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Original Article

Efficacy of Airway Exchange Catheter during Extubation in Patients Undergoing Major Head-and-Neck Surgeries

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Abstract

Background: Head-and-neck surgeries encompasses an expanded spectrum of procedures varying greatly in complexity, duration and complications thereby carrying considerable risk of post-operativelaryngo-pharyngeal edema and airway obstruction due to surgical manipulation. The aim of this study was to study the efficacy of airway exchange catheter (AEC) during extubation in patients undergoing major head-and-neck surgeries.

Material and Method: Clinical Observational study, enrolling 30 patients of either sex, aged 20–70 of the American Society of Anesthesiologist physical status I and II, scheduled for major head and neck surgeries. Cook's AEC (CAEC) was used in this study. Tolerability, number of patients desaturated with CAEC *in situ*, number of patients required reintubation over the catheter, ease of reintubation, and complications were assessed.

Result: It was observed 2 patients (6.67%) showed moderate tolerability and 1 patient (3.33%) showed poor tolerability. Four patients (13.33%) desaturated with catheter in situ out of which 1 patient (3.33%) required emergency reintubation after 4 h of tracheal extubation. Reintubation in this patient, was thought to be nearly impossible by direct laryngoscopy, was easily achieved over CAEC and none of the patient experienced any complication related to the catheter.

Conclusion: The study concluded that CAEC can act as life-saving device in patients with risk factors for difficult reintubation and loss of airway access due to surgical manipulation or anatomical changes.

Key words: Cook's airway exchange catheter, Head and neck surgeries, Extubation

INTRODUCTION

Head-and-neck surgery encompasses an expanded spectrum of procedures varying greatly in complexity, duration and complications, presenting unrivalled challenges for the anesthesiologist. Anesthesiologist needs to maintain airway patency, oxygenation, and ventilation in similar anatomical space in which surgeon operates, i.e., shared airways.

Extubation in such patients is extremely difficult as no one can predict adequacy of airway once endotracheal tube (ETT) has been removed though criteria used to predict successful extubation are generally satisfactory before extubation.[1] Planning for tracheal extubation is a critical component of successful airway management strategy when dealing with situations at increased risk for extubation failure and in patients with difficult airways and at risk of reintubation.[2]

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An extubation strategy should aim to maintain uninterrupted oxygen delivery to the patients lungs, avoiding airway stimulation and include a backup plan, that would permit ventilation and re-intubation with minimal difficulty and delay should extubation fail.[3] Head and neck surgeries carry considerable risk for post-operativelaryngo-pharyngeal edema and airway obstruction due to surgical manipulation, distorted airway anatomy and characteristics of surgery.[4] Re-establishing the airway in these patients can be extremely challenging and often result in considerable morbidity

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and mortality.[5] Hence, there should be a preformulate dextubation algorithm in such patients.

Airway exchange catheters (AEC) act as bridging devices to staged extubation trial as recommended in difficult airway society (DAS) guidelines. Cook's AEC (CAEC) plays a very important role in not only by securing the airway but also by providing continuous means of oxygen insufflation and also acting as conduit for tracheal reintubation if required.[6-10]

MATERIALS AND METHODS

After obtaining clearance from the ethical committee, we carried out a clinical observational study in 30 patients of ASA grade I and II in the age group 20–70 years posted for elective head and neck surgeries.

Proper pre-anesthetic check up was done and appropriate investigations were done. Patient was advised Tab Alprazolam 0.25 mg a night before and on the day of surgery with sip of water.

On arrival of patient in operation theater, 20G i/v cannula was secured, all the routine monitors were attached and baseline vitals were recorded. Following pre-medication with Inj. midazolam 1 mg, Inj. glycopyrrolate 0.2 mg and Inj. fentanyl 2mcg/kg, patient was preoxygenated for 3 minutes and induced with propofol 2 mg/kg. The trachea of patient intubated orally or nasally after attaining proper relaxation with Inj. scoline 1.5 mg/kg.

At the completion of surgery, Inj. myopyrrolate (neostigmine angglycopyrrolate) was given. Depending on complexity and characteristics of surgery, patients were transferred to ICU with a tube in situ, Patients who had undergone thyroidectomy were extubated on table over CAEC and were kept in post anesthesia care unit (PACU) for monitoring.

Technique of CAEC Insertion

Patients were extubated when they become conscious and had normal body temperature normal blood gases with inspired O2 concentration (FiO2) of 0.4, positive end-expiratory pressure less than 5 cm H20 and pressure support of <8 cm H20. Patients were given spontaneous breathing trial (SBT), i.e., CPAP and T-piece trial.

After sedating the patient with Inj. midazolam 2 mg, pharyngeal suctioning was done. CAEC was lubricated with lignocaine jelly and was inserted through ETT to the predetermined depth (not more than 26 cm orally) avoiding carinal irritation. Distal end of CAEC was connected to O2 supply with flow between 5 and 8 L/min and was fixed on cheek or forehead.

Patients were kept under observation in PACU or ICU and hemodynamic and ventilator parameters were observed and maintained for 15 min till 2 h, for 30 min till 4 h then hourly for 10 h, and 2 hourly thereafter.

Hemodynamic parameters (heart rate [HR], systolic blood pressure [SBP], diastolic blood pressure [DBP], mean arterial pressures [MAP]), ventilator parameters (SpO2, EtCO2), tolerability, need for reintubation, ease of reintubation, and complications were observed.

Statistical Analysis

The data from the present study was systematically collected and was analyzed to draw relevant conclusion. Sample size was calculated in consultation with statistician taking mainly the duration for which CAEC was need to be placed in situ, risk factors for difficult extubation and based on previous study to get power of study more than 85%. The continuous data were represented as standard deviation (mean ± SD). Number of patients and percentage of cases expressed discrete categorical data. The *P* value was calculated to evaluate level of significance. The $P > 0.05$ was considered non-significant, $P = 0.01$-0.05 was considered significant and $P < 0.001$ was highly significant. The results were then analyzed and compared to previous studies.

RESULTS

The distribution of sex, ASA grade, mean age, mean weight, mean duration of surgery, and mean duration of catheter kept in situ were observed.

Mean HR, Mean SBP, mean DBP, mean MAP, mean SpO2, and mean EtCO2 was observed before and after CAEC insertion and was found to be clinically insignificant with $P > 0.05$.

CAEC was kept for mean duration of 8.45 ± 8.59 h for maximum period of 24 h.

CAEC can be kept for 72 h.

It was observed that CAEC was well tolerated in 27 patients (90%), moderately tolerated in 2 patients (6.67%) for which patients were kept sedated and were kept under observation in ICU. Compliance of one patient was very poor and requested catheter removal after 15 min of insertion.

Four patients (13.33%) were desaturated of which three patients were managed with supplemental oxygen (1 with NRB and 2 with simple O2 mask).

One patient (3.33%) needed emergency reintubation after 4 h of extubation (had a history of difficult intubation during maxillectomy where patient was intubated following multiple attempts and use of video laryngoscope). Patient was easily reintubated over CAEC that would otherwise would had been difficult with direct laryngoscopy.

Seventeen patients (56.67%) could vocalize with indwelling catheter whereas 13 patients (43.33%) could not able to speak due to extensive surgery and altered anatomy.

No CAEC related complications such as esophageal misplacement, barotraumas, and pneumothorax were seen.

Demographic profile	
Mean age in years	43.53±12.09 years
Mean weight in kilogram	74.13±10.93 kg
Mean duration of surgery	181.67±88.79 min
Mean duration of catheter *in situ*	8.45±8.59 h
Sex distribution	Male=18 (60%)
	Female=12 (40%)
ASA grading	Grade 1=20 (66.67%)
	Grade 2=10 (33.33%)

Duration	Heart rate		*P*-value
	Mean	SD	
Before CAEC insertion	84.77	10.04	0.190 (NS)
After CAEC insertion	88.17	9.82	

Duration	Systolic blood pressure		*P*-value
	Mean	SD	
Before CAEC Insertion	126.33	8.09	0.184(NS)
After CAEC Insertion	128.83	6.22	

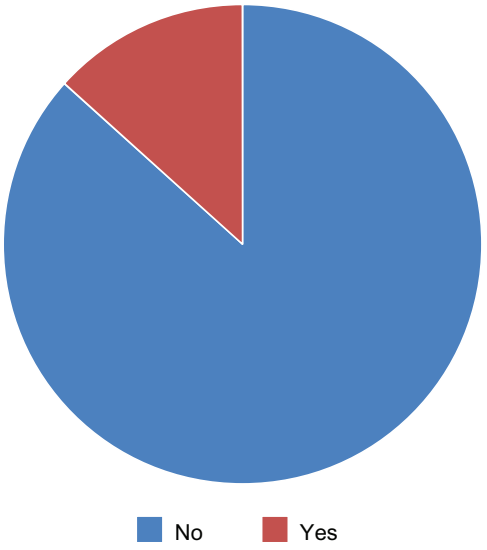
Duration	Diastolic blood pressure		*P*-value
	Mean	SD	
Before CAEC Insertion	80.53	6.08	0.093 (NS)
After CAEC Insertion	83.20	6.05	

Duration	Mean arterial pressure		*P*-value
	Mean	SD	
Before CAEC Insertion	97.80	6.40	0.299 (NS)
After CAEC Insertion	99.41	5.47	

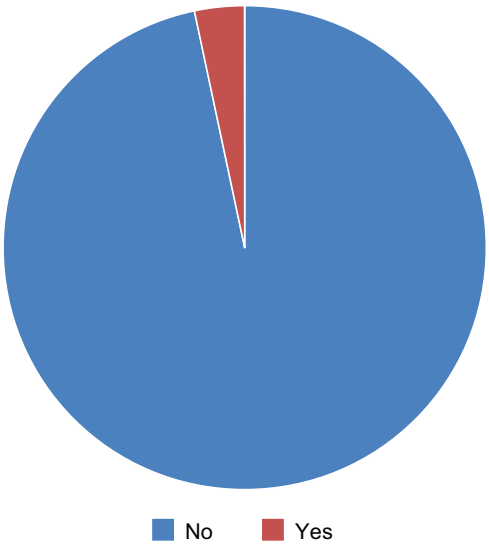
Duration	Saturation		*P* -value
	Mean	SD	
Before CAEC Insertion	99.12	1.02	0.499 (NS)
After CAEC Insertion	98.97	1.25	

Duration	ETCO2		*P*-value
	Mean	SD	
Before CAEC Insertion	35.60	1.73	0.186 (NS)
After CAEC Insertion	36.47	1.93	

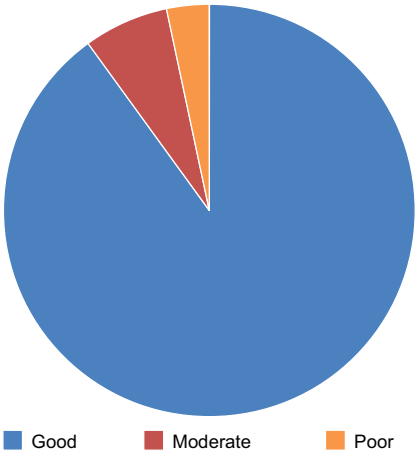
Desaturation	No. of cases	% age
No	26	86.67
Yes	4	13.33
Total	30	100.00



Reintubation	No. of cases	% age
No	29	96.67
Yes	1	3.33
Total	30	100.00



Tolerability	No. of cases	% age
Good	27	90.00
Moderate	2	6.67
Poor	1	3.33
Total	30	100.00



DISCUSSION

Tracheal extubation is a critical step during emergence from anesthesia.[11] It is not simply reversal of the process of intubation as conditions are often less favorable than at the start of process of intubation. At extubation, there is a transition from controlled to uncontrolled situation.

Extubation is a vulnerable time in patients undergoing head and neck surgeries. Head-and-neck surgeries carry considerable risk of post-operativelaryngo-pharyngeal oedema and airway obstruction due to surgical factors, hematoma, and anatomical changes. Reintubation may be very difficult or impossible through laryngoscopy in such patients. Even the bag mask ventilation may be difficult or impossible in such patients. A pre-established extubation plan with considerations made for the possible need for re-intubation is of utmost importance.

AEC, i.e., CAEC played very important role and offers several advantages:

- Providing method of continuous administration of oxygen
- Can be used as stlet for tracheal reintubation
- Provides a method of ventilating the patient.

In our study, it was observed CAEC was well tolerated in most of patients, two patients (6.67%) showed moderate tolerability, for which patients were kept sedated. Results were similar to study conducted by Dosemeci *et al.*[12]

One patient (3.33%) showed poor tolerability and requested removal 15 min following insertion. As patient was able to vocalize well and risk of developing respiratory distress appeared to be low airway exchange catheter was removed. Results were similar to study conducted by Loudermilk *et al.*

Four patients (13.33%) got desaturated with catheter in situ of which three patients were managed with supplemental oxygen in addition to oxygen insufflated through CAEC.

Results were similar to study conducted by Loudermilk *et al.*

One patient (3.33%) needed emergency reintubation, so patient was easily reintubated over CAEC on first attempt without any need for any other alternate method.

Results were similar to similar conducted by Dosemeci *et al.*

CONCLUSION

The use of CAEC is a life-saving method and a bridge to extubation in patients with a potential difficult airway. AEC is an efficient method of maintaining continuous access to the airway after extubation as it is well tolerated and offers a clinically valuable conduit for reintubation. It allows a safer trial of tracheal extubation and therefore can shorten the duration of reintubation.

Limitation

Sample size is small.

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