

**Effect of Vitamin C on Severity of Post-Operative Sore Throat Following Tracheal Intubation: A Randomised Controlled Trial**Rajmala Jaiswal<sup>1</sup>, Ishan S Kagra<sup>2</sup>, Vandna Arora<sup>3</sup><sup>1</sup>Senior Professor, Department of Anaesthesiology & Critical Care, Pt. B.D. Sharma PGIMS, Rohtak<sup>2</sup>Postgraduate Resident, Department of Anaesthesiology & Critical Care, Pt. B.D. Sharma PGIMS, Rohtak<sup>3</sup>Associate Professor, Department of Anaesthesiology & Critical Care, Pt. B.D. Sharma PGIMS, Rohtak

Received: 25-03-2024 / Revised: 23-04-2024 / Accepted: 26-05-2024

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Conflict of interest: Nil

**Abstract:**

**Background & Aim:** Post-operative sore throat is the discomfort in throat which often leads to an immense deal of uneasiness in patients. Recently micronutrient Vitamin C is being studied for its antinociceptive properties. Its role in management of acute and chronic pain has been documented in various studies. Against this background, the present study aimed to evaluate the role of vitamin C on severity of postoperative sore throat following endotracheal intubation in patients receiving general anaesthesia.

**Methodology:** The present study was a prospective, randomized, double blind, placebo-controlled study conducted after approval from Institutional Ethical Committee. After obtaining informed written consent, 100 adult patients with Mallampati class 1 & 2 undergoing elective surgical procedures under general anaesthesia requiring endotracheal intubation, with successful intubation in single attempt were included in this study. Patients were randomly allocated to 2 groups: Group 1 (n=50) received injection vitamin C 2gm in 500 ml of NS; Group 2 (n=50) patients received 500 ml of NS intraoperatively. Severity of sore throat, VAS, analgesic consumption and side effects were recorded at 0, 6, 12 and 24 hours postoperatively.

**Results:** Demographic parameters were comparable between the two groups. POST severity score was significantly lower in group 1 as compared to group 2 at 0, 6 and 12 hours postoperatively. Similarly, VAS scores were significantly lower in group 1 as compared to group 2 at 0, 6 and 12 hours postoperatively. Total amount of analgesia consumption was significantly higher in group 2 as compared to group 1 (p=0.03). No side effects were recorded related to vitamin C during our observation period in any patient.

**Conclusion:** Vitamin C plays a significant role in reducing the severity of post-operative sore throat following endotracheal intubation in patients receiving general anaesthesia for surgical procedures lasting less than 3 hours of duration.

**Keywords:** Vitamin C, sore throat, postoperative, intubation

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**Introduction**

Postoperative sore throat (POST) is the discomfort, pain or scratchiness in throat which often worsens during swallowing and can pose an immense deal of uneasiness in patients. [1,2] The incidence of post-operative sore throat ranges from 14.4% to 50% after tracheal intubation. [3] It is believed to originate from mucosal dehydration or edema, tracheal ischemia secondary to the pressure of endotracheal tube cuffs, aggressive oropharyngeal suctioning, and mucosal erosion from friction between delicate tissues and the endotracheal tube and is graded as mild, moderate and severe. [1,4]

Recently micronutrients have come into picture as a part of multimodal analgesia in an attempt to maximize the degree of analgesia while minimizing the untoward side-effects. [5,6] Vitamin C, also

known as ascorbic acid, is a water-soluble antioxidant present in a variety of citrus fruits and vegetables. Besides its role in wound healing and hemostasis, vitamin C also exhibits antinociceptive functions as it has been shown to reduce acute pain and the prevalence of complex regional pain syndromes. [6,7]

The analgesic property of vitamin C is maybe due to its action on the N-methyl-D-aspartate (NMDA) receptor. [7] Furthermore, vitamin C is essential for the synthesis of neurotransmitters involved in the inhibitory pain pathway. It has a critical role in the rate-limiting step in norepinephrine formation as it acts as the enzyme substrate. It is also involved in cholinergic and GABAergic transmission. [6,7]

The micronutrient vitamin C plays an important role in reducing inflammation. Its role in management of acute and chronic pain has been documented in various articles. [3,5,6,7] However, data regarding the prevention of post intubation sore throat with vitamin C is rather scarce. Hence, aim of the present study was to evaluate the role of vitamin C on severity of postoperative sore throat following endotracheal intubation in patients receiving general anaesthesia. Primary objective was to assess severity of post-operative sore throat using POST grading system and VAS score for 24 hours. Secondary objectives were to record the consumption of total amount of postoperative analgesics and side effects if any.

### Materials and methods

The present study was a prospective, randomized, double blind, placebo-controlled study conducted in the Department of Anaesthesiology and Critical Care, Pt. B. D. Sharma PGIMS Rohtak after obtaining approval from Institutional Ethical Committee from April 2021 to May 2022. After obtaining informed and written consent, adult patients between age 18–60 years, ASA physical status I and II and Mallampati class 1 & 2 undergoing elective surgical procedures under general anaesthesia requiring endotracheal intubation, with successful intubation in single attempt were included in this study. Patients with history of sore throat, sinusitis, upper respiratory tract infections, allergy to vitamin C, difficult airway and surgical duration of more than 3 hours were excluded from the study.

### Randomization

Randomization was done by prefilled sealed envelopes coded with either normal saline or injection vitamin C which was administered by the anaesthesia staff. Both, neither the investigator nor the patients were aware of (blinded) the group allocation and the content of the infusion drip and code was broken after the completion of the study.

The selected patients were randomly allocated to one of the following 2 groups: Group 1 (n=50) received injection vitamin C 2g in 500 ml of NS administered over a period of 30 minutes intraoperatively; Group 2 (n=50) patients received 500 ml of NS over a period of 30 minutes intraoperatively.

### Preparation of Patient

All patients scheduled for surgery were kept fasting for at least 6 hours prior to the surgery and premedicated with tab Alprazolam 0.25mg and tab Omeprazole 20 mg in night before surgery. The purpose and protocol of the study was explained to the patient and informed and written consent was obtained for willingness to participate in the study.

### Anaesthesia Technique

All patients received general anaesthesia with endotracheal intubation as per standard protocol. After endotracheal intubation, the study group (group 1) received 2 gm of inj. vitamin C in 500 ml of normal saline over a period of 30 minutes and the control group (group 2) received 500 ml of normal saline over 30 minutes as placebo. The drugs in both the groups were given by the anaesthesia staff whereas the anaesthesia consultant and anaesthesia resident were blinded to the drug. Immediately after extubation, we looked for any blood stain on endotracheal tube. Patients were shifted to recovery room post-surgery. Inj. paracetamol 1gm iv 8 hourly was given to all patients and rescue analgesia using inj. Tramadol 1-2 mg/kg iv was administered on demand when required by the patient.

The following observations were made postoperatively-

**Sore throat:** An evaluation of severity of sore throat occurring post endotracheal intubation measured on the basis of grading system as: [8,9,10]

Grading Severity of POST

0 - No sore throat at any time since the operation

1 - Mild- Patient answered in the affirmative when asked about sore throat

2 - Moderate- Patient complained of sore throat on his/her own

3 - Severe- Patient is in obvious distress

**VAS Score-** All the patients were followed up and VAS was recorded at 0, 6,12 and 24 hours postoperatively.

**Consumption of analgesia:** The total amount of rescue analgesia in the form of inj. Tramadol consumed over 24 hours period was calculated.

**Side effects:** Side effects like allergy, itching, redness, nausea and vomiting etc. was also recorded and managed accordingly.

### Sample size

Our estimated sample size was based on the study of Jarahzadeh et al, [3] the incidence of post-operative sore throat (POST) in two groups, with reference to previous study the incidence of POST in control group was 29% and 7% in study group. Thus sample sizes of 47 patients per group provide an 80% power for detecting a significant difference between any two groups at an alpha level 0.05. Hence the sample size was taken as 50 in each group.

**Statistical analysis:** The data was coded and entered into Microsoft Excel spreadsheet. Analysis

was done using SPSS version 20 (IBM SPSS Statistics Inc., Chicago, Illinois, USA) Windows software program. Descriptive statistics included computation of percentages, means and standard deviations. The unpaired t test (for quantitative data to compare two independent observations) was applied. The chi square test was used for quantitative data comparison of all clinical indicators. Level of significance was set at  $P \leq 0.05$ .

**Results**

Total 100 patients were included in the study (Figure 1). Mean age was 38.88 years in group 1 and 40.2 years in group 2 ( $p=0.59$ ). Distribution of

gender was statistically similar in the two groups ( $p=0.13$ ). POST severity score was significantly lower in group 1 as compared to group 2 at 0, 6 and 12 hours postoperatively (Table 1,2,3). However, the score was similar at 24 hours postoperatively between the two groups (Table 4).

Similarly, VAS scores were significantly lower in group 1 as compared to group 2 at 0, 6 and 12 hours postoperatively (Figure 2). Total amount of analgesia consumption was significantly higher in group 2 as compared to group 1 ( $p=0.03$ ) (Figure 3). No side effects related to vitamin C were recorded in any patient during our observation period.

**Table 1: Severity of sore throat at 0 hour**

			Groups		Total
			Group 1	Group 2	
Scores	0.00	N	30	13	43
		%	60.0%	26.0%	43.0%
	1.00	N	19	25	44
		%	38.0%	50.0%	44.0%
	2.00	N	1	11	12
		%	2.0%	22.0%	12.0%
	3.00	N	0	1	1
		%	0.0%	2.0%	1.0%
Total		N	50	50	100
		%	100.0%	100.0%	100.0%

**P value=0.001 (S)**

**Table 2: Severity of sore throat at 6 hours**

			Groups		Total
			Group 1	Group 2	
Scores	0.00	N	43	21	64
		%	86.0%	42.0%	64.0%
	1.00	N	7	25	32
		%	14.0%	50.0%	32.0%
	2.00	N	0	4	4
		%	0.0%	8.0%	4.0%
Total		N	50	50	100
		%	100.0%	100.0%	100.0%

**P value=0.001 (S)**

**Table 3: Severity of sore throat at 12 hours**

			Groups		Total
			Group 1	Group 2	
Scores	0.00	N	47	40	87
		%	94.0%	80.0%	87.0%
	1.00	N	3	10	13
		%	6.0%	20.0%	13.0%
Total		N	50	50	100
		%	100.0%	100.0%	100.0%

**P value=0.03 (S)**

**Table 4: Severity of sore throat at 24 hours**

			Groups		Total
			Group 1	Group 2	
Scores	0.00	N	50	49	99
		%	100.0%	98.0%	99.0%

	1.00	N	0	1	1
		%	0.0%	2.0%	1.0%
Total		N	50	50	100
		%	100.0%	100.0%	100.0%

P value=0.31

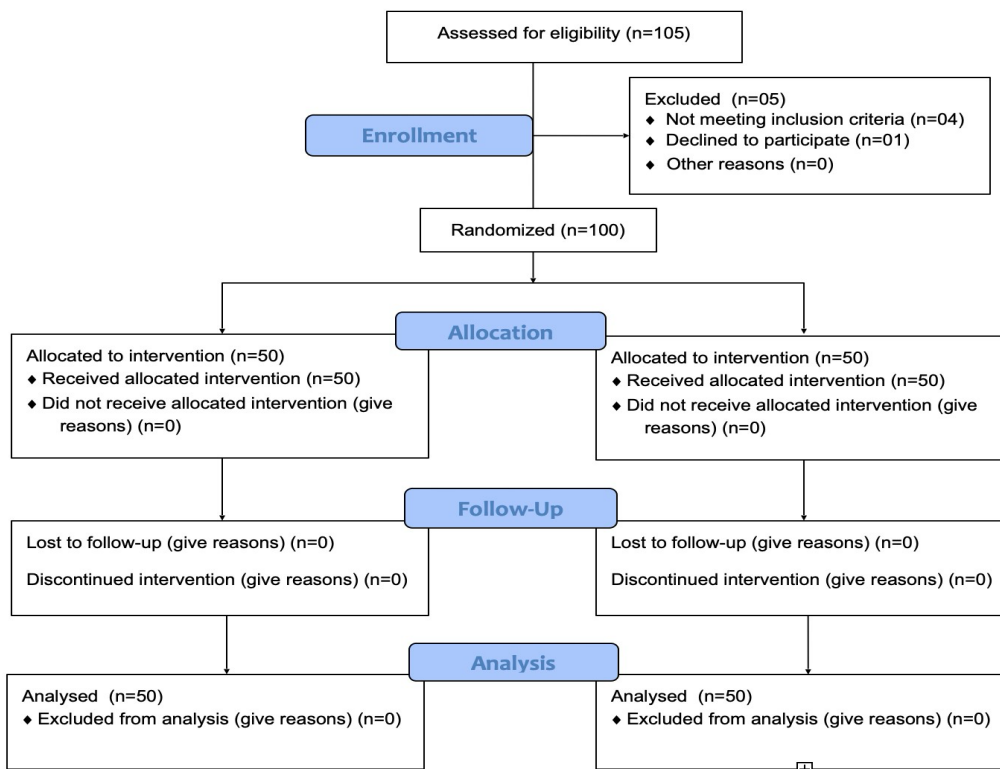


Figure1: Consort Diagram

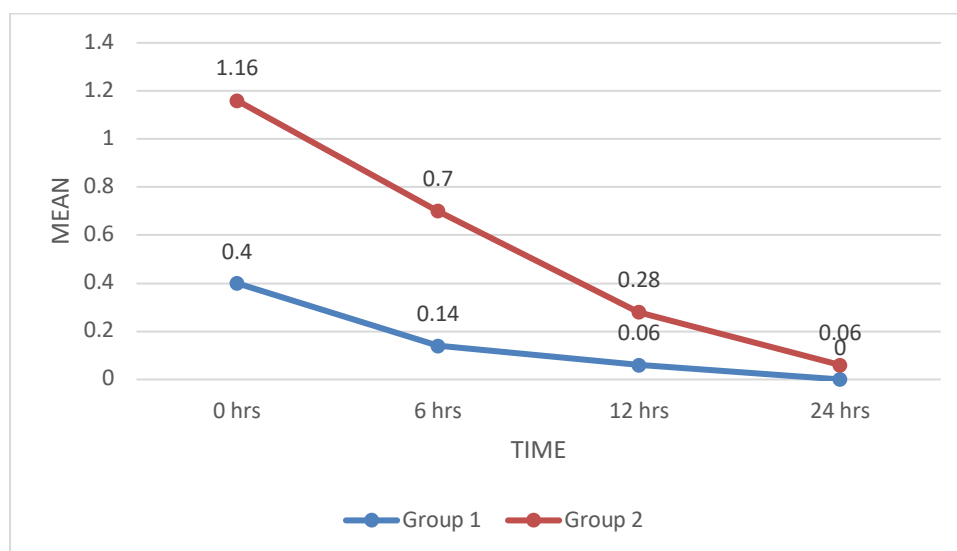
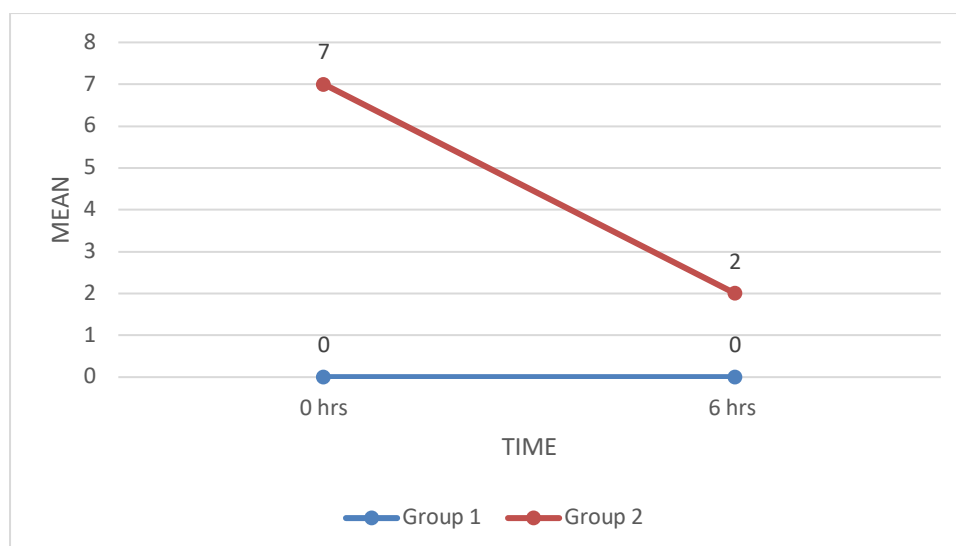


Figure 2: VAS at different time intervals between the two groups



**Figure 3: Total amount of analgesia received in the two groups**

### Discussion

Instrumentation of the airway is an inherent risk factor for the development of post-operative sore throat.<sup>11</sup> Previous studies have documented that vitamin C is a neuroprotective agent and acts as a neuromodulator through various mechanisms. [6] Vitamin C is considered as an effective adjunctive therapy for decreasing pain. Hence, the present study was planned to evaluate the role of vitamin C on severity of postoperative sore throat following endotracheal intubation in patients receiving general anaesthesia.

In our current study, we included 100 patients (50 in each group) of 18–60 years of age with ASA physical status I and II and Mallampati class 1 & 2 undergoing elective surgical procedures under general anaesthesia requiring endotracheal intubation. Only patients who were successfully intubated in single attempt were included in the study. In our study, we chose a dose of 2 gram of vitamin C in 500 ml of normal saline which was similar to previous studies. [3,5]

Our results are similar to the study conducted by Jarazadeh who included 70 patients undergoing elective laparoscopic surgery. Study group received 2 g of vitamin C mixed with normal saline for the total injection volume of 500 mL and control group received normal saline without vitamin C, after 30 minutes of anaesthesia induction. A significantly lower number of patients experienced postoperative sore throat in the study group as compared to the control group at 1, 6 and 24 hours ( $p < 0.05$ ). The authors observed significant differences in postoperative pain scores between the two groups. The mean scores were  $2.09 \pm 2.44$  and  $3.54 \pm 2.44$  ( $p = 0.011$ ) at 1 hour,  $1.66 \pm 1.84$  and  $3.34 \pm 2.04$  at 6 hours ( $p = 0.001$ ) and  $1.11 \pm 0.57$  and  $1.61 \pm 1.6$  ( $p = 0.001$ ) at 24 hours for the study and the control group respectively. [3]

Various studies are available in literature which analysed vitamin C for its analgesic properties. Kanazi et al conducted a randomized double-blind placebo-controlled trial to assess the role of a single prophylactic dose of vitamin C 2 g per oral in reducing the consumption of opioids postoperatively among the patients undergoing laparoscopic cholecystectomy where the following data were assessed postoperatively at 2, 4, 6, 12, and 24 hours. Pain was assessed with verbal numerical rating scale scores for incisional pain after the surgery. Post-operative nausea/ vomiting, pruritus and sedation scores were also measured. Study showed that morphine consumption was significantly lower in the vitamin C group ( $16.2 \pm 10.7$ mg) as compared to the placebo group ( $22.8 \pm 13.8$ mg). [5]

Ayatollahi et al conducted a randomized clinical trial in 40 patients to evaluate analgesic effects of vitamin C and recorded VAS at intervals of 0, 6, 12 and 24 hours and request for analgesic drugs (iv paracetamol or pethidine) postoperatively. They compared placebo with 3 g of vitamin C in 500 mL of Ringer during the first 30 minutes after the start of surgery. They found a significantly lower pain severity with vitamin C in recovery room at 6, 12 and 24 hours after surgery ( $p = 0.001$ ). There was a significant difference in time of first dose of analgesic and total requirement of pethidine amongst the two groups ( $p < 0.05$ ).<sup>12</sup>

There were no side effects related to vitamin C in these studies as was observed in the present study. [3,5,12]

Our study had few limitations. It had a small sample size and we studied a single dose of vitamin C. We did not measure the plasma levels of vitamin C. Further large randomized trials with different doses of vitamin C are warranted.

## Conclusion

We concluded that vitamin C plays a significant role in reducing the severity of post-operative sore throat following endotracheal intubation in patients receiving general anaesthesia for surgical procedures lasting less than 3 hours of duration.

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