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www.commprac.com
ISSN 1462 2815

INCIDENCE OF BRADYCARDIA DURING RECOVERY FROM SPINAL ANAESTHESIA: INFLUENCE OF PATIENT POSITION

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DOI: 10.5281/zenodo.11076090

Abstract

Background: Spinal anesthesia (or spinal anesthesia), also called spinal block, subarachnoid block, intradural block and intrathecal block, is a form of neuraxial regional anesthesia involving the injection of a local anesthetic. Spinal anesthesia has tended to make lowering blood pressure and heart rate and it causes hemodynamic instability to patients undergoing surgery below the umbilicus. Moderate bradycardia occurs regularly during spinal anesthesia. The incidence and time of occurrence of severe postoperative bradycardia during recovery from spinal anesthesia, and the influence of differences in venous return in the Trendelenburg, horizontal and hammock positions were examined in this study. Materials & Methodology: A prospective study was conducted in 30 elective patients from April 2023 to August 2023 at Saveetha Medical College hospital. Patients who underwent surgery with spinal anesthesia during the study period were included. Heart rate (above 100 beats/minutes [tachycardia] or below 60 beats/minutes [bradycardia] was noted. Appropriate graphs and tables have been done. Association between categorical variables was performed using pearsons chi square test. Results: In our study among 30 patient majority of the patients (50%) belonging to the age group 31-50 years followed by 33.3 % patients belonging to the age group 18-30 years. Our study found among 30 patients, In PACU majority of patients are stable 21 patients (70%) with Trendelenburg position patient facing bradycardia 6 patients (20%), followed by horizontal position 2 patients (6.6%), hammock position 1 patient (3.3%). Also our study found that after 90 min admission to PACU among 30 patients, majority of patients are stable 25 patients (83.3%) with Trendelenburg position patient facing bradycardia 3 patients (10%), followed by horizontal position 1 patients (3.3%), hammock position 0 patient (0%). Conclusion: Patients in the Trendelenburg position had a high incidence of severe bradycardia. We suggest that this position should not be used during recovery from spinal anaesthesia. Only patients in the hammock position did not have severe bradycardia in this late phase of recovery from spinal anesthesia. Therefore, the hammock position can be the optimal position for recovery from spinal anesthesia, especially after discharge from the PACU.

Keywords: Bradycardia, Spinal Anesthesia. Position.

INTRODUCTION

Spinal anesthesia (or spinal anesthesia), also called spinal block, subarachnoid block, intradural block and intrathecal block, is a form of neuraxial regional anesthesia involving the injection of a local anaesthetic or opioid into the subarachnoid space, generally through a fine needle, usually 9 cm (3.5 in) long. It is a safe and effective form of anesthesia usually performed by anesthesiologist that can be used as an alternative to general anesthesia commonly in surgeries involving the lower extremities and surgeries below the umbilicus. The local anesthetic with or without an opioid injected into the cerebrospinal fluid provides locoregional anesthesia: true analgesia, motor, sensory and autonomic (sympathetic) blockade. Administering analgesics (opioid, alpha2-adrenoreceptor agonist) in the cerebrospinal fluid without a local anesthetic produceslocoregional analgesia: markedly reduced pain sensation

(incomplete analgesia), some autonomic blockade (parasympathetic plexus), but no sensory or motor block. Locoregional analgesia, due to mainly the absence of motor and sympathetic block may be preferred over locoregional anesthesia in some postoperative care settings. The tip of the spinal needle has a point or small bevel. Recently, pencil point needles have been made available (Whitacre, Sprotte, Gertie Marx and others).[1-3]

Spinal anesthesia has tended to make lowering blood pressure and heart rate and it causes hemodynamic instability to patients undergoing surgery below the umbilicus. The adverse events are related to impaired perfusion of vital organ. Optimizing intraoperative hemodynamics after spinal anesthesia is one of the basicconcerning of safe anesthesia.[4]

Spinal anesthesia is one of the neuro-axial blocks with a massive and temporary interruption of nerve transmission within the sub arachnoid space produced by injection of local anesthetic solution into the cerebrospinal fluids. Local anesthetics administered in the subarachnoid space block sensory, autonomic, and motor impulses as the anterior and posterior nerve roots pass through the CSF. The site of action includes at theanterior and dorsal root of ganglion. Spinal anesthesia has been world widely used and continues to be Popular for surgeries involving the lower abdomen, perineum, and lower limbs.[5,6]

Spinal anesthesia is the technique of choice for Caesarean section as it avoids a general anesthetic and the riskof failed intubation (which is probably a lot lower than the widely quoted 1 in 250 in pregnant women). It also means the mother is conscious and the partner is able to be present at the birth of the child. The post-operative analgesia from intrathecal opioids in addition to non-steroidal anti-inflammatory drugs is also good. Spinal anesthesia may be favored when the surgical site is amenable to spinal blockade for patients with severerespiratory disease such as COPD as it avoids the potential respiratory consequences of intubation and ventilation. It may also be useful in patients where anatomical abnormalities may make tracheal intubation relatively difficult.

When compared with general anesthesia, spinal anesthesia has many advantages including; few adverse effects on the respiratory system as long as excessively high blocks are avoided, a reduced risk of airway obstruction oraspiration, little risk of unrecognized hypoglycemia in an awake diabetic patient, less sedation, less nausea and vomiting, decreased blood loss, less immune suppression, less cognitive impairment especially in the elderly, easy to perform for well trained, reliable and provides excellent operating conditions, less costly, normal gastrointestinal function returns faster, decreased incidence of deep vein thrombosis and pulmonary embolism formation.

Spinal anesthetics are typically limited to procedures involving most structures below the upper abdomen. To administer a spinal anesthetic to higher levels may affect the ability to breathe by paralyzing the intercostal respiratory muscles, or even the diaphragm in extreme cases (called a "high spinal", or a "total spinal", with which consciousness is lost), as well as the body's ability to control the heart rate via the cardiac accelerator fibers. Also, injection of spinal anesthesia higher than the level of L1 can cause damage to the spinal cord, andis therefore usually not done.

Bradycardia (*also sinus bradycardia*) is a slow resting heart rate, commonly under 60 beats per minute (BPM)as determined by an electrocardiogram. It is considered to be

a normal heart rate during sleep, in young and healthy or elderly adults, and in athletes.[1] In some people, bradycardia below 60 BPM may be associated with fatigue, weakness, dizziness, sweating, and fainting.[1] The term "relative bradycardia" is used to refer to a heart rate slower than an individual's typical resting heart rate. Athletes may have athletic heart syndrome, which includes bradycardia as part of the cardiovascular adaptations to training and participation.[2]

Moderate bradycardia occurs regularly during spinal anesthesia. The incidence of intraoperative severe bradycardia requiring therapy has been reported and cardiac arrest has occurred. Decreased venous return to the heart secondary to sympathetic block leads to a decrease in right atrial pressure and pressure in the great veins as they enter the right atrium; this is assumed to contribute to bradycardia during spinal anesthesia. The Trendelenburg position is associated with a higher venous return which might result in a decreased incidence of severe bradycardia.[7-9] The incidence and time of occurrence of severe postoperative bradycardia during recovery from spinal anesthesia, and the influence of differences in venous return in the Trendelenburg, horizontal and hammock positions were examined in this study.

MATERIALS AND METHODS

A prospective study was conducted in 30 elective patients from April 2023 to August 2023 at Saveetha Medical College hospital. Patients with characteristics known to influence the incidence of intraoperative severe bradycardia from spinal anesthesia were excluded, who underwent surgery with spinal anesthesia during the study period were included. The sample was selected using systematic random sampling from patients who presenting for elective surgery below the umbilicus under spinal anesthesia in orthopedic, urology, general, gynecological surgery during the study.

Operational definition for normal patients were defined as patients having a stable hemodynamic response of the patients for adults normal BP, normal Heart rate, and unstable hemodynamic response is considered if BP (hypertension patients=systolic: 140mmHg or higher and diastolic: 90mmHg or lower), Heart rate (above 100 beats/minutes [tachycardia] or below 60 beats/minutes [bradycardia]). Baseline blood pressure (SBP, MAP and DBP) using non-invasive blood pressure (NIBP) and heart rate (HR)using pulse oximetry were measured before the spinal anesthesia performing in the operation room table andrecord averagely. After spinal anesthesia given, then measured at 1, 5, 15, 30, 45 and 60 minutes after the spinal anesthesia then, the level of the block sensation was evaluated with cold alcohol and pin prick after spinal anesthesia.

All elective patients, undergoing surgery below the umbilicus in the urology, orthopedic,gynecological and general surgery under spinal anesthesia were included in the study (“the predication of spinal anesthesia hypotension and getting of high blood pressure).

American society of anesthesiologists physical status (ASA I, II and III). All patients under spinal anesthesia who received 2 to 3 ml of 0.5% hyperbaric bupivacaine were included in study.

Patients who had partial spinal block and total spinal, Patients with characteristics known to influence the incidence of intraoperative severe bradycardia from spinal anesthesia. Patients on combinations of spinal block with other type of anesthesia Also those who have any cardiovascular disease (valvular heart disease,

cardiomyopathies, etc.), DM, renal failure, anemia, electrolyte disturbance and pregnancy were excluded.

Appropriate graphs and tables have been done. Association between categorical variables was performed using pearsons chi square test

RESULT

In our study among 30 patients, 13 Patients (55%) were male, and 17 patients (45%) were female. Our study had majority of the patients (50%) belonging to the age group 31-50 years followed by 33.3 % patients belonging to the age group 18-30 years. Least number ofpatients was in 51-80 years. Our study found majority had ASA 2 (70%), 3 patients (10 %) had ASA 1 and 3 patients (20%) had ASA 3. Our study had majority who were pre – obese (40%) followed by normal patient (23.3%)and there were 20% who were obese.

Our study found among 30 patients, In PACU majority of patients are stable 21 patients (70%) with Trendelenburg position patient facing bradycardia 6 patients (20%), followed by horizontal position 2 patients (6.6%), hammock position 1 patient (3.3%) (Table 1). During total stay in the PACU the statistical results of comparison were as follows: Overall chi-square P<0.001; pairwise comparisons, Trendelenburg vs horizontal position P<0.01; Trendelenburg vs hammock position P<0.005; and Horizontal vs hammock P<0.007.

Table 1: Distribution of Patient Based On Bradycardia in PACU

Bradycardia During total stay in PACU	Hammock position	Horizontal position	Trendelenburg position	Stable Patients
	1	2	6	21
Percentage	3.33	6.6	20	70

Also our study found that after 90 min admission to PACU among 30 patients, majorityof patients are stable 25 patients (83.3%) with Trendelenburg position patient facing bradycardia 3 patients (10%), followed by horizontal position 1 patients (3.3%), hammock position 0 patient (0%) (Table 2). Similar the statistical analysis showed below results on comparison. Overall chi-square P<0.01; pairwise comparison, Trendelenburg vs hammock position P<0.005; and Horizontal vs hammock P<0.007

Table 2: Distribution of patient based on bradycardia later than 90 min after admission to PACU

Bradycardialater than 90min	Hammock position	Horizontal position	Trendelenburg position	Stable Patients
	0	1	4	25
Percentage	0	3.33	13.33	83.3

DISCUSSION

In the operating theatre, where all patients were in the supine horizontal position, the incidence of severebradycardia did not differ between groups and was like previous studies. We can assume that the risk factors for severe bradycardia during spinal anesthesia were evenly distributed between groups.

For comparison with previous studies, we defined severe bradycardia as HR 50 beat/min. This value wasthought to be an appropriate endpoint for intervention in this carefully defined group of patients: other patients may require earlier intervention or may safely tolerate this HR. Similar numbers of patients in the three groups were treated with atropine and ephedrine in the operative period and it is unlikely that these treatments influenced the differences in the incidence of bradycardia between groups.[10,11]

In the PACU, patients in the 30-degree Trendelenburg position had a higher incidence of severe bradycardia than patients in the horizontal or hammock position. This observation seems to contradict the proposed mechanisms for bradycardia during spinal anesthesia: according to Greene, diminished venous return secondary to sympathetic block activates great vein and right atrial cardiac receptors thatboth, by reflex mechanisms and directly, slow the HR[12-14].

Although patients in the Trendelenburg positionhave greater venous return, they had a higher incidence of severe bradycardia. The level of moderate bradycardia did not differ between groups in our study. Therefore, a decrease in venous return most probably was not the primary cause for moderate or severe bradycardia during spinal anesthesia in our patients.

Assuming a differential block of six segments between sensory and sympathetic block only one patient had a sensory level high enough to block one cardiac accelerator segment at the time of admission to thePACU. In the later phase of recovery, it can be assumed that no patient had cardiac accelerator block at atime when all patients had moderate bradycardia, and when some had episodes of severe bradycardia.[15-17]

During total stay in the PACU: overall chi-square P<0.001; pair wise comparisons, Trendelenburg vs horizontal position P<0.01; Trendelenburg vs hammock position P<0.005; and Horizontal vs hammockP<0.007. Later than 90 min after admission to the PACU: overall chi-square P<0.01; pairwise comparison, Trendelenburg vs hammock position P<0.005; and Horizontal vs hammock P<0.007.

CONCLUSION

Patients in the Trendelenburg position had a high incidence of severe bradycardia. We suggest that this position should not be used during recovery from spinal anaesthesia. Severe bradycardia occurring later than 90 min after admission to the PACU was observed in patients who had bradycardia treated successfully in the first 90 min and in patients who had not had severe bradycardia before.

This observation is particularly important, as in normal clinical practice some of these patients would have been discharged from the PACU before the occurrence of the first or a subsequent episode of severe bradycardia. Only patients in the hammock position did not have severe bradycardia in this late phase of recovery from spinal anesthesia.

Although the difference in the incidence of severe bradycardia between the hammock and horizontal groups was not significant, in comparison with the Trendelenburg group, only patients inthe hammock group had a significantly lower incidence of severe bradycardia occurring later than 90 min after admission to the PACU. Therefore, the hammock position can be the optimal position for recovery from spinal anesthesia, especially after discharge from the PACU.

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