Changes in O_2 Saturation During Inhalational Induction of Anaesthesia in Children - A Comparison Between Halothane & Isoflurane

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Objective: To study the change in O_2 saturation during induction of anaesthesia in children. A comparison between Halothane and Isoflurane. **Study design:** Prospective comparative study. **Place and duration of study:** Department of anaesthesia Services Hospital Lahore. **Patient and methods**: This study was conducted in 2004 on 70 children irrespective of sex age range 1-10 year. **Results**: A total 70 children were studied 35 in each group. The result showed that halothane is a better inhalational induction agent then isoflurane. **Conclusion:** Halothane is better than isoflurane for inhalational induction in children.

Key words: Anaesthesia, Halothane, Isoflurane children inhalational induction.

Inhalational induction is basic technique to induce anaesthesia in small children, as they are afraid of intravenous cannulation[1]. Halothane has been used for inhalational induction for decades in Pakistan mainly because of its availability. It also has sweet smell, fairly rapid predictable and potent effect with minimal irritation to respiratory tract [2]. But the hepatotoxic blame it carries especially on repeated exposures and cardiac dysrrythmia in the presence of hypoxia or hyper-carbia lead us to search a new agent devoid of such effects[3].

Isoflurane has recently become available in Pakistan with low blood gas solubility and has no hepatotoxic effect, expecting that it could replace halothane for inhalational induction[3].

Halothane hepatotoxicity on repeated exopsure has been shown to be more in adults than children. This may be because children metabolize the halothane faster than adult. More common mild form of hepatitis may result from reductive bio-transformation of halothane in presence of genetic susceptibility or reduced hepatic oxygenation, while rare fulminat form is most likely to be immune mediated[4].

Current evidence suggests that isoflurane is rarely reponsible for postoperative hepatotoxic. Isoflurane has less blood gas solubility coefficient 1.4 than halothane 2.3. So it should induce anaesthesia rapidly than halothane but practically its induction is slower than halothane because of its lesser potency and other following reasons[5].

The irritant effect of isoflurane causes respiratory complications and there are high incidences of cough, breath holding and laryngospasm with excessive movements and excitement in children leading to prolonged inductioning. So it is not an ideal agent for inhalational induction in children[6].

Patient and method:
Study was conducted in Services hospital anaesthesia department in 2004 in 70 children of either sex aged between 1-10 year with ASA-I status. SaO_2 and time was noted before induction and then after every 10 Seconds during the induction till completion.

Inclusion criteria: Age 1-10 year of either sex
Exclusion criteria: Patient with any medical disorder.

Results:
The study was conducted on 70 children in anaesthesia department of services hospital in 2004. The results showed in tabulated forms.

Table I: Duration of induction (Seconds)

	Halothane	Isoflurane	P. Value
N	35	35	
Mean Time (Seconds)	192	221.42	.001
SD	21.52	37.50	
SEM	3.63	6.33	
Min Duration	170	190	
Max Duration	270	290	

Table II: Minimum SaO_2 during Inhalational induction

SaO_2 %	100-95	94-90	<90
Halothane n=35	28	7	0
Isoflurane n-35	12	12	11
P Value		0.0001	

Table III: Airway Complications

	Isoflurane	Halothane
Excessive salivation	1	1
Coughing	13	0
Breath holding	07	01
Laryngospasm	02	0
Total	23	02

The results showed that SaO_2 in halothane group remained above 95% in 80% population and it did not drop below 90% even in a single case. While in isoflurane group SaO_2 remained at or above 95% only in 33% population and below 80% in 20% population which was statistically significant ($P < .001$).

The duration of induction was also longer in isoflurane group, which was statistically significant $P < .001$ Because isoflurane caused much irritation to the airways leading to excessive salivation, coughing, breath holding and laryngospasm which lead to prolonged induction and hypoxia in many cases as compared to halothane.

Fig. 1: Profile of duration of induction

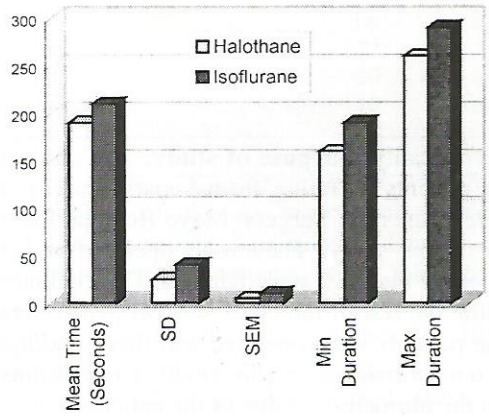
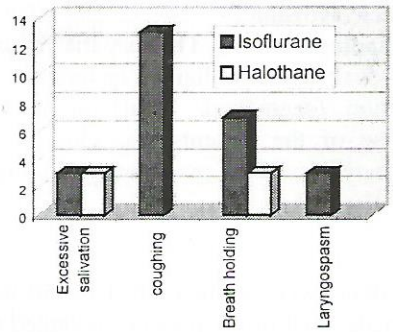


Fig. 2



Airway complications noted during inhalational induction of anaesthesia were more frequent in children who received isoflurane than those who received halothane. Cough was noted in 13 children receiving isoflurane while none in the halothane group. Breath holding was noted in 7 children in isoflurane group and only in one child in halothane group. Laryngospasm was noted in 2 children in isoflurane group and none in halothane group. For analysis of Airway complications chi-square test was applied which came to be 4.5 and degree of freedom (df) was 1 and P-value was 0.034* which is statistically significant.

In children who received isoflurane minimum SaO_2 less than 95% occurred most frequently with coughing, breath holding and laryngospasm but not due to excessive salivation.

Discussion:

Despite the introduction of topical analgesic cream, a survey in August, 1995 showed that 30% anaesthetists use inhalational induction to induce anaesthesia in children less than 3-5 years of age. Children are afraid of needle and sometimes it is difficult to get intravenous line in awake younger children. Inhalational induction is also simple, cheaper and useful technique in patients with compromised upper airway and potential intubation difficulties. Halothane due to its inherent pharmacological properties; as high potency, lack of flammability in usual concentration, relatively smooth administration without much irritation of airways, and cost effectiveness, is widely used in Pakistan and many other countries.

In this study either halothane or isoflurane was used in unpremedicated paediatic patients of ASA-I status between one to ten years of age. In halothane group 28 children (80%) had SaO_2 above 95% while 7 children (20%) had SaO_2 dropped to 90% during induction but no child had oxygen saturation dropped below 90%. The results of study show that no patient had hypoxia in halothane group.

According to results of our study in isoflurane group only 12 children (34.3%) had SaO_2 in the range between 100 to 95 percent, while in 34.3% children SaO_2 dropped upto 90% during the induction of anaesthesia, 31.3% children had oxygen saturation dropped below 90%, which is statistically significant because $P > 0.0001$.

This drop in oxygen saturation was noted while child were having problems like, breath holding, and coughing etc, which was particularly associated with isoflurane induction. Airway complications are minimal in halothane group but more than 60% in isoflurane group. The mean induction of anaesthesia time in halothane group is 192 seconds and in isoflurane group is 221.42 seconds, which is longer as compared to halothane which is statistically significant because $P < .001$.

In one study done by cattermole et al said that the time between induction and the loss of eye lash reflex was similar in both groups: Halothane (mean±SD) 2.1 Minute ±.9 minute isoflurane 2.4 minute ± 1.1.

Conclusion:

This study has demonstrated that during inhalational induction of anaesthesia, comparison between halothane and isoflurane shows that isoflurane is irritant to the airway causing airway complications; leading to hypoxia and prolonged induction time while halothane is minimal irritant on inhalation. So rapid induction and better oxygenation is maintained.

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