

# Comparison of Postoperative Upper Airway Complications Following Use of Endotracheal Intubation versus Baska Mask in Gynaecological Diagnostic Laparoscopic Surgeries Under General Anaesthesia

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## Abstract

**Introduction:** Baska masks, a new supraglottic airway device, have many advantages over endotracheal tubes, they are designed to decrease the risk of aspiration and increase the oropharyngeal leak pressure, improving the airway seal at higher airway pressures during intermittent positive pressure ventilation without significant gastric inflation.

**Aim:** The primary objective of the present study was to compare the effects of a Baska mask versus an endotracheal tube for securing the airway on the incidence and severity of postoperative cough (POC) in patients undergoing gynecological diagnostic laparoscopic surgeries. Secondary objectives included the assessment of postoperative hoarseness of voice and postoperative sore throat (POST) in these patients.

**Materials and Methods:** A total of 90 female patients aged 20–60 years, belonging to American Society of Anesthesiologist grades I and II, weighing between 30 and 60 kg, were posted for elective gynecological diagnostic laparoscopic surgeries under general anesthesia and were randomly divided into 2 groups of 45 each. Group A ( $n = 45$ ): endotracheal tube inserted to secure airway, Group B ( $n = 45$ ): baska mask inserted to secure airway. Pharyngolaryngeal morbidity in the form of cough, sore throat, hoarseness of voice, bronchospasm, laryngospasm, and dysphagia were evaluated after the removal of the device until 24 h postoperatively.

**Results:** The occurrence of POC was noticed between both groups at different time intervals of 30 min, 1, 2, 6, 12, and 24 h, respectively. POC was significantly higher in the endotracheal tube group at 30 min, 1, 2, 6, 12, and 24 h. None of the patients in the Baska mask group had POC at 12 or 24 h. POST was significantly higher in the endotracheal tube group at 30 min, 1, 2, 6, 12, and 24 h as compared to the Baska mask group. None of the patients had POST in the Baska mask group at 24 h. Hoarseness of voice was significantly higher in the endotracheal tube group; none of the patients had HOV in the Baska mask group at 6, 12, or 24 h postoperatively. Hemodynamic parameters were comparable in both groups.

**Conclusion:** It was concluded that the occurrence of postoperative complications such as cough, sore throat, and hoarseness of voice was significantly less with the Baska mask as compared to endotracheal intubation in gynecological diagnostic laparoscopic surgeries under general anesthesia.

**Key words:** Baska mask, Cough, Hoarseness of voice, Intubation, Postoperative, Sore throat

## INTRODUCTION

Airway management poses a significant challenge for anesthesiologists, as their main duty is to ensure adequate

ventilation for patients.<sup>[1]</sup> Before 1990, face masks and endotracheal tubes were the only available airway devices, but since then, various supraglottic airway devices have been developed.<sup>[2]</sup>

General anesthesia with endotracheal intubation remains the preferred technique for ensuring airway safety. However, laryngoscopy and endotracheal intubation often result in increased sympathetic activity, leading to tachycardia, hypertension, and postoperative pharyngolaryngeal complications.<sup>[3]</sup>

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In comparison to endotracheal intubation, the Baska mask,<sup>[4]</sup> a novel supraglottic airway device, offers numerous advantages over the ET tube. It does not come into direct contact with the tracheal mucosa and eliminates the need for direct laryngoscopy.<sup>[5]</sup> These masks are designed to minimize the risk of aspiration and increase oropharyngeal leak pressure,<sup>[6]</sup> thereby improving the airway seal at higher airway pressures during intermittent positive pressure ventilation without significant gastric inflation.

Given the limited available literature on this subject, the purpose of this study was to compare the incidence of postoperative upper airway complications between endotracheal intubation and the use of the Baska mask in gynecological laparoscopic diagnostic procedures.

### **Aim of the Study**

The main goal of this study was to compare the impact of using the Baska mask versus the endotracheal tube for airway management on the occurrence and intensity of postoperative cough (POC) in patients undergoing gynecological diagnostic laparoscopic surgeries. Secondary objectives included evaluating the presence of postoperative hoarseness of voice and postoperative sore throat (POST) in these patients.

## **MATERIALS AND METHODS**

Following approval from the institutional ethics committee, a randomized interventional study was conducted at a hospital. The study involved ninety female patients between the ages of 20 and 60 who were classified as American Society of Anesthesiologist (ASA) grade one or two. These patients were undergoing gynecological diagnostic laparoscopic surgeries under general anesthesia. The study excluded patients with an anticipated difficult airway requiring multiple attempts for airway placement, those with a preoperative sore throat or who were already on analgesics or steroids, as well as patients at increased risk of aspirating gastric contents. Additionally, patients with surgery durations exceeding 2 h were excluded.

Ninety patients were enrolled in the study and were randomly assigned to two groups using sealed envelopes. Each group consisted of 45 patients. In Group A, an endotracheal tube was used to secure the airway, while in Group B, a Baska mask was used, following a standardized hospital protocol.

Upon arrival in the operating theater, patients were identified, their written and informed consent was

checked, and their pre-anesthetic check-up and fasting status were confirmed. Standard monitoring devices were connected, and baseline measurements of systolic and diastolic blood pressure, heart rate, mean arterial pressure, oxygen saturation (SpO<sub>2</sub>), and electrocardiogram were recorded. A 18G intravenous cannula was inserted, and intravenous fluids were administered according to hospital protocol.

After preoxygenation with 100% oxygen for 3 min, anesthesia was administered to patients in the supine position with their heads in a neutral position. Pre-medication included injections of midazolam (0.05 mg/kg), glycopyrrolate (5 mg/kg), and fentanyl (2 mg/kg). Anesthesia induction was achieved with injections of propofol (2.5 mg/kg) and succinylcholine (1.5 mg/kg), followed by 1 min of ventilation. Before insertion into the patient, both the Baska mask and the endotracheal tube were carefully inspected for proper functioning and integrity.

In Group A, the airway was secured using an endotracheal tube, while in Group B, the airway was secured using a lubricated Baska mask. The mask was introduced into the mouth, advanced toward the hard palate, and then further downward until resistance was felt. All procedures were performed under the supervision of a senior anesthesiologist in the operating theater.

Confirmation of effective ventilation was done by observing EtCO<sub>2</sub> waveforms, bilateral thoracic movements, and equal air entry. The endotracheal tube, or Baska mask, was connected to the breathing circuit and secured in place with adhesive tape. Anesthesia was maintained with 40% oxygen and sevoflurane (MAC of 1–2%), along with a muscle relaxant (Atracurium) administered as a loading dose (0.5 mg/kg) and maintenance dose (0.1 mg/kg).

Hemodynamic parameters (systolic blood pressure, diastolic blood pressure, mean arterial pressure, heart rate, and SpO<sub>2</sub>) were recorded at various time intervals as per the data collection form. Postoperative pain was managed with intravenous administration of paracetamol (15 mg/kg). At the end of the surgery, all anesthetic agents were stopped, and any residual neuromuscular blockade was reversed using Neostigmine (0.05 mg/kg) and Glycopyrrolate (0.01 mg/kg). Extubation was performed once the patient was fully awake, breathing spontaneously, and ready to be transferred to the recovery room.

Postoperative morbidity was assessed by evaluating any trauma to the teeth, lips, or tongue.

**Assessment of POC, Sore Throat, and Hoarseness of Voice**

The following table describes the POC, sore throat, and hoarseness of voice assessment:

	Grade
<b>Postoperative cough</b>	
No cough at any time since the operation	0
Minimal	1
Moderate	2
Severe	3
<b>Postoperative sore throat</b>	
No sore throat at any time since the operation	0
Minimal - Patient answered in the affirmative when asked 1 about sore throat	1
Moderate - Patient complained of sore throat on his/her own	2
Severe - Patient is in obvious distress	3
<b>Postoperative hoarseness of voice</b>	
No complaint of hoarseness at any time since the operation	0
Minimal – Minimal change in the quality of speech. The patient answers in the affirmative only when enquired about	1
Moderate – Moderate change in the quality of speech of which the patient complains on his/her own	2
Severe – Gross change in the quality of voice perceived by the observer	3

**Comparison of demographics, American Society of Anesthesiologists physical status classes, and Mallampati scores**

Continuous variable	Mean±SD		P-value
	Group A	Group B	
Age (years)	30.38±5.11	29.71±4.73	0.523
Weight (kg)	59.24±3.62	61.18±8.44	0.242
Height (cm)	152.82±1.46	153.11±1.76	0.40
Anesthesia time (min)	57.5±9.06	55±8.16	0.198
Categorical variable	Group A, n (%)	Group B, n (%)	P
<b>Mallampati score</b>			
1	71.11	73.33	0.814
2	28.88	26.66	
<b>ASA physical status (%)</b>			
I	71.10	80.00	0.327
II	28.90	20	
<b>Attempts taken to insert device (%)</b>			
1	84.44	91.11	0.334
2	15.56	8.89	
Time taken for the insertion of device	17.56±3.474	17.56±2.106	1

SD: Standard deviation, ASA: American Society of Anesthesiologists

**Statistical Analysis**

An excel sheet was used to enter the data. In order to summarize continuous data, the mean and standard deviation were used. The student “t”-test was used to evaluate the variation in means between the two groups. The chi-square test was used to analyze the difference in proportions between continuous data that were reported as proportions. All statistical analyses would maintain a 95% level of significance. A 0.05 P-value was regarded as statistically significant.

**RESULTS**

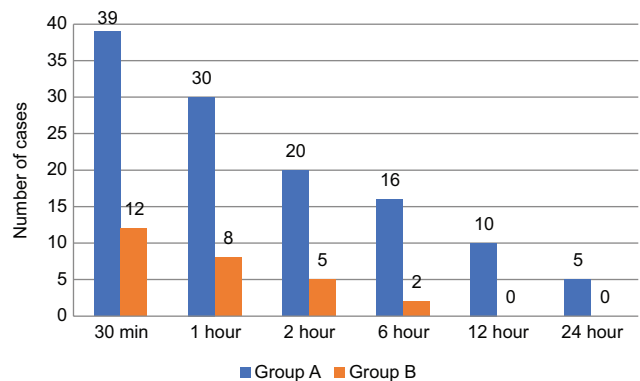
Age, sex, weight, MPG grading and ASA grading, anesthetic time, surgical procedure, and diagnosis were comparable across both groups ( $P > 0.05$ ).

Additionally, both groups’ hemodynamic characteristics were comparable.

POC was observed in both groups at various time intervals, including 30 min, 1, 2, 6, 12, and 24 h. At 30 min, 1, 2, 6, 12, and 24 h, POC was considerably higher in the endotracheal tube group. At 12 and 24 h, none of the patients in the Baska mask group developed POC. There was a statistically significant difference in the incidence of POC between the two groups. POST was substantially higher in the endotracheal tube group than in the Baska mask group at 30 min, 1, 2, 6, 12, and 24 h. At 24 h, it was seen that none of the patients in the Baska mask group had POST. At 6, 12, and 24 h after surgery, patients in the endotracheal tube group reported significantly higher hoarseness of voice, but none of the patients had HOV in the Baska mask group.

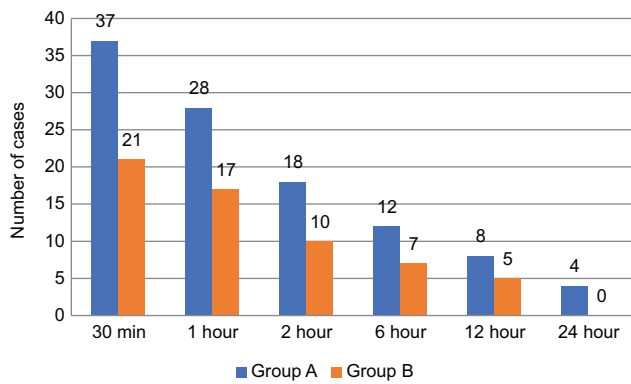
**Comparison of cough between both groups**

±Time	Count (%)		P-value
	Group A (n=45)	Group B (n=45)	
30 min	39 (86.7)	12 (26.7)	0.0001
1 h	30 (66.7)	8 (17.8)	0.0001
2 h	20 (44.4)	5 (11.1)	0.0001
6 h	16 (35.6)	2 (4.4)	0.0001
12 h	10 (22.2)	0	0.003
24 h	5 (11.1)	0	0.036



**Comparison of sore throat between both groups**

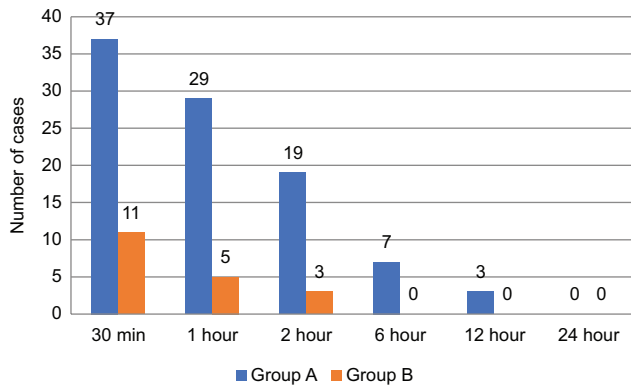
±Time	Count (%)		P-value
	Group A (n=45)	Group B (n=45)	
30 min	37 (82.2)	21 (46.7)	0.0001
1 h	28 (62.2)	17 (37.8)	0.020
2 h	18 (40.0)	10 (22.2)	0.069
6 h	12 (26.7)	7 (15.6)	0.197
12 h	8 (17.8)	5 (11.1)	0.368
24 h	4 (8.9)	0	0.041



**Comparison of hoarseness of voice between both groups**

Hoarseness of voice	Group A (n=45)	Group B (n=45)	P-value
30 min	37 (82.2)	11 (24.4)	0.0001
1 h	29 (64.4)	5 (11.1)	0.0001
2 h	19 (42.2)	3 (6.7)	0.0001
6 h	7 (15.6)	0	0.006
12 h	3 (6.7)	0	0.078
24 h	0	0	NA

NA: Not available



**DISCUSSION**

An essential component of general anesthesia is airway control. The two pillars of anesthesia for patients undergoing laparoscopic procedures have been the protection of the airways and the capacity to breathe in a setting of altered physiology.<sup>[7]</sup> As a result, it was widely accepted for many years that all laparoscopic procedures should be carried out while the patient is under general anesthesia and receiving regulated ventilation using an endotracheal tube. However, endotracheal intubation will cause mucosal irritation as a result of the tube’s existence, which frequently causes issues for the pharynx and throat after surgery.<sup>[8]</sup>

The Baska mask is a modern supraglottic airway device with a non-inflatable cuff that may help to improve airway seal

without the need for stomach inflation. Seal is increased with IPPV. A new pharyngeal drainage mechanism may lower the risk of lung aspiration.

Using the opaque sealed envelope method, 90 female patients aged 20–60 who were ASA grade I or II, weighed between 30 and 60 kg, and underwent elective gynecological laparoscopic diagnostic surgeries under general anesthesia were randomly assigned into two groups of 45 each.

- In group A (*n* = 45), the endotracheal tube and
- In group B (*n* = 45), a Baska mask was used to secure the airway.

The use of supraglottic airway devices results in fewer postoperative pharyngolaryngeal problems since they do not require laryngoscopy for correct implantation.

The most typical symptom of laryngeal damage during laryngoscopy is POC. The use of supraglottic airway devices is linked to a lower incidence of POC because they do not come into contact with the tracheal mucosa and cause less laryngeal trauma.<sup>[9]</sup>

In the current investigation, POC occurred in both groups at several time points, including 30 min, 1, 2, 6, 12, and 24 h. Grade 3 cough was seen in 15.6% of patients in group A at 30 min, 11.1% at an hour, and 6.7% at 2 h, respectively. After that, the severity of the cough gradually decreased, and no patient exhibited a grade 3 cough at 6, 12, or 24 h. In contrast, none of the patients in group B experienced a grade 3 cough.

The findings of the study conducted by Khetarpal *et al.* (2020), who also observed that the incidence of POC at 1, 2, 4, 8, and 12 h was considerably higher in the endotracheal group as compared to the Baska mask group, provide support for the findings of the current investigation.<sup>[10]</sup>

Similar findings were made by Ng CC *et al.* in 2018, who found that the ETT group experienced cough emergence much more frequently than the Baska mask group 7.

POST was more prevalent in the endotracheal group compared to the Baska mask group, according to Priya *et al.* (2021).<sup>[11]</sup> In our investigation, it was found that group A had a higher POST than group B. Ahn *et al.* (2022)<sup>[12]</sup> found contradictory results, reporting that after an hour of surgery, more patients in the Baska mask group experienced POST than in the endotracheal tube group.<sup>[11]</sup>

A relatively new supraglottic airway device called the Baska mask was proven to provide better airway seal pressure with fewer problems. In the current investigation, group A’s

hoarseness of voice was much worse than that of the Baska mask group. Park *et al.* (2016) reported similar data, demonstrating that the incidence of HOV was greater in the ETT group than in the Baska mask group.<sup>[13]</sup>

## CONCLUSION

The Baska mask was found to dramatically reduce the incidence of postoperative problems like cough, sore throat, and hoarseness when compared to endotracheal intubation during gynecological diagnostic laparoscopic operations performed under general anesthesia.

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