

Discussion

Ketamine, a dissociative anesthetic agent in use since 1965, depresses excitatory synaptic transmission by acting on glutamate receptors of the N-methyl-D-aspartate (NMDA) subtype. It is considered a very safe general anesthetic agent for intravenous and intramuscular use as it has minimal effect on laryngeal reflexes so chances of gastric juice aspiration are minimal.²

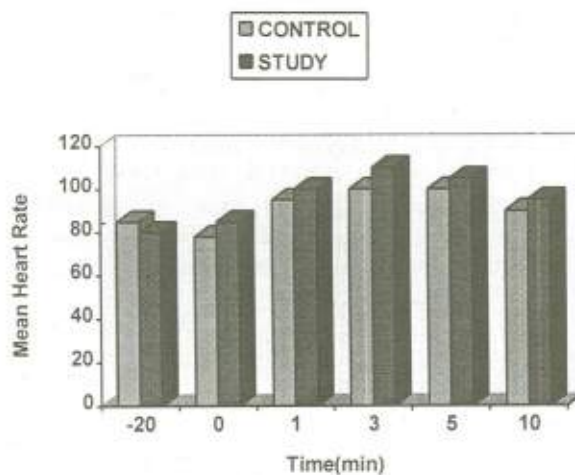
As with any other drug ketamine is not free of side effects which include, increased salivation, increased tone of muscles, nystagmus, spontaneous movements of the limbs unrelated to surgical stimulus, emergence delirium and psychological effects. The incidence of these side effects is variable and not troublesome.^{2,9} The psychological effects are common with younger age groups and less frequent in children. Even in adults the emergence delirium and hallucinations can be diminished and controlled by premedication with opioids, butyrophenones, benzodiazepines or barbiturates.² These effects are short lived and there is no evidence in literature that ketamine presents a higher risk compared to other anesthetics for causing long term psychological effects.^{2,9}

The excellent analgesic quality makes it preferred over other intravenous anesthetic agents and lately there is trend to use this drug for post operative pain in children,¹⁰ specially after cardiac surgery¹¹ and in elderly patients.¹² Because of positive inotropic effects ketamine is preferred over barbiturate induction in states of shock, because the later drugs can aggravate the condition due to their known cardio depressive effects. The hypertensive response to ketamine useful in shock states may actually be harmful for some surgical patient who present with known hypertension and ischaemic heart disease. The older patients with weak vessel walls are also at risk as surges in blood pressure following ketamine induction could cause cerebrovascular accident. This is why ketamine is

contraindicated in such patients and other neurosurgical patients with raised intracranial pressure (I.C.P) where it would raise it further.²

There is a majority of patients who come for minor surgery where muscle relaxation is not required, in this group ketamine is indicated and its use tried by making efforts to decrease its hypertensive response. In 1993 Katz et. al. tried different combinations of thiopental and fentanyl with ketamine for induction of anesthesia and found it satisfactory as far as patient satisfaction and haemodynamic stability were concerned.¹³

Oral clonidine premedication attenuates the hypertensive effects of ketamine better than lignocaine.^{3,4} Betablockers have also been found useful in this respect.² Lately the calcium channel blockers like nifedipine, diltiazem and nicardipine have



been tried to control hypertensive response to ketamine injection.^{6,8} Calcium channel blockers are useful but problem with them is of reflex sympathetic response causing tachycardia.⁷

In our study we planned to see the effect of an available safe and economical medicine on hypertensive response to ketamine induction. The results show that oral nifedipine (adalat) premedication definitely helps reducing hypertensive response following ketamine. The increase in heart rate was more in nifedipine group that shows reflex sympathetic response to this drug. The rate pressure product (R.P.P) which is a better indicator of a myocardial oxygen consumption and supply, was significantly lower in study group, the maximum being at 3 minutes after induction dose and came back to the base line in about 10-15 minutes.

We had to give second dose and allow the surgeons to proceed after ten minutes that is the time when effect of intravenous ketamine is wearing off.²

We found premedication with oral nifedipine (Adalat 10 mg) useful in decreasing hypertensive response to ketamine. The lower range of rate pressure products in study group will help us use this simple method safely on patients coming for minor surgery. The economy of the method is even more appropriate for poor country like Pakistan.

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Attenuation Of Hypertensive Response Of Ketamine By Sublingual Nifedipine

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Ketamine a dissociative intravenous anesthetic agent is associated with hypertensive response. Oral nifedipine was given before ketamine in 20 patients and its hypertensive response compared in 20 patients as control group who received only ketamine. Rate Pressure Product (RPP) of study group was lower than control group, though mean

heart rate was higher. Incidence of spontaneous activity was less in study group. Other side effects of ketamine e.g. nystagmus and increased secretion were comparable in both group. Allergic reaction was not seen in any patient.
Key words : Nifedipine; ketamine; hypertensive response.

Ketamine was introduced in clinical practice in 1965. It is a phencyclidine derivative that produces "dissociative anesthesia" rather than generalized depression of the CNS. It is a very useful agent for total intravenous anesthesia because of its good analgesic properties. It exerts its effects through sub set of glutamate receptors that are stimulated by the agonist N-methyl. D-aspartate (NMDA).¹ Initially it was used in emergency situations like, war injuries and also in patients with shock as it has positive inotropic effect and raises blood pressure and heart rate by 20 - 25%. These effects may be related to calcium influx modulated by cyclic AMP.²

The rise in blood pressure and heart rate that occurred after ketamine induction was considered harmful for patients with known hypertension, ischaemic heart disease, patients with head injury and raised intracranial pressure. Various trials have been done to diminish the side effects e.g. drugs like Beta blockers, clonidine and lignocaine were tried before giving ketamine with some success.^{3,4,5}

Recently calcium channel blockers were tried to see their effect on hypertensive response to ketamine.^{6,7,8} We planned our study to see the effect of oral nifedipine (adalat) on haemodynamics of ketamine. The idea was to make the use of ketamine safe and more frequent by adding a simple premedication. To avoid emergence delirium, hallucinations and psychological effects all patients received a benzodiazepine (Diazepam) premedication as well.⁹

Material and Methods

Forty patients both male and female of ASA I and II groups, between 20-50 years, undergoing minor surgery (skin grafting, debridement, dressing etc.) over their limbs were randomly divided into two groups: a study group (oral nifedipine + ketamine) of twenty patients and a control group (ketamine only) of twenty patients. Patients with excessive weight (> 90kg) morbid obesity, apparent upper air way difficulty (short neck, protruding incisors etc.) recent history of head injury or known to have hypertension (B.P. more than 140/90) ischaemic heart disease or sepsis were excluded from the study.

Weight in both groups ranged between 55-65 Kg, all patients received 5 mg diazepam intravenously half an hour before induction of anesthesia with ketamine. Base line blood pressure and heart rate were recorded 5 minutes after diazepam

injection and nifedipine (adalat) 10 mg capsule was cut and drug placed sublingually. Patients were advised to swallow any drug that trickled down the pharynx as absorption is equally good from stomach.

Heart rate, blood pressure (systolic, diastolic and mean) and oxygen saturation was monitored by non-invasive automatic monitors (Dinamap). All parameters were recorded just before giving ketamine and then at 1,3,5 and 10 minutes after induction. Surgery was not allowed during this period to avoid any added stimulatory effect. Other parameters like nystagmus, spontaneous activity and secretions were also recorded.

Results

The mean blood pressure (Fig -1) and rate pressure products (R.P.P.) were significantly lower in the study group as shown by graphic presentation (Fig -2), but heart rate (Fig. 3) in this group remained higher throughout the study period probably due to reflex sympathetic response. Heart rate in the study group was lower at base line probably due to the benzodiazepine sedation. Nystagmus and increased secretions were observed in all patients but were not significant to cause air way problem. Incidence of spontaneous activity (limb and jaw movements) was less in study group seen in 60% patients only as compared to 80% patients in control group.

