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COMPARISON OF HAEMODYNAMIC EFFECTS OF UNILATERAL VERSUS BILATERAL SPINAL ANAESTHESIA

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ABSTRACT

Aim of Study: A comparative study was carried out to determine whether the unilateral spinal block produces comparatively less haemodynamic disturbances as compared to bilateral spinal block or not.

Patients and Methods: Fifty male patients of age 25- 40 years of comparable weight and height, and ASA status I & II were selected and divided into two groups, Group A and Group B. Each group was assigned 25 patients by convenience sampling. Blood loss was comparable in both groups. All patients were assessed pre-operatively a night before operation. Two variables i.e. pulse and blood pressure was measured a night before operation, just before spinal injection and every thirty minutes for a total period of 180 minutes after the spinal injection. Average duration of surgical procedures was 57 +/- 13 minutes. Each patient was premedicated with tablet "Diazepam 10 mg" a night before operation and injection Diazepam 05 mg IV just before spinal injection and pre- loaded with 5% Dextrose Saline 500 ml. All patients were injected "abocaine spinal" 0.75% (heavy) 1.5 ml at L4-5 or L3-4 interspace intradurally with the help of 23G spinal needles under aseptic measures. Group-A patients were kept supine in flexed position for 10 minutes and Group B patients were kept in lateral decubitus position with surgical side down, for 10 minutes. Block was achieved up to T10-11 level. Contra lateral side was checked for block.

Results: Two groups were clinically comparable as regard to patient characteristics and methods of study e.g. dose and type of drug used and level of anaesthesia achieved. There was no significant hypotension or bradycardia in any group; rather there was an increase in blood pressure and heart rate in few patients signifying sympathetic over activation in younger patients.

Conclusion: In younger age group haemodynamic changes were negligible in either group of study most probably due to active sympathetic system at the unblocked area. Unilateral block could be a more useful concept in older age group and autonomically compromised patients.

Keywords: Unilateral, spinal, anaesthesia, haemodynamics

INTRODUCTION

In recent years spinal anaesthesia is becoming increasingly popular, especially in developing countries like Pakistan, because of its simplicity, reliability, rapid onset and minimal biochemical changes in the body. But the concern about its haemodynamic side effects remains. This concern makes most of the surgeons reluctant to accept it for their patients [1]. We did make an effort to relieve this anxiety by trying the possibility of unilateral spinal block, which, theoretically, may be resulted in minimal haemodynamic changes.

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Tansichuk and his colleagues [2] described a particular technique of spinal anaesthesia in patients receiving one limb orthopedic surgery, which they named spinal hemi analgesia.

In practice, a conventional unilateral spinal anaesthesia technique can only result in a motor hemi block and a sensory block preferential to one side.

The rationale of producing a restricted spinal anaesthesia is to minimize the extension of surgical block at the operative side, as well as to obtain surgical anaesthesia. Haemodynamic benefits have increased the interest in unilateral spinal anaesthesia. Unilateral spinal anaesthesia is also better accepted by the patients since they express their satisfaction for being able to, at-least, partly move their opposite leg, thus not feeling completely paralyzed.

The aim of the study was to determine whether the unilateral spinal block produces comparatively less haemodynamic disturbances as compared to bilateral spinal block are not.

PATIENTS AND METHODS

This comparative clinical trial was carried out at Combined Military Hospital Rawalpindi, which is a 750 bedded tertiary care hospital with average 45-50 surgical procedures daily. The duration of study was from Sep 1996 to Sep 1997.

Fifty male patients of age ranging from 25-40 years, comparable height and weight (table-1) with following inclusion and exclusion criteria were selected and assigned to two different groups by convenience sampling.

Inclusion Criteria

- American society of anaesthesiologist's physical status class I & II [3].
- Canadian cardiovascular society grading of angina grade – 1 [4].
- New York heart association grading for dyspnoea grade – I [4].
- Patients without any significant systemic disease.

Exclusion Criteria

- American Society of anaesthesiologists physical status class - III and above [3].
- Canadian cardiovascular society grading of angina grade-II and above [4]
- New York heart association grading for dyspnoea grade - II and above [4].
- Patients with diseases / injuries of vertebral column.
- Patients with neurological deficits.
- Patients with hypertension.

Patients were operated for hernia, varicose veins, vericocele, haemorrhoids, fistula in ano and lower limb orthopaedic surgery with tourniquet. Blood loss in all patients was comparable.

Patients were grouped into two A & B. Group A consists of 25 patients planned for bilateral spinal anaesthesia and group 'B' consists of 25 patients planned for unilateral spinal anaesthesia. All patients were visited a night before operation. A rapport was made between the anaesthetist and the patient. Procedure was explained and discussed with each patient. Every patient was examined thoroughly and all investigations were checked. Pulse and blood pressure were recorded and tablet Diazepam 10 mg was given before midnight, and patients were kept NPO from midnight onwards.

Each patient was again examined and assessed before operation in operating room. Pulse and blood pressure were recorded with noninvasive blood pressure monitor, "Dinamap". Intravenous line was maintained with 18-gauge cannula and 500 ml of Dextrose saline was given intravenously as a preload. Injection Valium 5 mg was given intravenously as a premedication.

Group A patients were kept sitting on the edge of the operating table. Back of each patient was prepared with antiseptic lotion, pyodine, and patient was draped aseptically. A skin wheal was raised with injection Lignocaine 1% and 2 cc solution was injected at the plane of needle puncture at L_{3-4} or L_{4-5} vertebral interspace. Lumbar puncture was performed at the same level with 23-gauge disposable spinal needle. After a free flow of clear cerebrospinal fluid, an injection of 0.75% bupivacaine (Abocaine spinal) 1.5 ml was injected intradurally, puncture site was sealed with tincture benzoin-co, and patient was kept supine in flexed position for ten minutes. Complete block was produced up to T_{10-11} level. Pulse and blood pressure were monitored every five minutes throughout operation and then every fifteen minutes for a total period of three hours. However, every thirty-minute record was included in study for comparison to make the data easier to handle and create similarity in intra-operative and post-operative recordings.

Group 'B' patients were kept in lateral decubitus position with surgical side down on the edge of operating table. Back of each patient was prepared with antiseptic lotion 'Pyodine' and patient was draped aseptically. A skin wheal was raised with injection Lignocaine 1% and 2 cc solution was injected at the plane of needle puncture at L_{3-4} or L_{4-5} vertebral interspace. Lumbar puncture was performed at the same level with 23-gauge disposable spinal needle. After a free flow of clear cerebro-spinal fluid, an injection of 1.5 ml 0.75% bupivacaine (Abocaine Spinal) was injected intradurally, puncture site was sealed with tincture benzoin-co, and patient was kept in this position for 10 minutes, then turned supine. Pulse and blood pressure were monitored every five minutes throughout operation and then every fifteen minutes for a total period of three hours.

Level of sensory block was assessed by pin prick and level of sympathetic block was monitored by temperature sensations. Contra-lateral side was assessed for block before the start of surgical procedure.

RESULTS

The groups were clinically comparable as regard to patient characteristics and methods of study e.g. dose and type of drug used and levels of anaesthesia achieved. All values are mean + standard error of mean; student t-test was applied and "P" value less than 0.05 were considered significant.

There was no significant difference in heart rate (table-2) and mean arterial pressure (table-3) between two groups and P value remained more than 0.05 in all findings. However, the p value was nearer to 0.05 in later findings i.e. after 120 minutes of establishment of block. There was an unexpected increase in blood pressure and heart rate in two patients, though this increase also did not reach the level of significance.

There was only one patient in group 'B' i.e. unilateral anaesthesia group, who developed hypotension 10 minutes after spinal injection. He was loaded with Ringer's solution 1500 ml intravenous and blood pressure was maintained with in 30 minutes.

Three patients, one from group "A" and two from group "B", complained of pain during operation, specially the traction pain, they were given 20 mg pethedine intravenously.

Two patients of group 'B' i.e. unilateral anaesthesia group, developed bilateral spinal block. They were eliminated from the study.

There was no nausea or Vomiting. The most common complication was backache.

Post spinal headache did not occur in any of our patients, despite the fact that we used 23 G spinal needle.

DISCUSSION

Haemodynamic side effects of spinal anaesthesia are well known, which makes most of the surgeons reluctant to accept it for their patients. We made an effort to relieve the anxiety about haemodynamic side effects by trying the possibility of unilateral spinal block, which theoretically, may have resulted in minimal haemodynamic changes. Unfortunately our results could not prove this.

In practice, a conventional unilateral spinal anaesthesia technique can only result in a motor hemi-block and a sensory block preferential to one side. In addition, it appears to be impossible to limit the unintended sympathetic block exceeding the sensory block by two to six segments to the side of surgery. The differential block model explains this clinical reality of unilateral spinal anaesthesia. In this study sensory block was up to T_{10-11} segments as monitored by pin pick, and sympathetic block was up to T_{6-7} segments as monitored by temperate sensations.

The distance between left and right spinal nerve roots is nearly 10-15 mm at the lumbar level. Such a small distance should reasonably prevent from producing a strictly unilateral block of spinal nerve roots. However using small doses of anaesthetic solution in patients lying in the lateral decubitus position for 15-30 mm results in a preferential distribution of spinal anaesthesia towards the operative side, providing surgical block on this side only [6]. In this study 8% of patients in-group 'B' developed bilateral block.

Hypotension is a common complication of spinal anaesthesia occurring in up to 33% of patients when larger doses of local anaesthesia have been used [7]. Unilateral spinal anaesthesia with hyperbaric solution is very effective in restricting the sympathetic block when used in lateral position with operating side down in high risk patients coming for lower limb surgery [8]. In one study, when haemodynamic changes were compared between bilateral and unilateral spinal blockage with the same dose of hyperbaric Bupivacaine, the incidence of hypotension was 22.4% and 5 % respectively [9].

In our study, carried out in ASA- I&II patients, we could not find any degree of hypotension or bradycardia in any group of our patients, rather there was an increase in blood pressure and heart rate in two patients, though the increase in blood pressure and heart rate was not significant. It may signify sympathetic over activation in younger age group of patients.

Table-1: Demographic data.

	Group – A	Group – B	P-value
Number	25	25	
Age (years)	33.4 +/- 8	31.57+/- 9	>0.05
Male/Female	25/0	25/0	>0.05
Weight (kg)	59.76+/-12.34	58.99+/-15.33	>0.05
Height (cm)	167.567+/-33.942	170+/-34.221	>0.05

Table-2: Comparison of heart rate bi-lateral vs uni-lateral spinal anaesthesia.

Time	Group – A Bi-Lateral	Group – B Uni-Lateral	P-value
NB	94.6± 1.42	92.6± 1.25	0.070
P.OP	99.32± 1.96	94.04± 1.95	0.145
0 min	98.48± 2.05	96.84± 2.41	0.148
30 min	95.68± 1.83	92.12± 1.58	0.898
60 min	94.20± 1.62	89.92± 1.77	0.844
90 min	93.60± 1.49	90.84± 1.53	0.027
120 min	95.80± 1.24	91.60± 1.54	0.340
150 min	95.12± 1.26	90.76± 1.69	0.962
180 min	94.96± 0.91	91.80± 1.49	0.595

NB = Night before operation, POP = Pre Operative

Table-3: Comparison of MAP bilateral vs unilateral anaesthesia.

Time	Group – A Bi-Lateral	Group – B Uni-Lateral	P-value
NB	94.22± 1.7	93± 2.0	0.60
POP	98.66± 2.1	98.75± 2.8	0.90
0 min	97.41± 3.5	97.83± 2.9	0.90
30 min	92.08 ± 2.3	95.16± 2.6	0.40
60 min	90.00 ± 2.6	93.83 ± 2.3	0.30
90 min	90.83 ± 2.3	93.33 ± 2.2	0.30
120 min	91.75 ± 2.3	95.58 ± 1.8	0.10
150 min	91. 08 ± 2.5	94.75 ± 1.8	0.20
180 min	91 .16 ± 2.1	94.75 ± 1.3	0.20

NB = Night before operation, POP = Pre operative, MAP = Mean Arterial Pressure.

There was only one case of hypotention and that was in group 'B' i.e. unilateral spinal block. This could be an accidental finding.

Most common complication in our patients was backache. Post spinal headache did not occur in any of our patient despite the fact that we used 23 G spinal needle. However, most workers do not prove any significant difference in post dural puncture headache with the use of 22 G or 25 G spinal needles [5].

CONCLUSION

Despite the limited size of this study, we conclude that the difference in haemodynamic changes in both groups is not significant. Better and more accurate unilateral block can be achieved if the lateral decubitus position is maintained after the injection of hyperbaric local anaesthetic for 20-30 minutes as compared to 10 minutes.

This study was carried out in patients of younger age group who by virtue of their strong and active sympathetic system can compensate for the blocked segments. Unilateral block could be a more useful concept in older age group and autonomically compromised patients.

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