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ORIGINAL ARTICLE

INTRATHECAL HYPERBARIC BUPIVACAINE WITH CLONIDINE AND HYPERBARIC BUPIVACAINE ALONE IN LOWER ABDOMINAL SURGERIES

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ABSTRACT

Spinal anaesthesia is effective in the management of perioperative pain which extends into the initial post operative period. In order to maximize post operative pain free period numerous techniques and newer drugs have been tried. In this study, the anaesthetic properties of 15 mg of 0.5% hyperbaric bupivacaine and 12.5 mg of 0.5% hyperbaric bupivacaine with 75µg of clonidine given intrathecally were compared.A hundred ASA physical status I and II patients, posted for various elective gynaecological surgeries were studied.The patients were divided into two groups of fifty each:Group I – Received 0.5% hyperbaric bupivacaine 15 mg.Group II – Received 0.5% hyperbaric bupivacaine 12.5 mg + 75 µg of clonidine.Addition of 75 µg of clonidine to hyperbaric bupivacaine resulted in a statistically significant faster onset of sensory block (mean time of 1.74 minutes as compared to 4.03 minutes in the Group I) and motor blockade (mean time of 2.7 minutes as compared to 4.81 minutes in Group I) with a P value <.001. The maximum level of sensory block achieved was comparable in both groups.Duration of analgesia was significantly prolonged in Group II (P < .001) with a mean duration of 211.7 minutes in Group I as compared to 316.4 minutes in Group II. Time for 2 segment regression was significantly prolonged in Group II (2O7.6 minutes in Group II and 133.58 minutes in Group I) and was found to be statistically significant. Patients were observed to have relative hemodynamic stability in Group II. The mean arterial pressure changes from baseline values varied from 12-18% for patients in group II compared with 6-10% group I. there was 15% fall in the mean pulse rate from the baseline in group II compared to 4% in group I. Side effects like dry mouth and sedation were observed in group II (16% and 28% respectively).With the above findings it is evident that the use of 75µg of intrathecal clonidine as an adjuvant to hyperbaric bupivacaine in gynecological surgeries is beneficial in several aspects and scored over the use of hyperbaric bupivacaine alone with minimal side effects.

Keywords: Spinal anaesthesia, Intraoperative, Postoperative, Bupivacaine, Clonidine.

1.INTRODUCTION

Relief of pain during operation is one of the mainstay of balanced anesthesia. So, any experience acquired in this field should be extended to thepostoperative period also. Postoperative pain relief is a growing concern for an anesthesiologist, since uneventful postoperative period makes surgery a comfortable proposition for surgical patients. Perkins and co-workers provided an insight into the reality that poorly managed acute pain like postoperative pain can lead to the occurrence of chronic pain.

Spinal anaesthesia is a safe and simple technique of providing all the requirements for surgeries. Better understanding of the physiological aspects of spinal anaesthesia, availability of long acting local anesthetic agents and understanding of pharmacokinetics and pharmacodynamics of these agents, have greatly contributed to the reincarnation of spinal anaesthesia during the last two and a half decades. It reduces surgical stress and attenuates increase in plasma catecholamines and other hormones. Regional anaesthesia gives intra and postoperative pain relief with full preservation of mental status and normal reflexes.

New trends in subarachnoid block are use of adjuvants which reduce the nature of complications as well as improve the anesthetic effect. In order to maximize post operative analgesia, a number of adjuvants have been added to spinal local anesthetics.Central neuraxial opioids, intrathecal as well as epidural offer the perceived benefit of selective analgesia without

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sensory or motor blockade.However side effects such as potentially catastrophic delayed respiratory depression have prompted further research to develop non opioid analgesics with lesser side effects. Intrathecal clonidine is being extensively evaluated as an alternative to neuraxial opioids for control of pain and has proven to be a potent analgesic, free of atleast some of the opioid related side effects.

The use of spinal clonidine / α 2 agonist has has been in use since 1984. The α2- agonist clonidine has a variety of different actions, including the ability to potentiate the effects of local anaesthetics. Unlike spinal opioids, clonidine does not produce pruritis or respiratory depression. It also prolongs the necessary blockade and reduces the amount or concentration of local anaesthetic required to produce postoperative analgesia.

If any adjuvant, given intrathecally along with a local anesthetic like bupivacaine can enhance the postoperative analgesia by reducing the need for NSAIDs in the immediate post operative period will be beneficial.The present study is aimed at evaluating the efficacy of the use of intrathecal clonidine as an adjuvant to hyperbaric bupivacaine in providing better intra operative and post operative analgesia and haemodynamic stability.

2.METHODS

A hundred ASA physical status I and II patients posted for various elective lower abdominal surgeries were studied. The patients were divided into two groups of fifty each. Group I received 0.5% hyperbaric bupivacaine 3ml (15mg). Group II received 0.5% hyperbaric bupivacaine 2.5ml (12.5mg) + clonidine 0.5ml (75µg) to keep the volume constant. Intraoperative hemodynamic stability, the onset of sensory block, onset of motor block, time taken for two segment regression of sensory block and total duration of analgesia were studied. Patients were observed for 24 hours post operatively to look for any complications.

3.RESULTS:

Addition of 75µg clonidine to hyperbaric bupivacaine resulted in a statistically significant faster onset of sensory block (Group I – 4.03min; Group II – 1.74min) and motor block (Group I - 4.81min; Group II – 2.70min). The time taken for two segment regression was significantly prolonged in Group II (Group I – 133.58min; Group II – 207.60min). The duration of analgesia was also longer in group II (Group I –211.70min; Group II – 316.40min). Patients in group II experienced a relative haemodynamic stability with minimum side effects like dry mouth and sedation(16% and 28% respectively).

4.DISCUSSION

The gate control theory of pain has had considerable influence on the anaesthesiologists management of pain focusing attention on the unique pharmacology of the dorsal horn of the spinal cord. The technique has implications in acute and chronic pain therapy. A typically modern view of perioperative pain is to view it as an impediment to recovery. Aggressive methods are often used to minimize pain to facilitate hospital discharge and a rapid return to normal functional activity. Spinal anaesthesia is the current wide spread popular anaesthetic technique available today. Spinal anaesthesia has the definitive advantage that profound nerve block can be produced in a large part of the body by the relatively simple injection of a small amount of local anaesthetic. An ideal anaesthetic agent used in spinal anaesthesia in lower abdominal surgeries should have rapid onset of action, intense analgesia, adequate motor blockade, long duration of action, adequate postoperative analgesia and minimal cardiovascular changes. Bupivacaine introduced by Ekenstam in 1957 seems to fulfill most of the requirements of an ideal local anaesthetic agent.

Spinal anaesthesia with bupivacaine is administered routinely for lower abdominal and lower limb surgeries. The ensuing sensory block is sufficient to ensure the patient‘s well being, while motor block facilitates the surgeon‘s work. It also provides effective pain relief in the initial postoperative period. Postoperative pain relief is an unresolved issue.To address the problem of limited duration of action and to improve the quality of analgesia both intra operative and postoperative, intrathecal opiates have been given in addition to bupivacaine. However, this enthusiasm was soon tempered off by reports of side effects such as pruritis, urinary retention, nausea and vomiting and respiratory depression. Although the endorphin system is well recognized, there are many other mechanisms involved in spinal antinociception and alpha2 adrenergic agonists such as clonidine, calcitonin, adenosine and somatostatin have been shown to possess spinally mediated analgesic properties.

Clonidine is a selective partial agonist for alpha2 adrenoreceptors. It is known to increase both sensory and motor block of local anaesthetic. The analgesic effect following its intrathecal administration is mediated spinally through activation of post synaptic alpha2 receptors in substantia gelatinosa of spinal cord and it works by blocking the conduction of C and A delta fibres ,increases potassium conductance in isolated neurons in vitro and intensifies conduction block of local anaesthetic.[8] Roh et al[9] recently suggested that one of the mechanisms for the enhanced potency of intrathecal clonidine administration in a rat model of neuropathic pain is its ability to modulate spinal cord NMDAR activation via suppression of NR1 phosphorylation.

Several studies have been done using different doses of clonidine (15-300µg) in order to determine the most effective intrathecal administration with minimal side effects. In our study, 75µg of clonidine was used, as it was found that the incidence of side effects increased with larger doses. In this clinical study, 100 patients in age group between 30-65 years, posted for various elective gynaecological surgeries belonging to ASA physical status I and II selected.

Group I received -3 ml 0.5% hyperbaric bupivacaine.

Group II received -2.5 ml 0.5% hyperbaric bupivacaine + 75 µg clonidine (0.5ml).

The first characteristic studied was the duration of onset of sensory block. Time in minutes was noted from the deposition of drug to the feeling of tingling sensation in the legs. In the present study, patients receiving clonidine had a faster onset of action, which was found to be statistically significant. In the present study, the onset time of sensory block varied from 3-6 mins in Group I, with a mean of 4.03 mins and 1–3 mins in Group II with a mean of 1.74 mins.

***** Group II received 37.5 µg of clonidine Our present study concurs with the studies by H.Saxena et al[56] who observed 0.92±0.08 mins as the onset time for sensory block for those patients receiving 37.5µg of clonidine in addition to bupivacaine.Maximum level achieved is comparable in both groups in our study. In majority of the cases the maximum level reached was T_6 – 66% in Group I and 68% in Group II. Our study found to be comparable with the studies conducted by Dan Benhamou, G.E.Kanazi, and H.Saxena. The time for onset of motor block in Group I was found to vary between 3.5 to 6 mins with a mean time of 4.81 mins, while in Group II it varied between 2-4 mins with a mean of 2.7 mins. The difference between the study and control groups was statistically significant.

Our study can be compared almost with the study conducted by H.Saxena et al.[56] The other authors have not mentioned this variable in their study. In our study the time taken for sensory regression in Group II was 207.6 mins while in Group I was 133.58 mins. From the below table it is clear that in all the studies conducted by different authors the mean time taken for 2 segment regression has been longer with clonidine group than control group.

***** Group I received 37.5 µg of clonidine
******Group II received 30µg of clonidine

In the study conducted by I.Dobrydnjov et al,[48] who used different doses of clonidine as 15µg and 30µg ,it was observed that duration taken for 2 segment regression was lesser for the group receiving 30µg.It was concluded that time taken for 2 segment regression is dose dependent. B.S.Sethi et al[53] compared using 1µg/kg of clonidine combined with hyperbaric bupivacaine with the control group receiving identical volume of saline mixed with hyperbaric bupivacaine. The duration for 2 segment regression with clonidine (218 mins) was comparable to our study (207.6 mins).

The duration for 2 segment regression with clonidine with hyperbaric bupivacaine in our study was comparable to that of other studies used for comparison.In our study the mean time for rescue analgesia was 211.7 mins in Group I, while patients in Group II did not require analgesics for about 316.4 mins.

***** Used Bupivacaine 6 mg
******Group II – Sufentanil 2µg + 75 µg Clonidine

From the above table it is clear that in almost all the studies conducted by different authors, the mean duration of analgesia has been longer than 250 mins with 75 µg of clonidine. H. Saxena et al56 conducted a study, who used different doses of clonidine as 15µg, 30µg and 37.5µg.It was observed that duration of analgesia was lesser for the group receiving 15µg of clonidine than the group receiving 30µg, which was less than the 37.5µg of clonidine group. It was concluded that duration of analgesia is dose dependent. Total analgesia time was prolonged in our study similar to Strebel et al, H.Saxena56 and lesser than B.S.Sethi et al.53 It was higher than Dobrydnjov et al48 which is as expected considering the different doses of clonidine or bupivacaine used.

Monitoring of heart rate, blood pressure, SpO_2 and respiratory rate were done to assess the hemodynamic stability and respiratory effects of intrathecal clonidine. In our study it was observed that patients in Group II had 15% fall in the mean pulse rate from the base line compared to 4% in Group I, 30 minutes after the injection. Mean arterial pressure was significantly lower during the first 30-120 minutes after spinal injection in Group II than in Group I. Maximum changes from the base line values in mean arterial pressure during this time varied from 12-18% for patients in Group II compared with 6-10% in Group I.

I.Dobrydnjov et al,[48] also observed the patients receiving 30µg of clonidine had similar pulse rate and mean arterial pressure changes from the base line values. H.Saxena[56] et al also had similar changes in haemodynamic parameters from the base line values. In our study, findings are in consonance with study by B.S.Sethi et al[53] and L.Neimi et al.[8] Minimal haemodynamic alterations were observed with B.S.Sethi,[53] where as L.Neimi[8] used 3µg/kg of clonidine added to 15 mg of 0.5% bupivacaine for knee arthroscopy and reported significant hypotension in 10% of patients. Their values for mean arterial pressure were also significantly lower than control group after 45 minutes to 8 hours. In our study 3 patients had hypotension and 4 patients had bradycardia in Group II, whereas 2 patients and 3 patients had hypotension and bradycardia in Group I respectively. Hypotension and bradycardia was observed in 3 patients Group I and 11 patients in Group II. There was no significant statistical difference between the two groups.There was no significant difference pertaining to respiration between two groups.

Incidence of shivering was observed in 8% (4 patients) in Group I and none in Group II. Incidence of nausea and vomiting was observed in 3 patients (6%) in Group I as opposed to 4 patient (8%) in Group II. Van Tuijl et al,[54] D.J.Fogarty et al[45] observed almost the same with respect to shivering, nausea and vomiting. Patients were observed post operatively for 24 hours and observed for hypotension, bradycardia respiratory depression dry mouth, drowsiness and others. In Group II, 16% (8 patients) had dry mouth, 28% (14 patients) had sedation and 14% (7 patients) had both (dry mouth and sedation) in our study. In Group I none had these side effects. The side effects of our study is comparable with B.S.Sethi et al, [53]H.Saxena et al,[56] D.J.Fogarty et al[45] regarding dry mouth and sedation.

Table 1: Results of the Present Study

		Group I	Group II	P Value
i	Mean Duration of surgery (Mins)	84	85	<0.757
ii	Mean Onset of Sensory Block (mins)	4.03	1.74	<0.001
iii	Mean Onset of Motor blockade (Mins)	4.81	2.7	< 0.001
iv	Mean Time for two segment regression (Mins)	133.58	207.6	<0.001
v	Mean Time of Post operative analgesia (Mins)	211.7	316.4	< 0.001
vi	Intra operative complications			
	Hypotension (%)	4	6	<0.057
	Bradycardia (%)	6	8	
	Hypotension + Bradycardia (%)	6	22	
	Shivering (%)	8	0	
	Nausea + Vomiting (%)	6	8	
vii	Postoperative side effects			
	Dry mouth	0	16	<0.001
	Sedation	0	28	
	Dry mouth + sedation	0	14	

Table 2: Comparison of Onset of Sensory Block

Authors	Group I	Group II
H.Saxena *	3.95 ± 1.76	0.92 ± 0.08
Present study	4.03 ± 0.76	1.74 ± 0.72

Table 3: Comparison of Onset of Motor Block

Authors	Group I	Group II
H.Saxena *	7.41	2.2
Present study	4.81	2.7

Table 4: Comparison of Time for Two Segment Regression

Authors	Group I	Group II
H.Saxena *	89±14.48	267±21.90
B.S.Sethi	136	218
I.Dobrydnjov **	95±32	126±17
Dan Benhamou	70±33	95±56
Present study	133.58	207.6

Table 5: Comparison of Duration of Analgesia

Authors	Group I	Group II
Dan Benhamou	137 ±35	183 ±80
I.Dobrydnjov *	171±65	253 ±71
Stephen Strebel	295 ±80	381 ±117
B.S.Sethi	223	614
Patricia M **	135 ±29	246 ±55
H Saxena	99.75 ±21.91	285.60 ±36.59
Present study	211.7±39.90	316.4±53.36

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