Original research article

Study of Efficacy of Clonidine as an Adjunct with with 2% Lignocaine for Duration of Analgesia and Hemodynamic Changes in Epidural Anesthesia

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Abstract

Background: Epidural anesthesia have important role for surgeries of lower abdomen, pelvis and lower limbs as they offer excellent operating conditions and are relatively safe for patients. This is especially useful in patient who are at risk of pulmonary aspiration

Materials & methods: The study comprised of 60 ASA grade I and II patients, of either sex, age group 20-70 years and weight 40-75 kg. undergoing elective surgeries on lower limbs, pelvis or abdomen with no contraindication to epidural anesthesia were selected. All patients were admitted in Gynecology, Surgery and Orthopedics ward, was conducted in the Department of Anesthesiology ANMMCH Gaya.

Conclusion-: clonidine will definitely expand scope and improve the reliability and efficacy of epidural anesthesia. The major clinical place of clonidine is as on adjuvant to other analgesics and local anesthestic as shown in number of studies.

Keywords: Clonidine, Epinephrine, Hemodynamic, Vasoconstrictor.

Introduction

Epidural anesthesia have become increasingly popular in recent years for surgeries of lower abdomen, pelvis and lower limbs as they offer excellent operating conditions and are relatively safe for patients. This is especially useful in patient who are at risk of pulmonary aspiration. It offers benefits in the form of, greater hemodynamic stability, absence of risk of post dural puncture headache and provision of postoperative analgesia via an epidural catheter. August Bier (1988**)** was the first to produce spinal anesthesia by experimenting on himself. He was himself the first reported case of post dural puncture headache. Kappis (1912) was the first to perform epidural block in man Although this technique was first applied in clinical practice by **Pages** (1921). The technique could not gain wide acceptance because of non-availability of safe local anesthetics. The only local anesthetic available at the time was cocaine, which was both neurotoxic and carried the risk of dependence. This problem was overcome with the introduction of lignocaine by Lafgren (1948**)** and later bupivacaine by Ekenstam (1957). Continuous epidural anesthesia for relief of postoperative pain was first introduced by Cleland (1949) in obstetrics for painless labour. A major problem with the use of epidural anesthesia for postoperative pain relief was the presence of concomitant motor paralysis, which prevented early ambulation. This led to a search of a drug that provided postoperative analgesia without motor paralysis. Opioids were the first drugs used for this purpose. The superiority of intrathecal and extradural administration of opioids as compared to conventional routes of administration have been shown in many reports (Yaksh and Rudy 1976, Lanz 1982**)**[1]. Addition of opioids to local anesthetics results in decreased degree of motor blockade and decreased requirement of local anesthetics. Also

the quality of analgesia is better with local anesthetic and opioid combination as compared with local anesthetic alone. But the use of neuraxial opioids carries its own disadvantages, viz, nausea and vomiting, respiratory depression, pruritus (Glynn et at 1979**:** Doblar et al[2] 1989: Riez and Westberg 1980). Epidural clonidine improves the quality of anesthesia, reduces the dose requirement of the anesthetic agent, and provides a more stable cardiovascular course during anesthesia. Epidural or intrathecal administration of clonidine potentiates the anesthetic effect and reduces the dose requirement of volatile or injectable general or regional anesthetic agent with correspondingly fewer side effects.

Materials & methods

The study comprised of 60 ASA grade I and II patients, of either sex, age group 20-70 years and weight 40-75 kg. undergoing elective surgeries on lower limbs, pelvis or abdomen with no contraindication to epidural anesthesia were selected. All patients were admitted in Gynecology, Surgery and Orthopedics ward, was conducted in the Department of Anesthesiology Anugrah Narayan Magadh Medical College and Hospital Gaya, Bihar. Study duration of Two years. They were randomly divided into two groups to avoid selection bias.

Group I (n-30) : **Control Group,** to receive 2% Lignocaine in the dose of 20 ml with equivalent amount of Distilled water to compensate for the volume of the study drug.
Group II (n-30) : **Study Group** to receive 2% Lignocaine in the dose of 20ml with clonidine 17g/kg. body weight.

Detailed history of all the cases along with the findings were recorded during preanaesthetic examination specially prepared for this study. Present and past history along with previous history of surgery and anesthesia were taken. Family history and personal history regarding life style, dietary habit, smoking, alcohol intake and medication history were explored. The nature and advantage and disadvantage of anesthesia, were fully explained and full cooperation were also obtained from the patients.

Main aim of premedication was to keep the patient free from apprehension and aspiration prophylaxis. An informed & written consent from all patient were taken. Baseline pulse rate, blood pressure and weight of the patient were recorded prior to administration of epidural anesthesia.

All patients were premedicated 30 minutes before the procedure with :

1. Inj. Atropine (0.6 mg) 1 ampoule IM.
2. Inj. Metoclopramide (10mg) 1 ampoule IM.
3. Inj. Ranitidine (50mg) 1 ampoule IV.
4. Antibiotic IV.
5. Infusion Ringer's Lactate 20ml/kg body weight.

All these articles except pre sterilized one were sterilized by autoclaving at 120 degree Centigrade under 20 lb pressure for 30 minutes.

Technique :

Pulse rate, Blood pressure were checked and recorded as soon as patient is brought to operation table. All the patients were preloaded with 20ml / kg body weight of crystalloid.
Patients were placed in lateral position and in sitting position, if difficulty occurred in lateral position in detecting the epidural space. The back was washed with savlon and betadine subsequently and then cleaned with spirit. After draping with sterile towel the highest point

of iliac crest was palpated and interspinous space of L3-4 was identified. The spine of the patient was flexed more to increase the width of space with help of operation theatre anesthesia assistant. After entry into epidural space absorption was done for blood or CSF. The epidural catheter was introduced through needle and 2-4 cm of it was kept in epidural space. Then test doses of 45 mg of lignocaine was introduced through catheter to detect subarachnoid or intravascular placement of catheter. After 3-5 min, the needle was taken out keeping the 2-4 cm of catheter in epidural space. Then the drug was introduced through catheter in epidural space. Patient was asked about feeling of numbness, tingling sensation, warmth in toes and feet, after some time of injection. The time of injection noted.
Side effects : If any were looked for.
Duration of analgesia **:** The time between drugs administration and need for rescue analgesic was taken as the duration of anesthesia.
It is crystalline white colorless powder with bitter taste. It is readily soluble in water. The ph is 6.66 and specific gravity is 1.030-1.035. The pka value is 7.8. Lignocaine is chemically N-di-ethyl aminoacetyl 2,6 xylidine hydrochloride monohydrate. It is compatible with adrenaline and Noaradrenalin.

Metabolism : The principal metabolic pathway of lidocaine is oxidative dealkylation in the line to monoethylglycinexylidine followed by hydrolysis of this metabolite to xylidine. In human approximately 75% of xylidine is excreted is urine as 4 hydroxy-2-6 dimethylaniline. Hepatic disease or decrease in hepatic blood flow which may occur during anesthesia can decrease the rate of metabolism of lidocaine. (Text is adapted from Miller RD 2005, Morgan 2002, Steolting 1999.)

Results

Table 1: Mean onset of analgesia in the two groups

Groups	Mean (min) ± S.E.
I - Control group (n = 30)	11.50 ± 0.61
II - Study group (n = 30)	9.07 ± 0.52

Mean onset of analgesia with standard error is shown in Table - 1. The difference between onset between the groups is highly significant statistically (t value - 3.032, p value - < 0.01).
Graph showing mean onset of Analgesia in two groups Onset of analgesia study group has early onset of analgesia. (9.07 Vs 11.50 min) P < 0.01 statiscally highly significant.

Table 2: Quality of analgesia in the two groups

Age (years)	Group-I (n=30) (Control group)		Group-II (n=30) (Study group)	
	No.	%	No.	%
Excellent	18	60.0	22	73.3
Fair	8	26.7	6	20.0
Poor	4	13.3	2	6.7

Table No.- 2 shown the quality of analgesia in two groups in terms numbers and precentage. Quality of analgesia improved in the study group than control group that is lesser number of patient complained of pain or discomfort in study group. The study group had 73% of patient with excellent analgesia as compared to 60% in control group. Fair and poor analgesia

was more common in control group. Study group experienced better quality of analgesia than control group (60% Vs 73%) Excellent analgesia.

Table 3: Incidence of hypotension & shivering in the two groups

Groups	Frequency
I - Control group (n = 30)	**10**
II - Study group (n = 30)	**5**

incidence of hypotension in both groups. Control groups has twice number of patients having hypotension and shivering than the study group. The incidence of side effects like hypotension shivering was 50% less in study group than that of control group. Incidence of these side effects were 33.33% in control group and 16.67% in study group. Study group had half the incidence of hypotension and shivering as that of control group (16.67% Vs 33.33 %)

Discussion

The interesting pharmacological profile of recently introduced preservative free parentral formulation of clonidine[3]. Search for a good adjuvant for local anesthetic in regional block is as old as the discovery of these agents so that duration and quality of anesthesia may be increased without facing much side effect. The list of drugs tried and used is very long and endless. The drugs that gained importance and acceptance were mainly adrenaline opioids benzodiazepines alpha-2 agonists. And among alpha-2 agonists[4], **clonidine** is been investigated and studied most. This molecule has a very promising feature. This chapter is dedicated for discussion of the observations that were recorded and reasons for it. The mean onset of analgesia in control group was 11.5± 0.61 min. and 9.07±0.52 min. in study group. The difference of mean of onset analgesia of both groups was found to be statistically highly significant t-value 3.032, p-value < 0.01. Early onset of analgesia with addition of clonidine may be due to its own intrinsic analgesic activity by causing inhibitions of substance P at the posterior horn cells of spinal cord. (Table – 1)[5]. Quality of analgesia also improved in the study group than control group that is lesser number of patient complained of pain or discomfort in study group. The study group had 73% of patient with excellent analgesia as compared to 60% in control group. Fair and poor analgesia was more common in control group. (Table – 2)[6]. There are various mechanisms proposed for the above analgesic parameters observations seen in the above study. Clonidine stimulates inhibitory alpha-2 adrenoceptors to reduce central neural transmission in he spinal neurons inhibition of substance-P release is believed to be involved in the analgesic effect[7]. The analgesic action is through alpha-2 adrenoceptors as shown by partial reversal of epidural of clonidine analgesia and sedation, by the alpha-2 adrenergic antagonist yohimbine, although the effects on blood pressure and heart rate were not reversed[8]. The alpha-2 adrenoceptors are located on the afferent terminals of both peripheral and spinal neurons, on neurons in the superficial laminae of the spinal cord, and within several brainstem nuclei implicated in analgesia[9]. The possible site/s of analgesic action of clonidine is one or more of these locations[10]. The incidence of side effects like hypotension shivering was 50% less in study group than that of control group. Incidence of these side effects were 33.33% in control group and 16.67% in study group. This was attributed to a more stable hemodynamic course of anesthesia after adding clonidine to local anesthetic[11]. Sedation was taken as a benefits effect rather than a side effect. Clonidine stimulates the alpha-2 receptors in the Reticular activating system (Locus Ceruleus) which has on

inhibitory effect on the sleep wake cycle[12]. This causes sedation and prevents or stop shivering.

Summary and Conclusion

All the patients underwent thorough pre-anesthetic checkup. The patients were reassured and the procedure explained to them. A written & informed consent were taken. The patients were randomly selected for each group to avoid selection bias and confounding factor bias.

Group - I (control) :- They received 2% lignocaine (preservative free) as fixed dose of 20ml + equivalent amount of distilled water as compensation for dose of the clonidine in study group.

Group – II (study) :- They received 20ml of 2% lignocaine (preservative free) plus 1μg/kg body weight of clonidine.

The following parameters were observed recorded :

1. Hemodynamic :- Pulse rate, systolic and diastolic blood pressure were measured pre-operatively, post-operatively and at 10, 20, 30, 60 minutes of drug administration.
2. Onset of analgesia at T-10 dermatome by pin prick method.
3. Quality of analgesia.
4. Duration of analgesia i.e. from the time of drug dose to the time of demand for analgesia.
5. Side effects of any were recorded.

All patients in both groups were comparable with respect to ASA grade, mean

1. Provides better hemodynamic stability in terms of pulse rate, systolic and diastolic blood pressure
2. Fastens the onset of analgesia.
3. Produces marked improvements in quality of analgesia
4. Prolongs duration of analgesia very significantly.
5. Decreases total dose of Local Anesthetics requirement.
6. Best for single shot epidural analgesia ; catheter application & related complications can be avoided hence decreasing cost & risks.
7. No side effects are attributable to epidurally administered clonidine.

Clonidine is a very useful adjunct to the pharmacological armamentarium of the Anesthesiologists. Appropriate use of clonidine in clinical practice would help in the producing excellent quality of analgesia and stable hemodynamics in the peri-opreative period. The extensive experience with clonidine is consistent with effect of alpha-2 adrenergic agonists in regional anesthesia and with our knowledge of the pharmacology of these agents. In summary clonidine will definitely expand scope and improve the reliability and efficacy of epidural anesthesia. The major clinical place of clonidine is as on adjuvant to other analgesics and local anesthestic as shown in number of studies. The clinical experiences of clonidine deserve to be more widely used in clinical practice and every anesthesiologists should became more familiar with the various facets of this interesting drug.

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