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Profile of spontaneously breathing, anaesthetized children during elective surgeries

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Abstract
The cricoid ring, the only circumferentially solid cartilage within the airway, placed immediately below the vocal cords, is the narrowest part of the paediatric airway, whereas in adults it is the glottis. Being covered by loosely adherent pseudostratified columnar epithelium, it can be easily subjected to edema in case of irritation. A total number of 90 paediatric patients posted for elective surgeries under general anaesthesia and satisfying the inclusion criteria were enrolled in the study after obtaining informed, written, valid consent from their parents/guardian. Group B (Baska mask) has 30 patients with a mean age of 10.6 years with a standard deviation of 0.9, group I (igel) has 30 patients with a mean age of 9.8 years with a standard deviation of 1.3 and group P (LMA ProSeal) has 30 patients with a mean age of 9.4 years with a standard deviation of 0.9. ANOVA test was used for comparison of the three study groups and with p value obtained as 0.43, the three groups are comparable in terms of age. On comparison of weight of patients in these three groups, group B patients have a mean weight of 21.6 kg witha standard deviation of 1.2, group I patients have 22.2 kg with a standard deviation of 1.8 and group P have 20.3 kg with a standard deviation of 2.9. Based on ANOVA test, p value obtained here is 0.54, hence the groups are comparable in terms of weight as well.
Keywords: Spontaneously breathing, anaesthetized children, elective surgeries

Introduction
Safe conduct of paediatric anaesthesia demands proper understanding and appreciation of the anatomical, physiological and pharmacological features and variations in each age group: neonates (0-1month), infants (1-12 months), toddlers (12-24 months) and young children (2-12 years). Paediatric and adult airways differ significantly in terms of size, shape and structure. The characteristic variations are listed below[1, 2]:

- Relatively larger head with prominent occiput in children help position the head naturallyin “sniffing the morning air” position, but in supine position it can lead to possible airway obstruction due to neck flexion as well.
- Nasal passages are narrower and more prone for obstruction than in adults.
- Easily collapsible larger tongue and lesser muscle tone make children more liable to airway obstruction.
- Children have relatively higher arched non-ossified palate.
- The longer omega shaped epiglottis of children is more angled to the airway lumen than in

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adults [3].

- Children have shorter neck, with hyoid cartilage lying closer to thyroid cartilage.
- The vocal cords are rostral posteriorly and cephalad anteriorly, appearing to be bow shaped.
- The location of larynx is more cephalad and anterior in paediatric age group-at C3-C4 level in term neonates and C4-C5 level in older children.
- The cricoid ring, the only circumferentially solid cartilage within the airway, placed immediately below the vocal cords, is the narrowest part of the paediatric airway, whereas in adults it is the glottis. Being covered by loosely adherent pseudostratified columnar epithelium, it can be easily subjected to edema in case of irritation[4, 5].
- Children have shorter trachea (4-5cm) supported by softer, non-calcified cartilaginous tracheal rings. Also, angulation of right and left bronchi to the tracheal axis are more horizontal than in adults. These factors increase the incidence of accidental endobronchial intubation in children[6].

Methodology

A total number of 90 paediatric patients posted for elective surgeries under general anaesthesia and satisfying the inclusion criteria were enrolled in the study after obtaining informed, written, valid consent from their parents/guardian. Then the patients were randomised into three groups:
Group B(n=30): Patients maintained with Baska mask Group I (n=30): patients with I-gel.
Group P(n=30): Patients with LMA-Proseal.

Inclusion criteria

1) ASA grade I and II.
2) Children of either sex.
3) Weight of 10 to 25 kgs.
4) Mouth opening of more than 3 cm.
5) Elective lower abdominal, urological and orthopaedic surgeries of duration less than 60 minutes, such as Circumcision, Orchidopexy, Herniotomy, Orthopaedic upper limb and lower limb short procedures, etc.

Exclusion criteria

1) Patients with active upper/lower respiratory tract infections.
2) Patients at risk of aspiration.
3) Patients with known systemic/syndromic comorbidities.
4) Patients with airway abnormalities, loose teeth, etc.
5) Uncooperative children.

Method of study

A prospective randomised single blinded comparative study was planned, with the randomisation sequence being computer-generated.
Pre-anaesthetic evaluation of all patients were done on the previous day of surgery by an anaesthesiologist. All patients under the above-said inclusion criteria, were randomly allocated into following groups after taking informed, written and valid consent from their parents/guardian:
Group B(n=30): Patients receiving Baska mask Group I (n=30): patients receiving I-Gel.
Group P (n=30): Patients receiving LMA-ProSeal.

All patients in each group were maintained on nil per oral as per standard guidelines prior to

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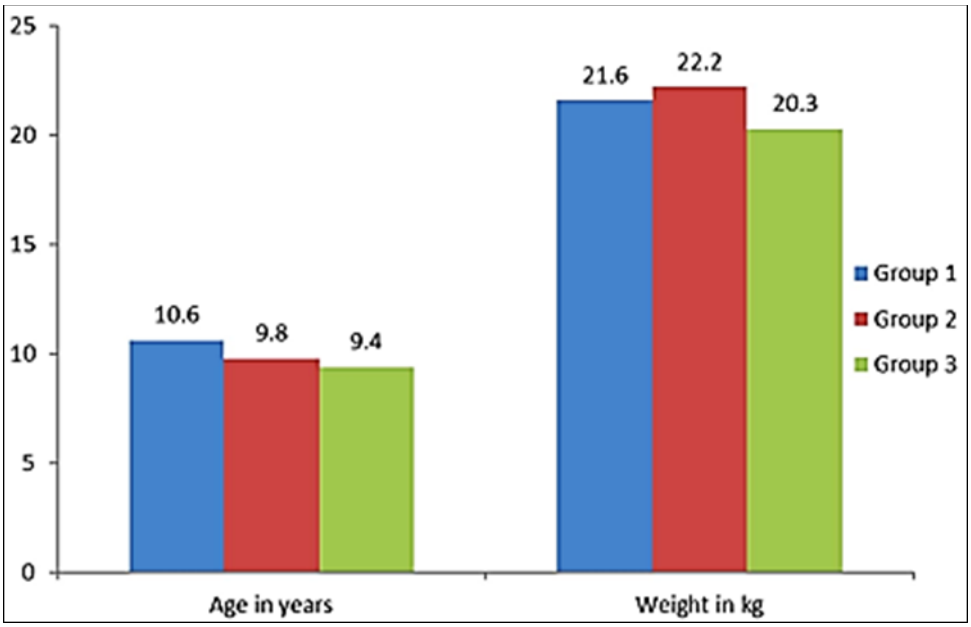
surgery and pre-medicated with Tab. Ranitidine 1.5mg/kg the night before surgery.

Results

Table 1: Age and weight distribution of study participants (Group B: Baska mask, Group I: I Gel and Group P: LMA ProSeal)

Sl. No.	Features	Group B (N=30)		Group I (N=30)		Group P (N=30)		p value#
		Mean	SD	Mean	SD	Mean	SD	
1.	Age in years	10.6	0.9	9.8	1.3	9.4	0.9	0.43
2.	Weight in kg	21.6	1.2	22.2	1.8	20.3	2.9	0.54

Note: # p value based on ANOVA test, SD-Standard deviation.



Graph 1: Age and weight distribution of study participants (Group-1: Baska mask, Group-2: I Gel and Group-3: LMA Proseal)

Group B (Baska mask) has 30 patients with a mean age of 10.6 years with a standard deviation of 0.9, group I (igel) has 30 patients with a mean age of 9.8 years with a standard deviation of 1.3 and group P (LMA ProSeal) has 30 patients with a mean age of 9.4 years with a standard deviation of 0.9. ANOVA test was used for comparison of the three study groups and with pvalue obtained as 0.43, the three groups are comparable in terms of age. On comparison of weight of patients in these three groups, group B patients have a mean weight of 21.6 kg witha standard deviation of 1.2, group I patients have 22.2 kg with a standard deviation of 1.8 and group P have 20.3 kg with a standard deviation of 2.9. Based on ANOVA test, p value obtained here is 0.54, hence the groups are comparable in terms of weight as well.

Table 2: Gender and ASA distribution of study participants (Group B: Baska mask, Group I: I Gel and Group P: LMA ProSeal)

Sl. No.	Features	Group B (N=30)		Group I (N=30)		GroupP (N=30)		Pvalue#
1	Gender	n	%	N	%	n	%	
	Female	1	3.3	3	10	6	20	0.12
	Male	29	96.7	27	90	24	80	
2	ASA grade I	30	100	30	100	30	100	NA

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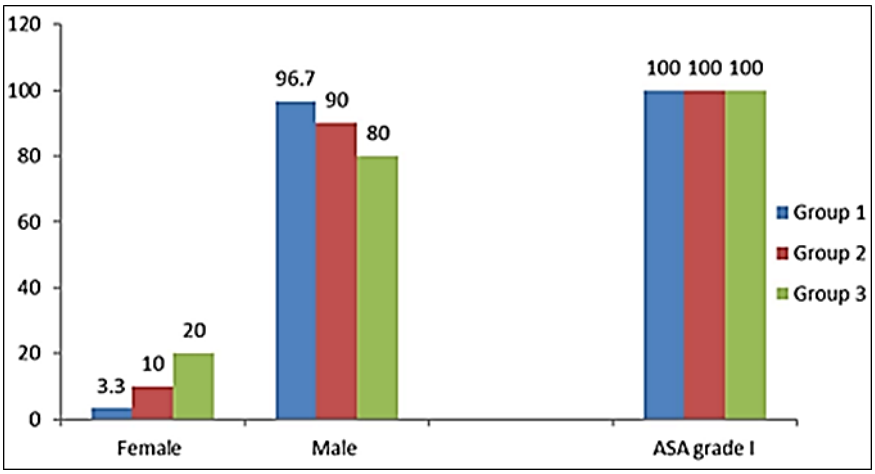
Note: # p value based on Chi-square test, NA-Not Applicable.



Graph 2: Gender and ASA distribution of study participants (Group-1: Baska mask, Group-2: I Gel and Group-3: LMA ProSeal)

As per the above table and graph, group B had 1 female (3.3%) and 29 male (96.7%) patients, group I 27 male (90%) and 3 female (10%) patients and group P 24 male (80%) and 6 female (20%) patients. Based on Chi-square test, p value obtained is insignificant(p value=0.12) which implies that all three groups are comparable. With all patients in all three groups being ASA grade 1, they are comparable in terms of the same.

Discussion

90 paediatric patients weighing 10-25 kg, of ASA grade I and II, of either sex, scheduled for elective lower abdominal, urological and orthopaedic surgeries undergeneral anaesthesia were included in the study with 30 patients in each study group (Group B: Baska mask, Group I: igel and Group P: LMA ProSeal).

Patients falling under our inclusion criteria were randomly allocated into three groups as mentioned above according to the SAD chosen for each-B, I and P, after taking informed written valid consent from their parent/ guardian. After overnight fasting as per standard guidelines and premedication with midazolam atomised intranasal spray 0.2 mg/kg half an hour before surgery, patients were shifted to OT, IV line was secured and monitors connected. Pre- medication with Inj. Glycopyrrolate 0.004 mg/kg and Inj. Fentanyl 2 mcg/kg IV was followed by preoxygenation with 100% Oxygen for 3 minutes and induction with Inj. Propofol 2 mg/kg

IV. This was followed by facemask ventilation with 1% to 3% Sevoflurane with Oxygen and once eyelash and airway reflexes disappeared, the SAD chosen for the group studied was inserted. Time in seconds from the device touching the teeth to the first recorded near rectangular capnogram curve was recordedas timetaken forinsertion, the primary objective of our study. Number of attempts taken are noted. Ease of insertion of SAD and gastric tube through the SAD are graded. Airway seal pressure measured by manometric stability test and occurrence of postoperative complications were also recorded[7, 8].

All the three groups had comparable demographic factors-age, weight, gender distributionandASA status. Group B patients had a mean age of 10.6 ± 0.9 years and weight of 21.6 ± 1.2 kg, group I 9.8 ± 1.3 years and 22.2 ± 1.8 kg and group P 9.4 ± 0.9 years and 20.3 ± 2.9 kg, with a p value of 0.43 and 0.54 respectively. Group B had 96.7% male and 3.3% female patients, group I 90% male and 10% female patients and group P 80% male and 20% female patients, with an insignificant p value of 0.12. All chosen patients in all three groups fell into ASA grade 1.

Conclusion

All the three groups had comparable demographic factors – age, weight, gender distribution and ASA status.

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