



A EFFECT ON PERFUSION INDEX FOLLOWING PROPOFOL VERSUS ETOMIDATE INDUCTION IN PATIENT UNDERGOING SURGERY UNDER GENERAL ANAESTHESIA IN TERTIARY CARE:- A PROSPECTIVE STUDY.

Anaesthesiology

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ABSTRACT

Background- The perfusion index (PI) is the ratio of the pulsatile blood flow to the non-pulsatile or static blood in peripheral tissue. PI indicates the status of the microcirculation which is densely innervated by sympathetic nerves, and therefore, is affected by multiple factors responsible for vasoconstriction or vasodilation of the microvasculature. Propofol and etomidate are induction iv agents which acts on Gaba receptors, etomidate also has structural similarities to $\alpha 2b$ agonists which results in vasoconstriction. Hence, cardiovascular stability is more defined with etomidate. **Materials And Method-** it is prospective single blinded randomized control study where study size is 60 which is divided into two groups by randomly allocated into group a: propofol group and group b: etomidate group. Study will be conducted in tertiary health care centre for duration of one and half year. The hemodynamic changes were recorded at baseline, at one minute, two minute and three minutes of induction. One minute, three-minute, five-minute, ten minute and fifteen minutes post induction. **Conclusion:-** it is concluded that when the patient has higher chance of incidence of hypotension the value of perfusion index was low while if the blood pressure is more stable with respect to baseline blood pressure the value of perfusion index is in higher range.

KEYWORDS

Perfusion Index, Propofol, Etomidate

INTRODUCTION

Induction is a critical phase of general anaesthesia ⁽¹⁾. In general anaesthesia airway management and patient safety is the most important aspect of patient management. Anaesthetics used in general anaesthesia depress the autonomic nervous system and helps in safety of general anaesthesia because they not only suppress excessive sympathetic activity evoked by surgery, but also suppress parasympathetic reactions ⁽²⁾. The attenuation of sympathetic activity during general anaesthesia is usually assessed by monitoring changes in blood pressure or heart rate. Anaesthesia induction is commonly initiated by intravenous administration of hypnotics for abruptly bringing wakeful patient into unresponsiveness to strong adrenergic stimuli including tracheal intubation and surgical procedures ⁽³⁾, general anaesthetic induction agents may decrease arterial blood pressure via myocardial depression, vasodilatation and attenuation of autonomic nervous activity ^{(3),(4),(5)}.

An ideal agent for general anaesthesia should have properties such as haemodynamic stability, minimal respiratory side effects, rapid clearance and minimal drug interaction. The perfusion index (PI) is the ratio of the pulsatile blood flow to the non-pulsatile or static blood in peripheral tissue. Perfusion index thus represents a non-invasive measure of peripheral perfusion that can be continuously and noninvasively obtained from a pulse oximeter. This index can serve as a valuable indicator of perfusion status ^(6,7).

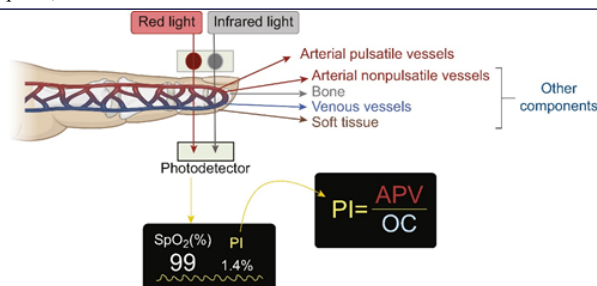


Figure no.2: Perfusion Index

The PI provides instant and continuous feedback as to the perfusion status of the selected monitoring site. PI indicates the status of the microcirculation which is densely innervated by sympathetic nerves, and therefore, is affected by multiple factors responsible for vasoconstriction or vasodilation of the microvasculature. It is also purported to be an indicator of systemic vascular resistance (SVR) effect on maintaining the circulation to vital organs. Over the years there has been a continuous search for better and safer intravenous agents. In this study we have taken injection propofol and injection etomidate as iv induction agent. Propofol is 2, 6-diisopropylphenol, it consists of a phenol. It is available as 1% and 2% concentration, the molecular weight is 178.27. propofol constituents of 10% soyabean oil, 1.2% purified egg phosphatide and 2.25% glycerol. Propofol should be used within 6 hours of opening the vial since it is preservative free. It is the drug of choice for the induction of anaesthesia in millions of patients every year because of its rapid onset of action and recovery with short duration of 6 action, easy titration, and lesser side effects. (despite these positive attributes, it is associated with hypotension). Propofol acts on gaba receptors. It increases transmembrane chloride conductance on activation of gaba receptors resulting in hyperpolarization of postsynaptic membrane which leads to post synaptic neuron inhibition. At cellular level, propofol induces the release of nitric oxide, acts as a calcium channel blocker and activates protein Kinase C. Propofol in a dose of 2 - 2.5 mg/kg causes systolic bp to drop by 25% -40% propofol metabolized mainly in liver by oxidation and conjugation and then excreted through the kidneys. Etomidate is an alkyl imidazole-5-carboxylate esters, contains carbonylated imidazole compounds. Etomidate is acidic with a PH of 6.9. Etomidate acts on gaba-a receptors it is a selective modulator of gaba-a receptors. It increases the affinity of the inhibitory neurotransmitters to this receptor. Etomidate provides a safe cardiovascular profile, and causes less significant fall in blood



Figure no.1: Pulse Oximeter with PI

pressure. A patient with cardiovascular disease depends on the sympathetic tone for maintaining the blood pressure, systemic vascular resistance (SVR), and cardiac output. Etomidate has structural similarities to α_2 agonists which results in vasoconstriction, by its action on α_2 receptors the need for treatment of post induction hypotension is negotiated. This explains its hemodynamic stability. Hence, it is considered as an ideal induction agent in patients with compromised cardiovascular system. There is minimal change in heart rate, cardiac output or stroke volume. It has no effect on the sympathetic nervous system or on the function of the baroreceptor. For general anaesthesia -0.3 to 0.4mg/kg i.v over 30 to 60 seconds.

AIMS AND OBJECTIVES

To compare and correlate of PI and changes in haemodynamic response following propofol and etomidate induction.

MATERIALS AND METHOD

After ethical committee approval and informed consent, patients posted for forearm and hand surgery were included in study randomly. Study design: it will be a prospective single blinded randomized control study. Study site: the study will be conducted in tertiary health care centre. Study duration: the study will be conducted for over a period of one and half years. Sample size: 60. Selection criteria. Epiinfo-7 software is used for data management; statistical analysis was conducted using the IBM SPSS 22. Software and R-4.1.0 software, the appropriateness of the data to the normal distribution was examined by the Kolmogorov Smirnov test.; the unpaired student's t-test for equality of means was employed for inter group comparison after obtaining the mean values and the SD and the two-tailed significance (p) was calculated. The paired t-test was utilized for intra group comparison. P values below 0.05 were evaluated as statistically significant results.

DISCUSSION

In our present study, we have concluded that the patient has higher chance of incidence of hypotension if value of perfusion index was low, while if the blood pressure is more stable with respect to baseline blood pressure the value of perfusion index is in higher range.

Perfusion index may detect changes in central blood volume earlier than traditional measures, such as mean arterial pressure⁽⁸⁾, potentially offering a more sensitive tool for hemodynamic management. Research has shown that lower perfusion index values correlate with

Table no.1: PI Comparison Between Group A And Group B

Pi	Etomidate	Paired t test P value	Propofol	Paired t test P value
Baseline	1.53 $\pm$ 1.15		1.40 $\pm$ 0.90	
Post induction 1min	1.78 $\pm$ 1.08	0.040	1.56 $\pm$ 0.82	0.220
Post induction 2min	2.23 $\pm$ 1.54	0.002	2.01 $\pm$ 1.52	0.050
Post induction 3min	2.53 $\pm$ 2.22	0.003	2.52 $\pm$ 3.17	0.067
Post intubation	3.31 $\pm$ 2.39	<0.001	3.12 $\pm$ 2.76	0.004
Post intubation 1min	4.35 $\pm$ 3.13	<0.001	3.29 $\pm$ 3.12	0.006
Post intubation 3min	4.72 $\pm$ 2.99	<0.001	3.69 $\pm$ 3.39	0.002
Post intubation 5min	5.07 $\pm$ 2.80	<0.001	3.96 $\pm$ 2.75	<0.001
Post intubation 10 Min	5.47 $\pm$ 2.73	<0.001	3.65 $\pm$ 2.28	<0.001
Post Intubation 15min	6.01 $\pm$ 3.24	<0.001	3.76 $\pm$ 2.37	<0.001

Table no.2 :PI Comparison Within Group A, Group B

Pi	Etomidate	Propofol	Unpaired t test P value
Baseline	1.53 $\pm$ 1.15	1.40 $\pm$ 0.90	0.628
Post induction 1min	1.78 $\pm$ 1.08	1.56 $\pm$ 0.82	0.367
Post induction 2min	2.23 $\pm$ 1.54	2.01 $\pm$ 1.52	0.579
Post induction 3min	2.53 $\pm$ 2.22	2.52 $\pm$ 3.17	0.992
Post intubation	3.31 $\pm$ 2.39	3.12 $\pm$ 2.76	0.778
Post intubation 1min	4.35 $\pm$ 3.13	3.29 $\pm$ 3.12	0.197
Post intubation 3min	4.72 $\pm$ 2.99	3.69 $\pm$ 3.39	0.992
Post intubation 5min	5.07 $\pm$ 2.80	3.96 $\pm$ 2.75	0.130
Post intubation 10 min	5.47 $\pm$ 2.73	3.65 $\pm$ 2.28	0.007
Post intubation 15min	6.01 $\pm$ 3.24	3.76 $\pm$ 2.37	0.004

The fall in systolic blood pressure was less seen with etomidate group but there was gradual rise in perfusion index whereas in propofol group there was more fall in systolic blood pressure and less rise in perfusion index with respect to etomidate group. Mean diastolic pressure, mean blood pressure and heart rate do not show any significant relation with perfusion index in either of the group. We hypothesised that baseline PI will be useful in predicting hypotension following propofol and looked

poorer outcomes in both surgical patients and critically ill individuals^(9,10). In the operating room setting, increasing evidence suggests that the use of the perfusion index may help predict the occurrence of acute kidney injury postoperatively^(11,12). Given its ability to provide rapid, non-invasive insights into a patient's perfusion status, the perfusion index may emerge as a promising parameter for optimizing perioperative care and potentially reducing postoperative complications.

In 1930, introduction of intravenous anaesthetic agents caused a major shift in the concept of anaesthesia from production of anaesthesia to that of induction and maintenance of anaesthesia.

Propofol, intravenous administration causes rapid loss of consciousness, with a very rapid recovery. Propofol resets the baroreceptor reflex control of heart rate. Maximal effect is seen at 2 minutes after induction and is due to direct myocardial depression and decreased peripheral resistance and preload. The hypotensive effect of propofol is potentiated by a) large doses of propofol b) hypovolemia or CVS decompensation c) pre-existing CVS disease d) pre-medication with opiates e) use of nitrous oxide f) advanced age. So, care to be taken in patients who are hypovolemic or have poor lv function.

Etomidate, an imidazole derivative is a safe alternative with regard to hemodynamic stability. Hemodynamic stability results from reduced effects on baroreceptor reflex responses and sympathetic nervous system. It is particularly useful in patients with impaired ventricular function. There is high incidence of myoclonus with etomidate which occurs due to disinhibition of sub cortical extrapyramidal pathways. Premedication with opioids or benzodiazepines can reduce the myoclonus. It also suppresses adrenal cortical function directly; increased mortality is seen in critically ill patients receiving long term infusion. In etomidate group it is observed that perfusion index was significant throughout study but it became highly significant after 3 minutes post induction. There was increase in perfusion index at 15 minutes post intubation (6.01 $\pm$ 3.24) from baseline (1.53 $\pm$ 1.15). Whereas in propofol group also, there was significant change in perfusion index till 3 minutes post intubation (3.69 $\pm$ 3.39, pi=0.002). But it became statistically significant after 5 minutes post intubation (3.96 $\pm$ 2.75, pi <0.001). Whereas in propofol group there was increase in perfusion index from baseline (1.40 $\pm$ 0.90) to post intubation 15 minutes (3.76 $\pm$ 2.37, p value <0.001) but it was less significant with etomidate group.

for a cutoff value that predicted hypotension.

CONCLUSION

There is significant change in perfusion index following induction with propofol versus etomidate in surgeries with general anaesthesia.

As induction of anaesthesia causes sympatholysis and vasodilation,

peripheral perfusion improves hence in both the groups PI increases from baseline.

When comparing propofol and etomidate groups, the PI values in propofol group correlates with fall in blood pressure after induction where as in etomidate group the maintained hemodynamic parameters are reflected in the trends of PI values as the perfusion index raised and the study showed a statistically significant difference on comparing both the groups PI values.

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