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Two Syringe Technique for Spinal Anesthesia in Cesarean Section: A Study of a Simple Way to Achieve more Satisfactory Block, Less Frequency of Hypotension and Prolong Analgesia

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Abstract: ***Spinal anaesthesia is now the safest and most popular method for cesarean section. Hypotension is common adverse effect of spinal anaesthesia. Fentanyl added to bupivacaine enhances the sensory blockage without altering the degree of sympathetic blockade and less significant adverse effect. The reason might be that the mixture of hyperbaric bupivacaine and fentanyl may alter the density of hyperbaric bupivacaine solutions and affect the spread of drugs. So this study is undertaken to find out if the effect of these two drugs can vary by altering their technique of administration. This observational study compared the effect of spinal injection of hyperbaric bupivacaine and fentanyl in separate syringe with standard injection of mixed fentanyl with hyperbaric bupivacaine. . Total 60 patients are equally divided into two groups: Group M: 25ug fentanyl (0.5cc) premixed with 0.5% bupivacaine heavy 10 mg (2cc) in the same syringe. Group S: 25ug fentanyl (0.5cc) and 0.5%bupivacaine heavy 10 mg(2cc) separate syringes. We concluded that Separate intrathecal injections of Fentanyl and hyperbaric bupivacaine provided significant improvement in the quality of sensory block with reduction in frequency of hypotension compared to injection of mixed medication.***

Keywords: Bupivacaine, Fentanyl, two syringe ,Spinal anaethesia, Cesarean section

1. Introduction

'Regional Anaesthesia techniques are used for cesarean section. Various techniques are available in regional anaesthesia like spinal Anaesthesia, epidural Anaesthesia, transverse abdominis plane block. Among these spinal Anaesthesia is most commonly used method. [1]

Hypotension is most common complication of spinal anaesthesia. It occur due to more sympathetic blockade leading to peripheral vasodilatation, pooling of blood in dilated vascular bed leads to decrease venous return and cardiac output. [2,3]

Management of hypotension in spinal anaesthesia can be managed by 1**) Fluid therapy** - there is administration of crystalloids or colloids: preloading or co loading 2) **vasopressor**- causes vasoconstriction so as to decrease vascular bed dilatation. [4,5]

In pregnancy, physiological changes are also present. Pregnant woman is more liable to hypotension due to positional changes. In supine position, gravid uterus compress aorta and inferior vena cava leads to decrease venous return and decrease maternal cardiac output which compromise uteroplacental perfusion. [2.3]

Hyperbaric bupivacaine is used as local anaesthetic agent in spinal anaethesia. Opioids and local anaesthetics are administered together intrathecally, which have potent analgesia. Intrathecal opioids like fenatanyl enhance analgesia from sub therapeutic dose of hyperbaric bupivacaine and achieve successful subarachnoid block. It provide more sensory blockade than sympathetic blockade. So it causes less adverse hemodynamic effects. [6]

It is common practice to mix fentanyl and hyperbaric bupivacaine in single syringe before intrathecal injection. Various factor influence the spread and action of anaesthetic solution like temperature ,PH ,density volume of drug , patients position and height of patient. [6]

Density of fentanyl and hyperbaric bupivacaine is 0.9957 and 1.0262 respectively. The mean density of cerebrospinal fluid of term pregnant patient is 1.00030. [7] So the addition of fentanyl to hyperbaric bupivacaine may alter the density of the mixture and affect the spread of hyperbaric bupivacaine. If we inject both the drugs separately in different syringe may minimize the effect of the changes in densities and PH of both the drugs. They produes their maximum effect. [7] Here, this study was undertaken to find out effect of fentanyl and hyperbaric bupivacaine can vary by altering their mode of administration.

2. Aim of Study

To compare the effect of spinal injection of hyperbaric bupivacaine and fentanyl separately with standard injection of mixed fentanyl with hyperbaric bupivacaine.

3. Material and Method

This observational study was conducted from April 2017 to August 2017. 60 Parturient at full term scheduled for cesarean section, ASA grade I, II, with uncomplicated pregnancy were included in the study after written informed consent. Body weight: <50kg and>90kg, height: <150cm and >170cm ,preeclampsia ,any major systemic disease contraindication to regional anaethesia and allergy used to medication were excluded from the study. Thorough pre-anesthetic evaluation was carried out. Basic hematological investigation like complete hemogram was reviewed.

Pre-operative pulse, blood pressure, ECG, SPO_2 were noted in the operation room before giving the study drug and considered as baseline. Premedication was given Inj. Glycopyrrolate 5-10 µg/kg IV, Inj. Ondensetrone 4 mg IV before giving spinal anaethesia in both groups. All patients were preloaded with Ringer's lactate (RL) solution 10–15 ml/kg over 10 min.

Technique of Anaesthesia: Spinal anaesthesia was given under all aseptic and antiseptic precaution in sitting position in midline approach at L2-L3 or L3-L4 intervertebral space with 25 G spinal needle after free flow of clear CSF by using following drugs intrathecally and divided into two group:

Group M: 25ug fentanyl(0.5cc) premixed with 0.5% bupivacaine heavy 10 mg(2cc) in the same syringe. Group S: 25ug fentanyl (0.5cc) in one syringe and 0.5%bupivacaine heavy 10 mg(2cc) without barbotage in a second syringe. All patients were kept in supine position immediately. We observed the pulse, systolic blood pressure , diastolic blood pressure and spo2 at different time interval at2min, 3min, 4min, 5min, 10min, 20min, 30min, 45min and 1hr.
Segmental sensory level of Anaesthesia was assessed by pt's response to pinprick and Onset of sensory blockade was assessed by the time from injection of study drugs to complete abolition of pin prick (score 0).
Motor block was assessed by modified Bromage scale
0- No motor block
1- Unable to raise an extended leg
2- Unable to flex the knee
3- Unable to flex the ankle

Time to achieve maximum sensory and motor block level, time to regression of sensory and motor block level were recorded.
We also looked for intraoperative complication like hypotension, bradycardia and itching. Hypotension (MAP <10% base line) treated with head low and given fluid challenges and (MAP <25% base line) treated with Inj Mephentermine 0.3 to 0.5mg/kg given and repeated when needed. Bradycardia treated when heart rate <60/min with Inj atropine 0.6mg IV.Itching : mild :no treatment, Moderate: Inj chlorphinaramine 10mg IV and Severe: Inj Naloxone 0.01mg/kg IV.

Pain was assessed by visual analogue scale in postoperatively at 30 min and thereafter every 30min up to 4hour. Rescue analgesia (Inj Diclofenac sodium1.5mg/kg IV or Inj Tramadol 50mg IV) was given to the patients if VAS scores ≥3 or above. We observed time to 1st rescue analgesia. We also Looked for sides effects like Bradycardia, Hypotension, Nausea, Vomiting. The statistical analysis was done by unpaired t-test for quantitative data and chi-square test for qualitative data by medcalc software. The 'P' Value was considered stastically significant less than 0.05.

4. Observation and Result

There was no significant difference between demographic data.

There was no significant difference of intraoperative pulse, spo2 between two groups (p >0.05)

There was significantly decrease systolic and diastolic blood pressure in group M than group S at 4min after administration of drug. (P <0.05). There was significantly decrease mean blood pressure in group M than group S at 4 min. after administration of drug. (P <0.05).(figure -1)

16number of patients in group M and 4number of patients of group S were observed hypotension after administration of drugs. There was statistically significant observed more incidence of hypotension in group M than group S. (P <0.05). (figure-2)

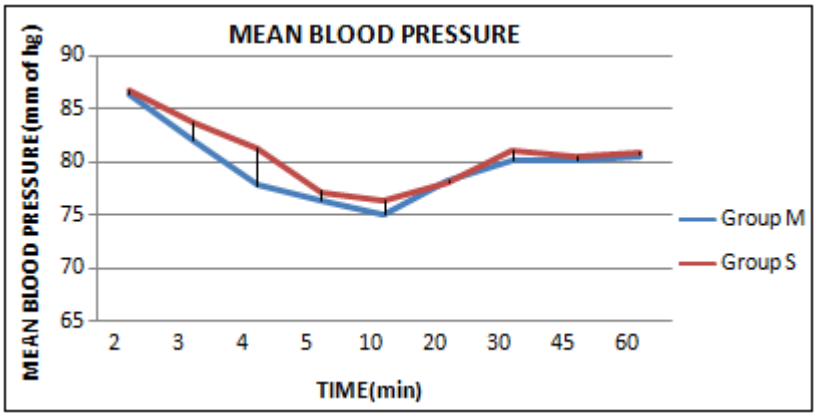

Figure 1: Comparasion of two groups according to mean blood pressure

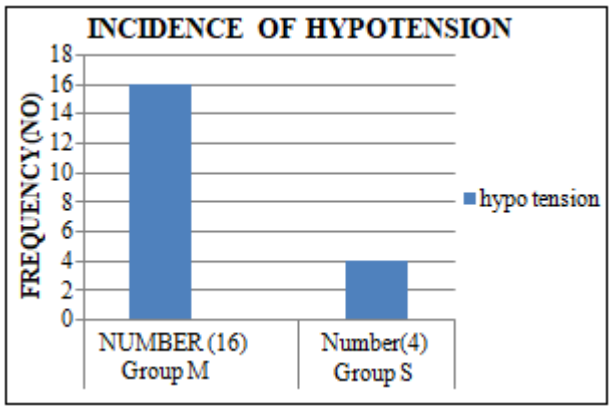

Figure 2 Comparison of two groups according to incidence of hypotension

Mean time to onset of sensory and motor block was observed early in group M (*3.28±0.66 ;4.2±0.66* respectively*)* than group S(*4±0.43; 4.82±0.42* respectively) ,which was statistically highly significant.(P <0.001). Maximum sensory block level was higher in group M (6.75±0.98) than group S (6.13±0.51), which was statistically highly significant. (p <0.05). There was not significant difference of time to maximum sensory and motor block observed between group M (8.6±3.28; 5.23±1.95 respectively) and group S (8.67±3..92;5.23±1.97 respectively) (P >0.05). Mean time to regression of sensory and motor block was observed early in group M (219±16.04; 188±15.6 respectively) than group S (253±17.04; 223±17.04 respectively), which was statistically highly significant. (P <0.001). Mean time to 1st rescue analgesia was required early in group M (226±29.9) than group S (268±39.28), which was statistically highly significant. (P<0.001) (table-1).

Table 1: Block characteristic of two groups

	Group M (Mean±SD)	*Groups (Mean±SD)*	*P Value*
time to onset of sensory block	*3.28±0.66*	*4±0.43*	*P <0.001*
time to onset of motor block	*4.2±0.66*	*4.82±0.42*	*P <0.001*
time to maximum sensory block	*8.6±3.28*	*8.67±.3.92*	*P >0.05*
time to maximum motor block	*5.23±1.96*	*5.23±1.97*	*P >0.05*
time to regression of sensory block	*219±16.04*	*253±17.04*	*P <0.001*
time to regression of motor block	*188±15.6*	*223±17.04*	*P <0.001*
time to 1st rescue analgesia	*226±29.9*	*268±39.28*	*P <0.001*

At 240 min interval VAS score was significantly higher in group M compared to group S. At 300min interval VAS score was significantly lower in group M as compared to group S due to early supplementation of analgesia. At 360min VAS score was again higher in group M as compared to group S. So patients in group S had prolonged post operative analgesia than patients of group M. (figure-3)

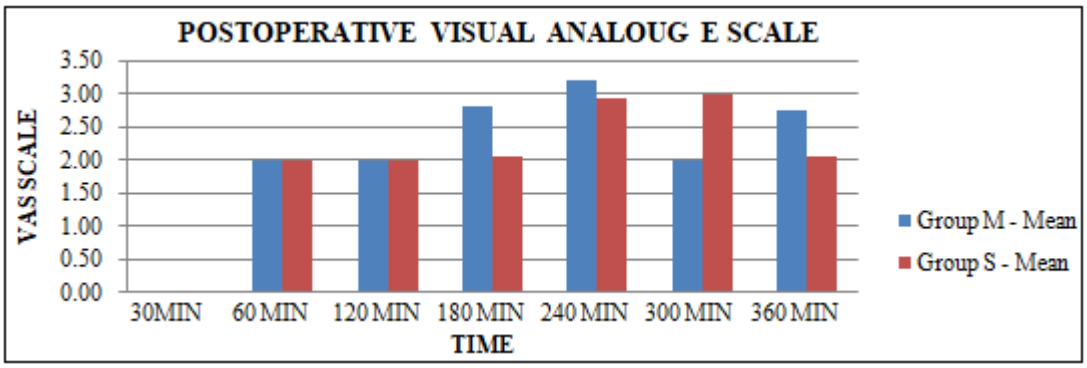

Figure 3 Comparison of two groups according to visual analogue scale

The patients in group M had incidence of hypotension (53.3%), nausea (23.3%) and vomiting(13.3%) shivering (10%).The patients in group S had incidence of hypotension, (13.3%) nausea (13.33%) and vomiting (10%) and shivering (6.66%.) (table 2)

Table 2: Adverse effects

	GROUP M(30)	GROUP S(30)
Hypotension	53.3%	13.3%
Nausea	23.3%	13.3%
Vomiting	13.3%	10%
Shivering	10%	6.66%

5. Discussion

This study was undertaken to find out hemodynamic effects and block characteristics after administration of premixed and sequential use of hyperbaric bupivacaine and fentanyl.

When the patients were turned supine after study drug injection intrathecally in lumbar region, a hyperbaric solution was spread under the influence of gravity down slope created by lumbar spinal curvature. The mixture of hypobaric fentanyl and hyperbaric bupivacaine sank down,

then they crept up together when the patient lay down acting synchronously on the same level. Hyperbaric bupivacaine which was injected separately without mixing was denser than bupivacaine fentanyl mixture and sank down and took a longer time to reach the final level which delayed the onset of the sympathetic block and gave time for a compensatory mechanism to prevent hypotension. [8]

In present study, There was significantly decrease mean blood pressure in group M than group S at 4 min. after administration of drug. (P <0.05). There was statistically significant observed more incidence of hypotension in 16number of patients in group M than 4 number of patients in group S. (P <0.05). **Noopur et al** concluded that there was significant difference in systolic and diastolic blood pressure within 10mins after induction of Anesthesia.[6] **Armr aly et al** found that early hypotension occurred in group M as compared to group S and also found that frequency of hypotension in group S was lower as compared to group M. [8] **Desai et al** studied that there was no significant difference of hypotension. [7]

In present study, Mean time to onset of sensory and motor block was observed early in group M (3.28±0.66 ;4.2±0.66 respectively) than group S(4±0.43; 4.82±0.42 respectively) ,which was statistically highly significant.(P <0.001). **Sharma et al**, concluded that onset of sensory block and motor block was faster in mixture group compared to sequential group. Contrast to our study. [10] **Noopur et al,** studied that onset of sensory and motor block was faster in sequential group (2.7±0.53;3.1±0.3respectively) as compared to mixed group (5.03±1.07;7.23±1.07respectively).[6] **Armr aly et al ,** found that onset of sensory and motor block was faster in sequential group (5.07±2.4;5.4.7±1.8 respectively) as compared to mixed group.(5.79 ±3.08;.5±1.3respectively). [8] **Schen et al** reported that onset of sensory and motor block was faster in sequential group as compared to mixed group. [9]

Maximum sensory block level was higher in group M (6.75±0.98) than group S (6.13±0.51), which was statistically highly significant. (p <0.05).**Armr aly et al** found that mean level of maximal sensory block was non significantly higher in group S as compared to group M.(p>0.05). [8]

Mean time to regression of sensory and motor block was observed early in group M (219±16.04; 188±15.6 respectively) than group S (253±17.04; 223±17.04 respectively), which was statistically highly significant. (P <0.001).**Noopur et al** concluded that mean time to regression of sensory and motor block was faster in control group(116.5±37.7;124.0±41.5 respectively) than study group(173.5±46.89;168.0±34.9respectively).(p<0.001).[6] **Sharma and schen et** al also found similar finding. [9,10]. **Desai et al** studied that there was no significant difference in block regression in either group. [7]

At 240 min interval VAS score was significantly higher in group M compared to group S.At 300min interval VAS score was significantly higher in group S compared to group M.So patients in group S had prolonged post operative analgesia than patients of group M.(p<0.05). Mean time to 1st rescue analgesia was required early in group M (226±29.9) than group S (268±39.28), which was statistically highly significant. (P<0.001) **Sharma et al,** studied that the time of rescue analgesia was 148.6min in premixed group and 242.4 mins in sequentially administered groups. [10]**Noopur et al** ,concluded that time of rescue analgesia was 189 min in study group and 102min in control group. [6]**Armr aly et al** found that time to 1st rescue was prolonged in sequential group compared to premixed group . [8]

6. Conclusion

From the study we can recommended that two syringe technique of fentanyl and hyperbaric bupivacaine provide significant improvement in the quality of sensory block without incidence of hypotension compared to one syringe technique.

7. Financial support and sponsorship

Nil

8. Conflicts of interest

There are no conflicts of interest

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