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To compare the effect of intrathecal morphine and hyperbaric bupivacaine by using different techniques of administration in lower limb orthopaedics surgeries.

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Abstract *The aim of the study was to compare the efficacy and haemodynamic effects between the sequential administration and pre mixing of morphine and hyperbaric bupivacaine. A randomized and single blinded study was undertaken in the department of anaesthesiology in the attached teaching hospital. 60 patients were divided equally, where one group received sequential and another received premixed morphine and hyperbaric bupivacaine. The demographic parameters of patients were comparable in two groups. There was no statistically significant change in pulse rate of study and control groups on induction of anaesthesia, however the blood pressure fall (both systolic and diastolic) after induction of anaesthesia was more in control group compared to study group. Statistical analysis was done using statistics package. P- value less than 0.05 was considered statistically significant.*

Keywords: *Morphine, Hyperbaric bupivacaine, Opioids.*

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I. Introduction

Pain is one of the major complaint encountered in post-operative period. The main goal of anaesthesia is to provide adequate pain relief in surgical procedure and also in the post-operative period. Spinal anaesthesia has the definitive advantage of profound nerve block which can be produced in a larger part of the body with relative simple injection of a small amount of local anaesthetic[1]. It is easy to perform, economical and produces rapid onset of anaesthesia and complete muscle relaxation and hence it is the preferred anaesthesia for lower limb surgeries[2]. Opioids and local anaesthetics administered together intrathecally, have a potent synergistic analgesia. Intrathecal opioids like morphine enchance analgesia from sub therapeutic doses of local anaesthetic and make it possible to achieve successful spinal anaesthesia using otherwise inadequate doses of local anaesthetic. It is common practice to mix opioids with hyperbaric bupivacaine in a single syringe before intrathecal injection of the mixture. Mixing these drugs may alter the density of the hyperbaric solution, affecting the spread of local anaesthetic and opioid[3]. The spread and action of the anaesthetic solution is often influenced by a number of factors including the temperature of the solution, patient position during and after spinal injection, pH and density of the solution, volume of the drug injected and height of the patients. The premixing of drugs before injection may alter the density of the drugs influencing its spread in the cerebrospinal fluid[4]. However, the anaesthetic effect of pre-mixing of bupivacaine with morphine and using the two drugs separately has not been evaluated in a detailed manner so far. Hence, this study was undertaken in order to find out the effect of these two drugs by altering their mode of administration.

II. Materials And Methods

60 patients of ASA physical status I,II requiring spinal anaesthesia for elective lower limb orthopaedic cases were induced in the study. Patients with ASA grade III, IV, skin infection at the site of injection, coagulation disorders, spinal deformatives were excluded. A written informed consent and institutional ethics committee approval were obtained. The patients thus selected were grouped randomly by blinding of observer in to two groups:-

Group I (Study) - received intrathecal morphine and bupivacaine in separate syringe

Group II (Control) - received intrathecal morphine and bupivacaine in same syringe.

A thorough pre-anaesthetic examination was conducted and patients were kept nil by mouth for 6 hours before the surgery. The peripheral venous access were secured with 18 G IV cannula before the operative procedure and patients preloaded with RL solution at the rate of 10ml/kg/hr for 30 minutes. Under all aseptic precautions lumbar puncture was done with 25 G quincke's needle at L3-L4/L4-L5 space in lateral position and drug was injected.

In the study group, 2.5ml bupivacaine and 100µg of morphine were given in sequential manner and in the couter group 2.5ml bupivacaine and 100µg were pre mixed in the same syringe and administered to the patient. Hemodynamic changes pulse rate, blood pressure, heart rate respiratory rate and SPO2 be monitored at every 5,10,15,20,30 minute for first 2 hours and 2 hourly for 24 hour. Assessment of pain relief was done using VAS and occurrence of side effect like nausea, vomiting urinary retention, itching, respiratory depression are noted. The onset of devation, degree of analgesia and the side effects were analysed using Chi-square test and paired 't' test.

III. Results And Observations

The study was completed in all the enrolled participants. The demographic parameters such as age, height, weight and duration of surgery, as shown in table 1 were comparable in the two groups and did not affect the study outcome

1. Table showing the distribution and comparison of demographic parameters in the two groups

Parameters	*Group I (Different syringe)*	*Group II (Same syringe)*	*Statistical test value (T value)*	*P value*
Age in years (Mean±SD)	25.4±4.1	25.7±3.4	0.31	0.76
Height in cms (Mean±SD)	154.3±2.9	155.5±3.8	1.77	0.07
Weight in Kgs (Mean±SD)	60.4±9.7	60.9±7.6	0.21	0.84
Duration of surgery in minutes (Mean±SD)	63.0±7.0	65.33±6.3	1.36	0.18

P<0.05 is significant

The intraoperative pulse rate were comparable in the two groups and statistically not significant at different time points, as shown in table 2. However, the systolic and diastolic blood pressure showed significant reduction in the group II during the first 4 minutes (shown in table 3 & 4)

2.Table showing the distribution and comparison intraoperative pulse rate in the two groups at different time points

Time points	*Group I (Different syringe) (Mean±SD)*	*Group II (Same syringe) (Mean±SD)*	*Statistical test value (T value)*	*P value*
Baseline	86.5±9.6	87.7±8	0.49	0.62
1 minute	87.2±11.6	90.9±12.5	1.19	0.23
2 minutes	88.1±12.3	93.4±11.8	1.71	0.09
3 minutes	87.0±9.5	92.1±11.6	1.85	0.06
4 minutes	90.2±11.9	92.2±12.9	1.25	0.21
5 minutes	88.0±11.0	94.7±16.1	1.34	0.18
6 minutes	86.3±11.5	92.1±12.9	1.85	0.06
7 minutes	86.4±12.6	92±12.6	1.68	0.09
8 minutes	88.0±12.6	92±12.3	1.25	0.21
9 minutes	87.6±11.6	93.5±12.2	1.89	0.06
10 minutes	85.9±10.8	91.6±12.1	1.93	0.06
20 minutes	88.4±9.9	93.3±12.8	1.74	0.08
30 minutes	87.0±10.5	91.3±14.2	1.31	0.19
40 minutes	87.7±10.5	91.3±14.2	1.23	0.22
50 minutes	84.9±9.7	90.4±13.4	1.82	0.07
60 minutes	87.2±9.2	92.5±14.6	1.57	0.12

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40 minutes	87.7±10.5	91.3±14.2	1.23	0.22
50 minutes	84.9±9.7	90.4±13.4	1.82	0.07
60 minutes	87.2±9.2	92.5±14.6	1.57	0.12

P<0.05 is significant

3.Table showing the distribution and comparison intraoperative systolic blood pressure in the two groups at different time points

Time points	*Group I (Different syringe) (Mean±SD)*	*Group II (Same syringe) (Mean±SD)*	*Statistical test value (T value)*	*P value*
Baseline	116.9±6.7	114.4±5.7	1.6	0.12
1 minute	121.2±8.6	114.6±7.3	3.17	0.002*
2 minutes	116.2±8.3	107.3±6.6	4.61	0.000*
3 minutes	111.5±9.0	102.3±11.6	3.84	0.000*
4 minutes	107.8±11.0	100.4±8.9	2.87	0.006*
5 minutes	107.4±15.5	102.2±8.7	1.59	0.12
6 minutes	106.1±13.6	104.2±9.4	0.61	0.55
7 minutes	106.5±12.1	109±8.7	0.94	0.35
8 minutes	110.1±10	109.1±10.1	0.39	0.70
9 minutes	113±11.2	108.7±9.5	1.59	0.12
10 minutes	112.8±10.8	109.9±9.3	1.13	0.26
20 minutes	114.2±12.8	113.5±10.3	0.24	0.80
30 minutes	116.6±11.3	113.7±8.6	1.14	0.26
40 minutes	117.7±10.8	114.6±8	1.26	0.22
50 minutes	113.7±8.1	113.7±8.1	1.40	0.17
60 minutes	116.2±7.8	112.6±6.6	1.80	0.08

*=Significant & P<0.05 is significant

4.Table showing the distribution and comparison intraoperative diastolic blood pressure in the two groups at different time points

Time points	*Group I (Different syringe) (Mean±SD)*	*Group II (Same syringe) (Mean±SD)*	*Statistical test value (T value)*	*P value*
Baseline	75.1±4.7	74.3±4	0.71	0.48
1 minute	77.3±7.6	72.1±6.4	2.86	0.02*
2 minutes	73.6±8.5	67.3±6.6	3.47	0.001*
3 minutes	72.9±8.9	66.6±7.7	2.92	0.005*
4 minutes	73.1±12.5	67.2±8.1	2.18	0.03*
5 minutes	67.7±13.5	69.6±8.4	0.63	0.52
6 minutes	69.3±13.0	70.2±8.5	0.32	0.75
7 minutes	69.3±11.8	70.7±5.9	0.55	0.58
8 minutes	72.3±11.1	69±8.2	1.28	0.21
9 minutes	70.3±10.5	71.9±7.2	0.67	0.50
10 minutes	73.1±12	72.1±5.9	0.38	0.70
20 minutes	72.5±13.4	74.3±7.1	0.63	0.54
30 minutes	72.8±10.7	72.3±6.1	0.21	0.84
40 minutes	74.1±11.7	72±5.9	0.87	0.38
50 minutes	75±9.1	71.7±5.3	1.85	0.07
60 minutes	75.4±8.5	71.7±5.3	1.88	0.07

*=Significant & P<0.05 is significant

The comparison of study parameters such as the onset of sensory and motor blockade were significantly faster in the study group as compared with the control group. Also, the regression of both sensory and motor blockade were significantly slower in the study group, as shown in table 5. The analgesia free time intervals were significantly longer in the study groups.

5. Table showing the distribution and comparison of study parameters in the two groups

Parameters	*Group I (Different syringe) (Mean±SD)*	*Group II (Same syringe) (Mean±SD)*	*Statistical test value (T value)*	*P value*
1. Onset of sensory block in minutes	2.7±0.53	5.03±1.07	10.71	0.001*
2. Onset of motor block in minutes	3.1±0.3	7.23±1.07	20.30	0.0001*
3. Regression of sensory block in minutes	173.5±46.89	116.5±37.7	5.19	0.001*
4. Regression of motor block in minutes	168±34.9	124±41.5	6.76	0.001*
5. Time of rescue analgesia in minutes	189±37.1	102.5±32	9.67	0.001*

P<0.05 is significant

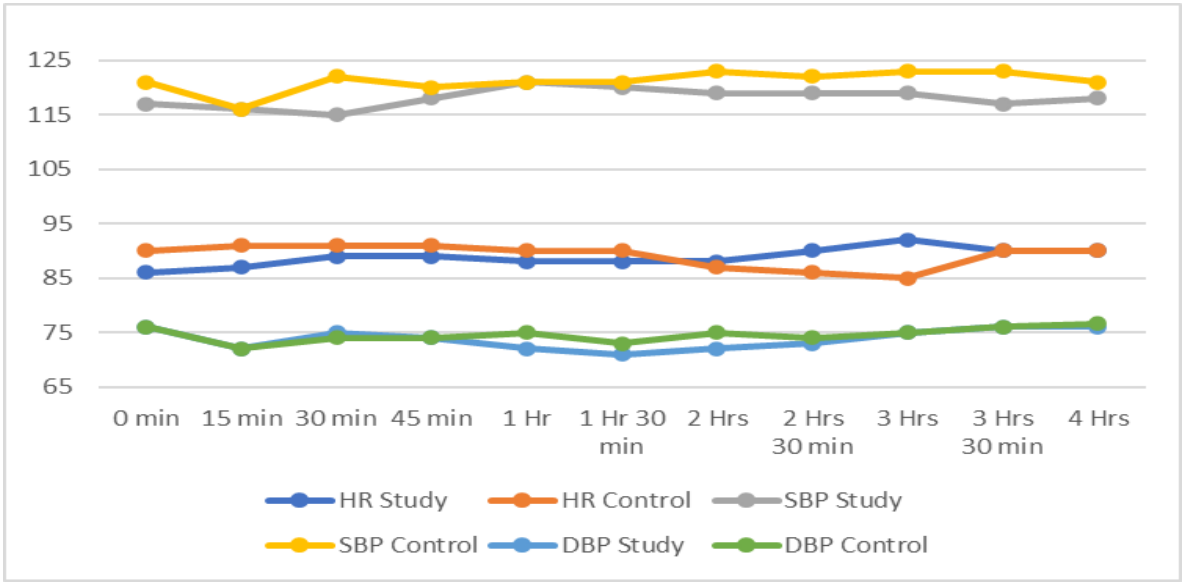
6. Table showing the distribution and comparison of side effects in the two groups

Side effects	*Group I (Different syringe) N (%)*	*Group II (Same syringe) N (%)*	Total *N (%)*
Nil	19(63.3)	17(56.7)	34(56.7)
Hypotension	2(6.7)	7(23.3)	9(15)
Pruritis	8(26.7)	3(10)	14(23.3)
Vomiting	1(3.3)	3(10)	3(5)
Total	30(100)	30(100)	60(100)

The incidence of side effects were 36.7% and 43.3% respectively in the study and control groups, as shown in table 6. Hypotension were recorded more with the control group as with vomiting, however more patients with pruritis were recorded with the study group.

The postoperative haemodynamics variable, as shown in the chart were comparable in the two groups and no observable difference were noted at different time points and statistically not significant.

Chart showing the distribution of haemodynamics parameters in the postoperative period in the two groups at different time points



IV. Discussion

This study was undertaken to find out the efficacy of premixed and sequential administration of morphine and hyperbaric bupivacaine. Several local anaesthetics are used to alleviate pain during orthopaedic surgeries which have their own advantages and disadvantages. Hyperbaric bupivacaine is not commonly used

local anaesthetics. Bupivacaine is an amide local anaesthetics with high potency, slow onset, long duration of action offering good sensory blockade[5].

Morphine: - Morphine is the prototype opioid agonist to which all other opioids are compound, producing analgesia, euphoria sedation, nausea and pruritus[6]. Morphine is effective against pain arising from viscera. Analgesia is most prominent when morphine is administered before the painful stimulus occurs. It is a common practice in anaesthesia to mix hyperbaric bupivacaine with opiods. This procedure alters the density of the hyperbaric solution and thus affect the spread of local anaesthetics and opiods. Hyperbaric bupivacaine and morphine produce their maximal effects at their original densities sequential administration allows drugs to take their own course of spread and subsequently their expected action. Intraoperative and post operative effects such as hypotension,bradycardia, pruritus, vomiting, shivering were noted till complete recovery. Pain was assessed by VAS score. Injection dynapar 75mg im was given as the first dose rescue analgesia. Chi square test was applied to compare the statistical differences between the two groups as test of significance for categorical data and independent sample 't' test was applied for quantitative data as test of significance. A 'p' value of less than 0.05 was considered as statistically significant. Thus, from the results obtained in our study, it can be concluded that sequential administration of morphine with bupivacaine reduces the time required to achieve complete sensory and motor block delays both sensory block regression and motor block resolution and significantly prolongs the total duration of analgesia while maintaining better intraoperative haemodynamic parameter. However, there may be possibility of accidental spillage of drug during change of syringes. But, this study was able to bring out important facts that the sequential technique is better than premixed administration of morphine with bupivacaine.

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