throat (POST) can be a cause of great discomfort after endotracheal intubation with an incidence of up to 65%. While there are studies demonstrating the efficacy of prophylactic zinc lozenges in decreasing POST in patients intubated using MacIntosh laryngoscope, similar studies with King Vision video laryngoscope (KVVL) are lacking. Hence, we conducted this study to assess whether similar beneficial effects can be seen in South Indian patients. **Aims and Objectives:** The primary objective was to evaluate the efficacy of prophylactic zinc lozenges for the prevention of POST in patients intubated using channeled KVVL. The Secondary objectives were to assess the severity of POST, the duration of laryngoscopy, and the number of intubation attempts and their effect on POST. **Materials and Methods:** In this prospective comparative trial, 94 American Society of Anesthesiologists physical status one and two patients, randomized into two groups received either 40 mg of a zinc lozenge or a placebo, 30 min before endotracheal intubation POST was evaluated after surgery at 0, 2, 4, 6, and 24 h. **Results:** The overall incidence of POST in the zinc group was 13.18% and in the placebo group was 26.37% resulting in an almost 50% reduction in the overall incidence of POST. **Conclusion:** The administration of zinc lozenge 30 min preoperatively is effective to reduce the incidence of POST in the immediate and early post-operative period.

Key words: Endotracheal intubation; King Vision video laryngoscope; Post-operative sore throat; Zinc lozenges

Access this article online

Website: http://nepjol.info/index.php/AJMS

DOI: 10.3126/ajms.v15i10.67226

E-ISSN: 2091-0576

P-ISSN: 2467-9100

INTRODUCTION

Patient satisfaction is an important facet of perioperative care. With improvements in anesthesia techniques, critical incidents have been minimized. Thus, more emphasis is placed on addressing seemingly minor but potentially distressing anesthetic problems like post-operative sore throat (POST). POST is a frequent, undesirable, unpleasant, stressful sequel of tracheal intubation that contributes to post-operative morbidity following general anesthesia.[1]

POST and pain can significantly change patient satisfaction scores with a reported incidence of up to 65%.[2] In a study of minor adverse events after anesthesia, in which more than 12,000 patients were interviewed, POST was found to be the second most prevalent complaint after nausea and vomiting.[3]

Numerous pharmacological and non-pharmacological treatments have been explored, with varying levels of effectiveness Micronutrient zinc has antioxidant and anti-inflammatory qualities that support tissue repair, growth, and immune system modulation.[4] Zinc has been applied topically to individuals undergoing high-dose chemotherapy to prevent oral mucositis.[5] We believe these tissue-healing properties of zinc may mitigate POST as well.

Address for Correspondence:
Dr. Anjali T M Ollapally, Assistant Professor, Department of Anesthesiology, St John's Medical College Hospital, Bengaluru, Karnataka, India. **Mobile:** +91-080-2206-5502. **E-mail:** dr.anjaliollapally@gmail.com

POST could have multifactorial etiology such as pharyngeal, laryngeal, or tracheal mucosal damage or other instrumental factors such as an inappropriately large endotracheal tube, cuff shape, cuff pressure, and airway securement.

Therefore, reducing physical stimulation, such as selecting a device that considers both intubation and extubation techniques, can aid in mitigating the risk of developing a sore throat. The King Vision video laryngoscope (KVVL) was utilized in this study as it has been demonstrated that this device secures the airway more quickly, reducing trauma.[6]

At the time of designing this study, there was no existing literature on the local effects of zinc on (POST) in the Indian population undergoing intubation with the KVVL.

Aims and objectives

Primary objective: To evaluate the efficacy of prophylactic zinc lozenges for the prevention of POST in patients intubated using channeled KVVL.

Secondary objective: To assess the severity of POST, the duration of laryngoscopy and the number of intubation attempts and their effect on POST.

MATERIALS AND METHODS

Study setting

This prospective, randomized, double-blinded placebo-controlled trial was done on patients posted for elective surgery under general anesthesia at a private tertiary care teaching hospital, Bengaluru. Ninety-four consenting adults belonging to either sex with American Society of Anesthesiologists physical status (ASA PS) Grade 1 or 2 aged 18–59 years, undergoing elective surgeries with endotracheal intubation lasting for 1–6 h duration were included in the study. Patients with a nasogastric tube *in situ*, patients requiring throat pack intraoperatively, anticipated difficult airway, patients with a history of pre-operative sore throat within 2 weeks before surgery, immune deficiencies, chronic smokers, taking tetracyclines, or quinolones antibiotics or with allergic reactions to zinc, patient undergoing head-and-neck surgery and pregnant patients were excluded from the study.

After obtaining permission from the Institutional Ethical Committee, and registration with CTRI (REF/2021/02/040607 N), patients above the age of 18 years admitted to the hospital who meet the inclusion criteria were included in the study and written informed consent to participate in the study was taken.

With the use of computer-generated tables, patients were randomized to either of the two groups. Group A (n=47) received 40 mg zinc lozenges orally and Group B (n=47) patients received placebo lozenges 30 min before elective intubation. In addition, allocation bias was eliminated using sealed envelopes containing the lozenges which were indistinguishable in appearance, flavor, and taste from one another. Both contained Vitamin C 200 mg and *Echinacea purpurea* 20 mg (plant-based sweetening agent) in addition, zinc lozenges contained 40 mg of zinc.

The patients were kept nil per oral for 6 h for solids and 2 h for water, before surgery. They were instructed to dissolve the tablet in the mouth by sucking the lozenges 30 min before the scheduled surgery. Patients were then transferred to the operating room where standard American Society of Anesthesiologists' monitors were attached including electrocardiography, non-invasive blood pressure, and SpO_2. Intravenous access was secured.

Patients were pre-oxygenated and general anesthesia induction as per standard institutional protocol with endotracheal intubation was done by a consultant anesthesiologist who had performed more than 25 intubations using KVVL. The size of the endotracheal was standardized to a 7.0 mm tube in female and 8.0 mm in male patients. Channeled KVVL was prepared using 10% lignocaine spray, once on the channel and once on the cuff of the appropriate endotracheal tube.

The duration of laryngoscopy (defined as the interval between the insertion of the video laryngoscope into the mouth to the passing endotracheal tube into the glottis), number of attempts, Percentage of glottis opening score (POGO), and presence of orotracheal bleeding at the end of laryngoscopy were recorded. The position of the patient and the exact duration of surgery and anesthesia were recorded. Anesthesia was maintained using oxygen, air, and isoflurane at the discretion of the anesthesia team. The cuff pressure of the endotracheal tube was adjusted every 30 min using a handheld pressure gauge and was maintained between 20 and 22 cm of H_2O. The patient also received 0.1 mg/kg of dexamethasone intraoperatively and diclofenac 75 mg as an intravenous infusion over 20 min. Intraoperative use of anti-hypertensive agents and opioids was recorded.

During emergence, the degree and duration of coughing or bucking on the endotracheal tube was recorded and the presence of blood in the oropharynx was confirmed by visual inspection and such cases were excluded from the study. At the conclusion of the surgery, the oropharynx was suctioned once with minimal suction pressure and the patient's trachea was extubated. The patient was then transferred to the post-anesthesia care unit. On arrival in

the post-anesthesia care unit, the patient was immediately evaluated for the presence of a sore throat (time 0 h) using a standardized scale.

A 4-point scale with a range of 0–3 was used to rate the POST severity.[7]

- 0 – No sore throat
- 1 – Mild sore throat (complains only with questioning)
- 2 – Moderate sore throat (complains on their own)
- 3 – Severe sore throat (change in voice, hoarseness, and throat pain).

Evaluations were done at 0 min, 2 h, 4 h, 6, and 24 h. The primary outcome was the incidence of POST at 4 h based on the assumption that the onset of anti-inflammatory action of zinc lozenge maybe 30 min to 4–6 h based on available literature.[8] If a patient got discharged before the 24-h time point, the investigators would telephonically call the patient at home for evaluation. Each examination included an assessment of side effects including gastrointestinal discomfort, metallic taste, nausea, vomiting, and diarrhea.

The reported incidence of POST after 4 h of procedure in the placebo group and zinc lozenge group is 29% and 7%, respectively, in previous studies.[7] Hence to study the effectiveness of zinc lozenge in reducing the incidence of POST compared to the control with 80% power of the study and 5% level of significance; the required sample size was calculated with mean ± SD. The required total sample size was 94 patients with 47 subjects in each group. The sample size was calculated using n Master 2.0 software.

Statistical analysis

Data were entered into the Microsoft Excel data sheet and analyzed using Statistical Package for Social Sciences 22 version software. Categorical data were represented in the form of frequencies and proportions. The Chi-square test or Fischer's exact test (for 2×2 tables only) was used as a test of significance for qualitative data. Continuous data were represented as mean and standard deviation. Independent t-test or Mann–Whitney U test was used as a test of significance to identify the mean difference between two quantitative variables and qualitative variables, respectively. Graphical representation was done using a bar diagram and a column diagram. $P<0.05$ was considered statistically significant.

RESULTS

There was no statistical difference between the two groups in terms of demographic data, comorbidities, and ASA PS as illustrated in Table 1. Both the groups were comparable in terms of duration of laryngoscopy, attempts at intubation, POGO scoring, and presence of bleeding at the end of surgery as seen in Table 2.

The overall incidence of POST in the zinc group was 13.18% and in the placebo group was 26.37% resulting in an almost 50% reduction in the overall incidence of POST. For this analysis, Bonferroni correlation was used to account for multiple measurements within the groups. The incidence of POST between the two groups at 0, 2, 4, 6, and 24 h can be seen in Table 3 statistically significant difference was found between the two groups at 0 min ($P=0.049$), 2 h ($P=0.021$), and 4 h ($P=0.04$) (Figure 1).

An outcome of clinical significance was that 97.87% of patients in zinc group did not complain of POST as compared to 87.32% in placebo group in the immediate post-operative period. This trend of reduced POST continued at 2 h and 4 h postoperatively.

None of the patients suffered from grade 3 severity of POST in both the study groups, however, three patients in placebo group complained of grade 2 POST at 2 h post-intubation whereas none in zinc group experienced grade 2 POST.

In terms of the side effects, no difference in the incidence if post-operative nausea, vomiting, or diarrhea between the groups was observed.

DISCUSSION

POST is a frequent problem following endotracheal intubation under general anesthesia. It is shown to delay post-anesthesia recovery and decrease patient satisfaction. In addition, POST can increase the risk of aspiration pneumonia.[9] There are individual differences in the severity of POST as expressed by patients. The variation in pain threshold and the perception of pain differs from individual to individual, influenced by both inherent factors and mental states like anxiety. In addition, the damage to the airway mucosa caused by the strong stimulation by the laryngoscope and the movement of the endotracheal tube excites the C fibers related to secondary pain, and the subsequent release of neurotransmitters, leading to POST.

To address this, we believe that minimizing instrumentation factors is important to reduce the physical irritation of laryngoscopy. We used the KVVL in this study as its curved blade enables ease of intubation without the need to align the oropharyngeal and tracheal axis. It is proven to take a shorter time to secure the airway when compared to a conventional laryngoscope, thus reducing airway-related trauma.[9,10] It is rational to attribute the lower incidence of

Table 1: Demographic data of both study groups

Demographic data	Group				P-value
	Zinc		Placebo		
	Count	%	Count	%	
Comorbidities					
NIL	37	78.72	40	85.11	0.598
DM	4	8.51	3	6.38	
HTN	1	2.13	2	4.26	
Hypothyroid	0	0.00	0	0.00	
Other	0	0.00	0	0.00	
DM and HTN	5	10.64	2	4.26	
Gender					
Male	25	53.19	24	51.06	0.836
Female	22	46.81	23	48.94	
American Society of Anesthesiologists					
1	38	80.85	38	80.85	1
2	9	19.15	9	19.15	
Age, mean±SD	39.55±13.61		38.13±12.21		0.594

SD: Standard deviation, DM: Diabetes mellitus, HTN: Hypertension

Table 2: Secondary outcome measure across both groups

Outcome variable	Group				P-value
	Zinc		Placebo		
	Count	%	Count	%	
#Attempts of intubation					
1	47	100.00	46	97.87	0.315
2	0	0.00	1	2.13	
POGO score					
1	0	0.00	3	6.38	0.078
2	47	100.00	44	93.62	
Presence of bleeding at the end of surgery					
No	46	97.87	47	100.00	0.315
Yes	1	2.13	0	0.00	
Duration of laryngoscopy, mean±SD	32.23±8.77		34.89±7.9		0.126

POGO: Percentage of glottis opening, SD: Standard deviation

Table 3: Post-operative sore throat score distribution between two groups

Incidence of POST in both groups at different evaluation times			
Evaluation time (h)	Zinc group (n=47), n (%)	Placebo (n=47), n (%)	P-value
0	1 (2.12)	6 (12.76)	0.049*
2	5 (10.63)	14 (29.78)	0.021*
4	9 (19.14)	18 (38.29)	0.040*
6	11 (23.40)	16 (34.04)	0.250
24	5 (10.63)	8 (17.02)	0.370

POST: Post-operative sore throat, *p <0.05 was considered statistically significant

POST (28.72%) and the absence of severe (grade 3) sore throat postoperatively in both groups to less tissue trauma caused by the use of KVVL.

Treatment with anti-inflammatory agents such as NSAIDS and steroids is known to reduce the symptoms of POST in the absence of a clearly established single mechanism for POST magnesium lozenges are a commonly used anti-inflammatory agent for POST[3] but there are very few studies that use zinc lozenges for the same purpose. In our study, we used 40 mg of zinc lozenges similar to the previous studies[7,10] as a higher dosage may precipitate certain side effects such as nausea, vomiting, headache, abdominal pain, and diarrhea. A dose range of 30–150 mg/day has been used in some previous studies, but unfortunately, there are no studies looking at the pharmacokinetics and duration of action though it is commonly recommended to be used 4 h in upper respiratory infection treatment and oncology patients.[11]

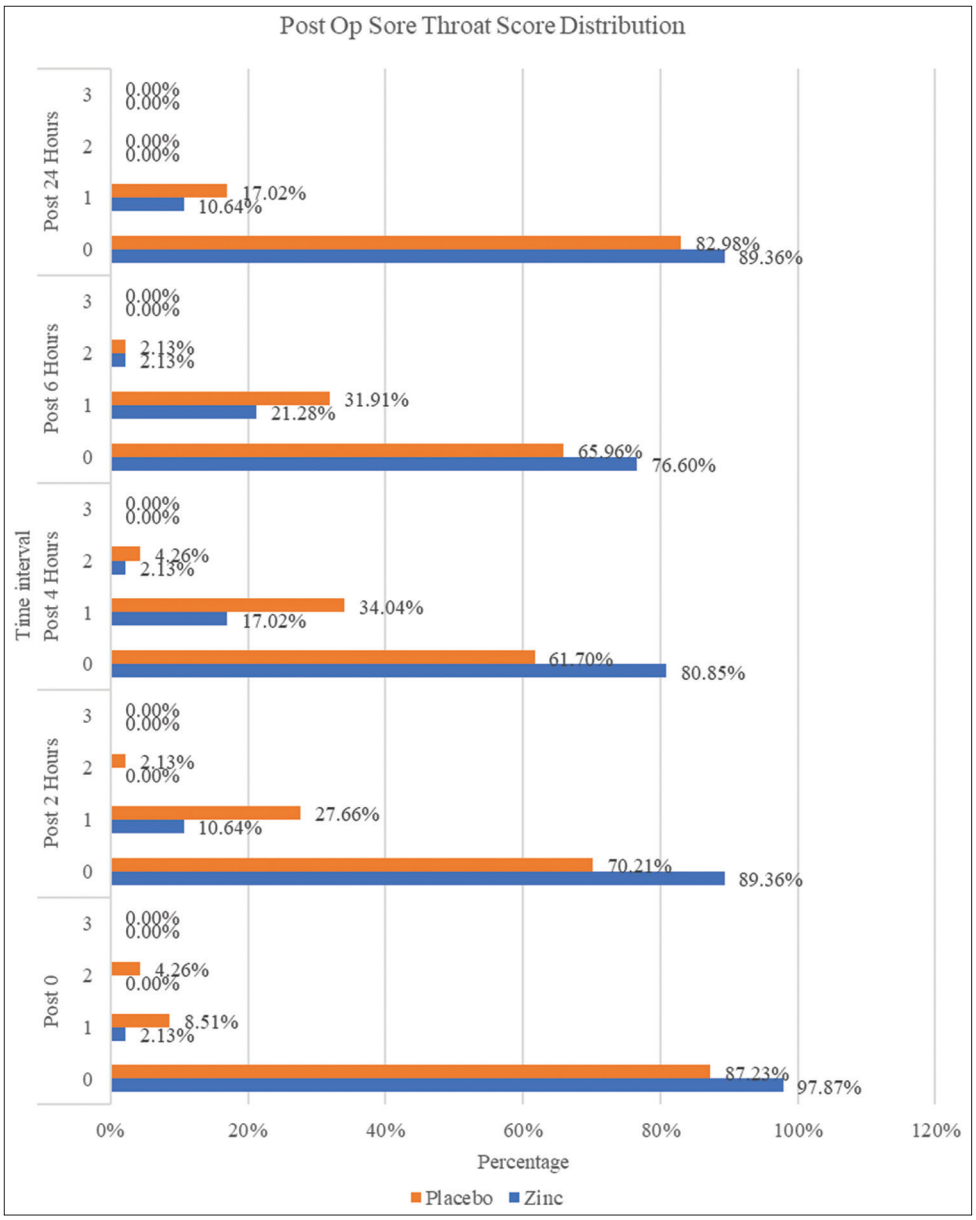

Figure 1: Column diagram showing post-operative sore throat score distribution between two groups

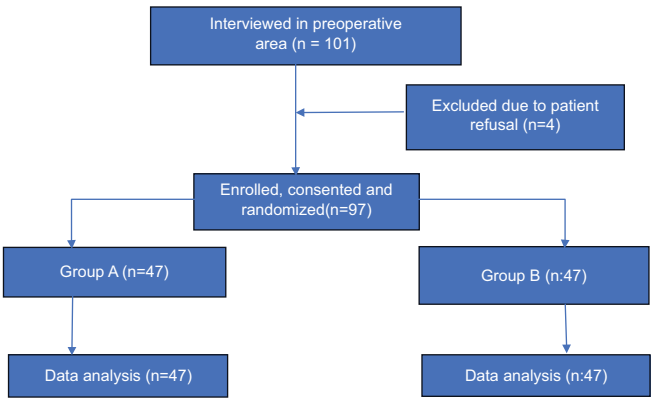

Figure 2: Consort diagram

The significant difference in POST in the study group was most likely because zinc prevents the release of cytokines and reactive oxygen species, which in turn reduces the expression of COX-2 and the release of prostaglandin-E2.

Our results were similar to the observations in the study done by Farhang and Grondin[7,10] which further validates the potential use of zinc in the prevention of POST.

The most significant difference in POST incidence between the two groups was seen at 2 h postoperatively which is the expected duration of onset of anti-inflammatory actions of zinc, The total surgical duration of most procedures in our

study was approximately 2 h. Thus maximum relief seen 2 h postoperatively correctly correlates with the expected onset of action of zinc lozenges. The use of zinc lozenges compared to placebo was not associated with any significant adverse events.

Limitations of the study

As documented in the literature, female patients undergoing gynecological procedures or ophthalmic procedures are more prone to POST. However, the exact etiology is not known. This set of patients were not excluded from our study. The pharmacokinetic data for zinc lozenges are very limited, hence further research is needed to recommend the exact administration time and dosage with any certainty.

CONCLUSION

A single dose of 40 mg oral zinc lozenges administered 30 min before endotracheal intubation can significantly and effectively reduce the incidence of POST at 0, 2, and 4 h with maximum benefit seen at 2 h after endotracheal intubation. The overall incidence of POST in our study was significantly less even in the placebo group. This could be attributed to the use of KVVL which shortened the time needed to secure the airway and lessened the tissue trauma.

ACKNOWLEDGMENT

We would like to acknowledge the HOD of the Anaesthesiology department for her support.

REFERENCES

1. Jaensson M, Olowsson LL and Nilsson U. Endotracheal tube size and sore throat following surgery: A randomized-controlled study. Acta Anaesthesiol Scand. 2010;54(2):147-153.
   https://doi.org/10.1111/j.1399-6576.2009.02166.x
2. Christensen AM, Willemoes-Larsen H, Lundby L and Jakobsen KB. Postoperative throat complaints after tracheal intubation. Br J Anaesth. 1994;73(6):786-787.
   https://doi.org/10.1093/bja/73.6.786
3. Borazan H, Kececioglu A, Okesli S and Otelcioglu S. Oral magnesium lozenge reduces postoperative sore throat: A randomized, prospective, placebo-controlled study. Anesthesiology. 2012;117(3):512-518.
   https://doi.org/10.1097/ALN.0b013e3182639d5f
4. Truong-Tran AQ, Carter J, Ruffin R and Zalewski PD. New insights into the role of zinc in the respiratory epithelium. Immunol Cell Biol. 2001;79(2):170-177.
   https://doi.org/10.1046/j.1440-1711.2001.00986.x
5. Arbabi-Kalati F, Arbabi-Kalati F, Deghatipour M and Moghaddam AA. Evaluation of the efficacy of zinc sulfate in the prevention of chemotherapy-induced mucositis: A double-blind randomized clinical trial. Arch Iran Med. 2012;15(7):413-417.
6. Ali QE, Amir SH and Ahmed S. A comparative evaluation of King Vision video laryngoscope (channelled blade), McCoy, and Macintosh laryngoscopes for tracheal intubation in patients with immobilized cervical spine. Sri Lankan J Anaesthesiol. 2017;25(2):70.
   https://doi.org/10.4038/slja.v25i2.8200
7. Farhang B and Grondin L. The effect of zinc lozenge on postoperative sore throat: A prospective randomized, double-blinded, placebo-controlled study. Anesth Analg. 2018;126(1):78-83.
   https://doi.org/10.1213/ANE.0000000000002494
8. Sarkar T and Mandal T. Preoperative oral zinc tablet decreases incidence of postoperative sore throat. Indian J Anaesth. 2020;64(5):409-414.
   https://doi.org/10.4103/ija.IJA_959_19
9. Mitobe Y, Yamaguchi Y, Baba Y, Yoshioka T, Nakagawa K, Itou T, et al. A literature review of factors related to postoperative sore throat. J Clin Med Res. 2022;14(2):88-94.
   https://doi.org/10.14740/jocmr4665
10. Sonavane SR, Gvalanil SK and Bhokare PP. Comparison between conventional macintosh laryngoscope and king vision video laryngoscope in endotracheal intubation for elective surgeries: A prospective randomized study. Res Innov Anesth. 2020;5(2):28-32.
    https://doi:10.5005/jp-journals-10049-0090
11. Hoppe C, Kutschan S, Dörfler J, Büntzel J, Büntzel J and Huebner J. Zinc as a complementary treatment for cancer patients: A systematic review. Clin Exp Med. 2021;21(2):297-313.
    https://doi.org/10.1007/s10238-020-00677-6

Authors' Contributions:
AP- Implementation of study protocol, data collection, data analysis, manuscript preparation, revision, and submission for publication; **AK and ATMO:** Concept, design of study, clinical protocol, statistical analysis and interpretation, manuscript preparation, editing, revision, and submission for publication. Statistical analysis and interpretation.

Work attributed to:
Dr. Anas P, Dr Arpana K and Dr. Anjali T M O.

Orcid ID:
Dr. Anas Parappurath - https://orcid.org/0009-0008-8321-9820
Dr. Arpana Kedlaya - https://orcid.org/0000-0001-5663-9610
Dr. Anjali T M Ollapally - https://orcid.org/0000-0002-7098-6237

Source of Support: Nil, **Conflicts of Interest:** None declared.