

COMPARISON OF MEDIAN AND PARAMEDIAN TECHNIQUES OF SPINAL ANAESTHESIA

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ABSTRACT

Objective: To compare median and paramedian technique of spinal anaesthesia in terms of success rate, number of attempts, paresthesia, bloody tap and length of needle.

Study Design: Comparative cross-sectional study.

Place and Duration of Study: Department of Anaesthesia and Intensive care PNS Shifa Karachi over duration of one year from March 2007 to Feb 2008.

Patients and Methods: This was a comparative cross-sectional study and 100 patients undergoing spinal anaesthesia for lower abdominal and lower limb surgeries were included. Hundred patients were divided into two separate groups. Group I was given spinal anaesthesia with median approach and Group II was given spinal anaesthesia with paramedian approach. In both the groups the patients were divided using non probability convenience sampling and patients were blind to the choice of technique of spinal anaesthesia used, however consent was obtained from every patient to be included in study.

Results: The success rate of median approach was found to be 84%, with the first attempt success rate of 48%. Paresthesia was felt by 38% of patients and incidence of bloody tap was 6%. Length of needle required most of the time was between 4-6 cms. The success rate of paramedian approach was found to be 96%, with first attempt success rate of 70%. Paresthesia was felt by 20% of patients and incidence of bloody tap was 12%. Most of the time length of needle required was between 6-8 cms.

Conclusion: Paramedian approach is associated with higher success rate with lesser number of attempts and decreased incidence of paresthesia.

Keywords: Lumbar puncture, median approach, paramedian approach, spinal anaesthesia.

INTRODUCTION

General anaesthesia is associated with many perioperative as well as postoperative complications. So in order to avoid these complications the technique of neuroaxial blockade should be preferred particularly in lower limb and lower abdominal surgeries¹.

Spinal anaesthesia is administered through midline approach but this approach has its own limitations like proper positioning of the patient in full flexed posture, calcifications and ossifications of the interspinous and supraspinous ligaments in old age, congenital anomalies and traumatic deformities of spine².

An alternate approach is the paramedian

encountered in the interspinous structures. Paramedian approach offers several advantages over midline approach and is associated with lesser frequency of technical problems³.

Paramedian approach is associated with increased success rate as compared to median approach. Identification of the intervertebral space in the first attempt is improved and repeat attempts at needle insertion are decreased with the paramedian approach. Catheter insertion is faster in the paramedian approach and there is a trend towards a lower incidence of paraesthesia⁴. Paramedian approach requires longer protrusion length of spinal needle than midline approach⁵. Midline approach has its own advantages like it is less traumatic as compared to the paramedian approach because the epidural veins are usually located laterally from the midline⁶.

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approach which does not require flexed posture and is useful when degenerative changes are

PATIENTS AND METHODS

The study was conducted at Department of Anaesthesia PNS Shifa in one year. One hundred surgical patients for lower abdominal and lower limb surgeries were divided in two groups.

Inclusion Criteria:

All the patients undergoing lower abdominal and lower limb surgeries who were willing for the spinal anaesthesia and willing to participate in the study.

Exclusion Criteria:

Patients suffering from traumatic deformity of spine, congenital anomaly of spine and having any contraindication to spinal anaesthesia e.g. local sepsis, coagulopathy, severe hypovolemia, increased intracranial pressure, severe aortic stenosis and severe mitral stenosis.

Procedure:

The patients were divided into two groups by non probability convenience sampling method. OT assistant was instructed to indicate every fifth patient coming for lower abdominal and lower limb surgeries as per inclusion criteria. Hence first fifth patient was placed in group I (patients who received spinal anaesthesia with median approach by using 25/24/23 gauge quincke needle) and next fifth patient was placed in group II (patients who received spinal anaesthesia with paramedian approach by using 25/24/23 gauge quincke needle). Each group consisted of 50 patients.

After obtaining informed written consent, thorough and detailed history of present and past medical illness, past history of anaesthetic exposure with concomitant history of drugs taken in preoperative period was also recorded. General and systemic examinations of all the patients were done. Routine investigation including coagulation profile. Laboratory data was provided by Pathology Laboratories of PNS Shifa Karachi. Inj. Ranitidine 50 mg and Inj. Metoclopramide 10 mg were given IV slowly preoperatively 1 hour before surgery. In the operating room, ECG and heart rate were monitored by a cardioscope. Blood pressure

was monitored non-invasively. Pulse oximetry was done using a finger probe. All the patients were preloaded with 500 ml Ringer lactate solution prior to spinal anaesthesia.

Spinal anaesthesia was administered with median and paramedian approach. The back of the patients was cleaned with Povidone Iodine and spirit and draped with sterile towels. Spinal anaesthesia was performed using 25/24/23 gauge quincke needle at the L2-L3 or L3-L4 interspaces and 0.75 % hyperbaric bupivacaine 2.0 ml was injected. In paramedian approach, skin wheal was raised 2 cm lateral to the inferior aspect of superior spinous process of the desired level and needle was directed and advanced at 10-25 degree angle towards the midline. Incidence of success rate, bloody tap, paresthesia and total number of attempts was recorded. If lumbar puncture could not be done in three attempts, it was declared unsuccessful. Skin to space distance was measured by applying steristrip on the needle next to the skin and then measuring distance from steristri~ till needle tip. After withdrawal of the needle, the patient was turned to the supine position. Level of sensory blockade and changes in parameters like heart rate, BP were recorded. Solution of Ringer lactate, Normal saline, colloid and blood was transfused as maintenance fluid and also according to the blood loss. Hypotension was treated with 5-12 mg Inj. Ephedrine given intravenously. Complications like nausea, vomiting, bradycardia, respiratory depression, skin reaction were managed symptomatically. After recovering from spinal anaesthesia, which included complete regression of sensory analgesia of the perineum, full return of motor function of the lower extremity and spontaneous urination, the patients were shifted to the ward.

All the data was entered into the Statistical Package for Social Sciences (SPSS) version 10.0 and analyzed. Mean SD was calculated for age and weight of the patient. Frequencies and percentage were calculated for success rate, bloody tap, paresthesia, number of attempts and length of needle. For quantitative data student's t-test and for qualitative data Chi-

square test was applied. P value <0.05 was considered statistically significant.

RESULTS

The mean ± SD of age in median group was found to be 41.72 ± 14.24 while in paramedian group it was 41.84 ±13.34. The difference between means of two groups was found to be statistically insignificant (P = 0.965). The mean ± SD of weight in median group was found to be 71.96 ±7.35 while in paramedian group. It was 71.98±8.60. The difference in both the groups was found to be statistically insignificant (P= 0.990). The distribution of male and female in both the groups was found to be statistically insignificant (P=0.689) although there was greater number of males in the median group (26 Vs 24) and greater number of females in paramedian group (26 Vs 24).

In the median group, success rate of lumbar puncture was 84% while in 16% patients successful lumbar puncture could not be done. In paramedian group, success rate of lumbar puncture was 96% while in 4% patients successful lumbar puncture could not be done. The result proved that the difference between two groups was statistically significant (P = 0.046) (Fig. 1).

The first attempt success in median approach was 48% while first attempt success in paramedian approach was 70%. The result proved that the difference between two groups was statistically significant (P = .041) (Fig.1).

In median group, 38% patients felt paresthesia while in paramedian group 20% patients felt paresthesia. The result proved that the difference between two groups was statistically significant (P = 0.047).

In the median group, bloody tap was found in 6% patients while in paramedian group, it was found in 12% patients. The difference was not statistically significant (P=0.295).

Length of needle required most of the time in median group was 4-6 cm while in paramedian group length required was 6-8 cm.

The result proved that the difference between two groups was highly statistically significant

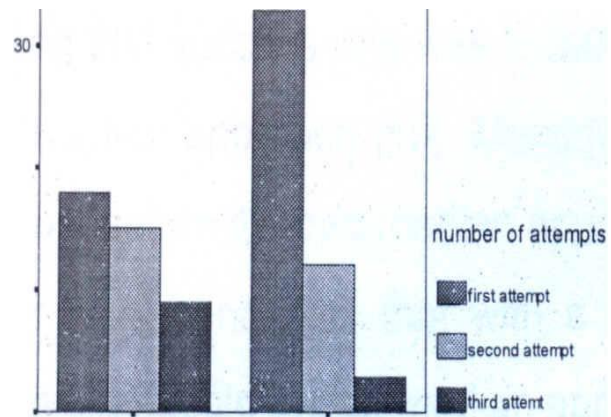


Fig. 1: Success rate of two groups.

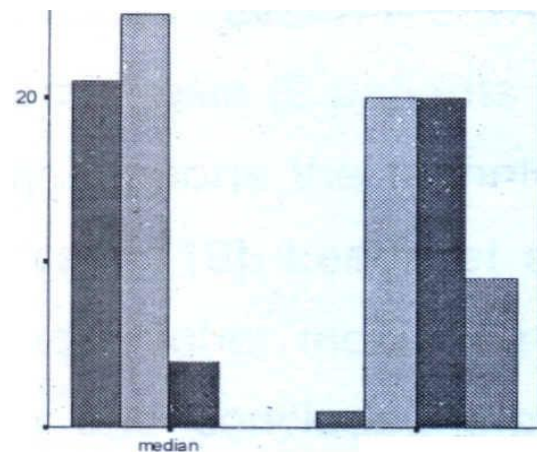


Fig. 2: Statistical significance of two groups.

(P < 0.001) (Fig.2).

DISCUSSION

To reduce the incidence of postoperative cerebral dysfunction and bronchopneumonia, spinal anaesthesia is preferred for lower abdominal and lower limb surgeries. Neuroaxial blockade reduces the postoperative mortality and other serious complications. It is still to be determined, whether these benefits are solely due to neuroaxial blockade or due to avoidance of general anaesthesia. Nevertheless, findings support more widespread use of neuroaxial blockade^{7,8}. Usually spinal anaesthesia is administered through median approach. In certain conditions like obesity, spinal deformity or fracture it is very difficult to make proper position and administration of spinal anaesthesia through median approach is difficult^{9,10}. An alternative approach of needle

placement is paramedian approach which does not require flexed posture as is the case of median approach and needle placement through para spinal muscle mass is easy^{6,11}.

The paramedian approach offers several advantages over midline approach and is associated with lower frequency of technical problems as compared to median approach¹². The successful location of the subarachnoid or the epidural space in the first attempt is influenced by the technique of spinal anaesthesia¹³. There is higher incidence of paresthesia in patients with lumbar spine pathology^{14,15}. Influence of technique of spinal anaesthesia on success rate, number of attempts and paresthesia is determined by a number of studies and almost all of the studies favor paramedian approach.

Robinowitz et al conducted a study on 40 patients and compared the two approaches demonstrating that success rate was found to be 85% in paramedian approach as compared to 45% in the median approach¹⁶. Mericqu et al concluded that in patients who are elderly and with spinal deformity, paramedian approach is a safe alternative with success rate of 100%¹⁷. Podder et al concluded that with a patient sitting in an unflexed position, it is usually possible to insert needle in paramedian approach as compared to midline approach¹⁸. Molina et al studied the factors associated with lumbar puncture success and found that paramedian approach has higher success rate as compared to median approach¹⁰. Blomberg et al conducted study on 40 patients and demonstrated statistically significant difference between the two techniques in regard to repeated number of attempts and production of paresthesia (9 patients in median group as compared to 1 patient in paramedian group). This study supports the technical advantage of paramedian approach as compared to the median approach¹⁹. Leeda et al conducted study on 30 patients and found that there was a trend towards higher incidence of paresthesia in midline approach²⁰. Joucot et al conducted a study and concluded that the success rate at the first attempt was higher in paramedian

approach (98%) as compared to median approach (94.5%) and the incidence of paresthesia was definitely higher in midline approach (48%) as compared to paramedian approach (24%)²¹. Muhammad Ahsan-ul-haq et al conducted a study on paramedian technique and demonstrate that success rate with paramedian approach was 100% with the first attempt success was 60%⁶.

The results of our study are in accordance with the above mentioned studies with success rate of 96% with paramedian approach as compared to success rate of 84% in median approach. The first attempt success rate was found to be 70% with paramedian approach while in median approach it was 48%. Paresthesia (which is defined as agonizing feeling like shooting pain along the nerve roots) was felt in 20% of patients with paramedian approach while in median technique 38% of patients felt paresthesia. So, paramedian approach was found to have higher success rate with less possibility of repeated number of attempts and lesser incidence of paresthesia.

The findings suggest that routine spinal anaesthesia is often complicated by minor degrees of vascular trauma. There are more chances of traumatic complications in paramedian approach, because epidural veins tend to be situated laterally²². Muhammad Ahsan-ul-haq et al demonstrated that bloody tap with paramedian approach was found in 10% of patients⁶. In our study although difference of bloody tap in both approaches was not statistically significant but there was slightly higher incidence of bloody tap in paramedian group 12% as compared to median group 6%, this finding supports the theoretical possibility of vascularity of epidural space in the lateral region.

Distance from skin to subarachnoid space depends on factors like weight of patient, anatomical level and technique of lumbar puncture^{23,24}. Muranaka Kenji et al conducted the study on 70 patients and demonstrated that paramedian approach required longer protrusion length of spinal needle as compared to median approach¹¹. Adachi et al concluded

that epidural space was deeper if upper thoracic than lower thoracic and lumbar region and depth with paramedian approach was greater than midline approach for both sites²⁴. This study supports these findings and demonstrates that the distance from skin to subarachnoid space was found to be more with paramedian approach as compared to median approach (6-8 cm vs 4-6cm).

CONCLUSION

The paramedian approach is a superior technique as compared to median approach and is associated with higher success rate with lesser number of attempts and paresthesia.

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