Original Article

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Recovery Profile after Subarachnoid Block in Elderly Versus Young Adult Patients

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Abstract

Routinely, Subarachnoid block is practiced for performing operative procedures under general surgery, orthopaedic and obstetrics and gynecology below umbilicus. 100 patients ASA grade I - II of either sex were divided into 2 equal groups of 50 each pout which Group I were young adults (20-40 years age) and Group II were elderly patients above 60 years age. All patients were preoperatively evaluated for fitness of anaesthesia. In group I mean age was 32.42 ± 3.44 and in group II mean age was 66.40 ± 3.91 years. After intravenous access, preloading was done with 7 ml / kg Ringer lactate solution. The mean duration of operation in group I was 77.6 ± 14.6 mints and in group II was 81.0 ± 14.6 mints, there was no statistical significant difference. Mean preoperative pulse rate in group I was 87.12 ± 7.17 per min and 84.92 ± 14.6 min in group II patients. Mean arterial pressure was 90.0 ± 5.17 in group I and 91.2 ± 5.45 in group II patients with no significant difference. The maximum height of sensory blockade was significantly higher in elderly patients as compared to adult patients. Intraoperative fluid requirement was same in both groups. Intraoperative hypotension was noted in 22% of patients in group I and 34% of patients in group II and average number of patients requiring vasopressor was 2 patients in group I and 6 patients in group II. Thus incidence of intraoperative hypotension requiring immediate correction was more in elderly group as compared to adult patients.

In recovery room, highest level of sensory blockade was more in group II as compared to adult group. In recovery room after application of orthostatic challenge, the changes mean pulse rate and MAP were noted at 0, 30, 60 and 90 minutes. At all time intervals percentage rise in mean pulse rate and percent fall in MAP was more significant in elderly (group II) patients at all time intervals as compared to group I patients and it was more significant at 0 and 30 minutes and even upto 90 minutes in elderly patients. The sensory level was higher and regression was slower in elderly patients as compared to adult patients. Thus orthostatic challenge test can be safely applied in elderly patients to assess its efficacy for discharging patients from recover to wards without harm to patients.

Keywords: Spinal Anaesthesia; Differential Spread of Blockade; Higher Sensory Block In Elderly; Delayed Regression of Block; Orthostatic Challenge; Efficacy; Criteria for Early Shifting of Patients from Recovery to Wards; Curtails Load on Recovery Room.

Introduction

Subarachnoid block has upmost potential being a uniquely safe technique of anaesthesia due to the combination of profound analgesia, muscle relaxation, less sympathetic and metabolic disturbances. It also preserves airway, decreases intraoperative blood loss and provides residual postoperative analgesia. Despite these various advantages anaesthesiologist has to face confusion about balancing risks and benefits of spinal ananesthesia.

Now a days, geriatric operative procedures are increasing day by day due increase in life expectancy and evolutions in medical fraternity. Currently about one quarter of all operations are being performed on elderly patients above 60 years age. The elderly patients appears to be at greater risk due to underlying concomitant medical disorders and normal physiological changes of various systems which are aught to be present in these patients.

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As far as spinal anaesthesia is concerned, empirical discharge criteria from recovery room desires regression of sensory level by 2 dermatomes, return of motor function (toe movement) and stable cardiovascular parameters. There is no guarantee of return of autonomic function and may lead to haemodynamic instability when subjected to autonomic stress in ward.

Recent discharge criteria are based on checking return of autonomic function by subjecting the patients to orthostatic challenges in recovery room. There is no correlation between orthostatic decrease in Mean arterial pressure (MAP) and concurrent sensory level. It is also safe hemodynamically to review discharge criteria even though sensory level is above T_{10} dermatome. The present study was undertaken to compare and evaluate efficacy of discharge criteria in elderly and young adult patients after subarachnoid block.

Material and Method of Study

100 patients of either sex were randomly divided in 2 groups as Group I and Group II of 50 patients each. Group I comprised of 50 adult patients between 20-40 years and Group II had 50 elderly patients above 60 years of age. The patients with cardiovascular diseases, respiratory disorders, peripheral and autonomic neuropathy, severe systemic diseases and patients where spinal anaesthesia is contraindicated were excluded from study. All patients were preoperatively evaluated for fitness of anaesthesia, and usual preoperative preparation with informed consent was advised.

After arrangement of all monitors and emergency drugs anaesthesia trolly was prepared. After Intravenous access all patients were preloaded with 7 ml/kg of Ringer lactate solution. Under all aseptic precautions, lumbar puncture was performed in left lateral position with 23G LP needle at L_3-L_4 or L_4-L_5 interspace in all patients. 3 ml of 0.5% hyperbaric Bupivacaine hydrochloride was injected in subarachnoid space after obtaining clear CSF flow. Intraoperatively all patients were monitored for changes in pulse rate, blood pressure, ECG, level of analgesia, respiratory rate, Oxygen saturation with suitable monitors attached.

The blood pressure was maintained at ±20% of baseline reading with adequate intravenous fluids and with Vasopressors Inj. Mephenterimine 6mg bolus as when required. Total dose requirement of vasopressor, total fluids infused intraoperatively, highest level of analgesia and total duration of operative procedure were noted in all patients.

In the recovery room, highest level of sensory block, presence of toe movement, pulse rate, mean arterial pressure (MAP) were noted at 0, 30, 60 and 90 minutes postoperatively 2 minutes following orthostatic challenge. Orthostatic challenge was performed by giving 60^0 head up tilt for 2 minutes and after that the changes in pulse rate and blood pressure were noted. During the procedure, these patients were asked for dizziness or chest pain and having in those then immediately given supine or head low position, oxygenation with mask and were settled. All patients were shifted to respective wards after 90 minutes of recovery observation. All observations were statistically evaluated with Paired T test, two sample t test or Z test.

Observations or Results

100 patients were divided into 2 equal groups of 50 patients each according to the age. Age distribution in Group I (Adults) and Group II (Geriatric) was as shown in Table 1.

Mean age range in Group I was 32.42 ± 3.44 (t = 46.15)

Mean age range in Group II was 66.4 ± 3.91 (p -< 0.001)

In group I maximum number of patients were in age range of 26 to 35 years and in group II 60 – 70 years.

Sex distribution was as shown in Table 2.

There was no significant difference as far as sex distribution was concerned in both groups.

Weight distribution was as shown in Table 3.

Mean weight range in Group I was 59.24 ± 8.51 kg

Mean weight range in Group II was 57.30 ± 7.28 kg

There was no significant difference in weight range in 2 groups.

There were maximum number of patients with weight range of 51 – 60 kg and 61-70 kg in both groups.

Height distribution in both groups was as shown in Table 4.

Mean height in group I was 158.5 ± 16.5 cm

Mean height in Group II was 157.3 ± 15.1 cm

There was no significant difference in height distribution in both groups. Maximum number of

patients was having height in range of 151-160 and 161-170 cm.

During preoperative evaluation, all patients were divided into ASA grading in both groups as shown in Table 5.

There was no significant difference in ASA grading distribution was concerned in both groups.

The distribution of operative procedures performed in both groups was as shown in Table 6.

Distribution of operative procedures performed was identical in both groups.

Mean preoperative pulse rate was 81.72 ± 7.17 in group I and 84.92 ± 5.91 in group II patients.

Mean preoperative systolic blood pressure was 90.0 ± 5.17 in group I and 91.2 ± 5.42 in group II patients. There was no statistical significant difference in mean pulse rate and mean blood pressure in both groups.

All patients were monitored for maximum height of sensory block at about 10 minutes after the administration of intrathecal drug by pin prick method. Maximum level of sensory blocked noted in both groups was as shown in Table 7.

There were more number of patients in group II having sensory level T_5 and T_6 as compared to group I . It was observed that the level of analgesia was higher in more number of patients of group II when compared to group I patients. Intraoperatively the toe movements were absent in both group patients indicating complete muscle relaxation.

Total duration of operative procedure was noted in both groups as shown in Table 8.

In group I – mean total duration of operation was 77.6 ± 15.5 mints

In group II – mean total duration of operation was 81.0 ± 14.6 mints.

There was no significant difference as far as total duration of operation was concerned in both groups.

Intraoperatively fluid requirement or total IV fluids infused were noted in both groups including preoperative loading fluids as shown in Table 9.

In group I – Total IV fluids infused mean : 1201 ± 141 ml.

In group II – Total IV fluids infused Mean – 1225 ± 155 ml.

The fluid requirement was insignificantly more in group II patients as compared to group I patients.

All patients were monitored for incidence of intraoperative complications as shown in Table 10.

The incidence of dreadful intraoperative complication was very less in both groups. Only hypotension and bradycardia were noted in more number of patients of group II as compared to group I patients. For correction hypotension and bradycardia 1-2 doses of inj.Mephenterimine 6mg and inj. Atropine .6mg were required to normalize the parameters in group II patients only.

Postoperatively in recovery room, sensory level was noted at 0, 30, 60 and 90 minutes in both groups as shown in Table 11.

At 0 minutes – mean level was T_{10} In 04 ± 0.9 in group I patients and T_9 in 48 ± 1.01 in group II patients. At 30 minutes, mean level was T_{11} 86 ± 1.05 patients in group I and T_{11} 02 ± 1.06 in group II patients. At 60 minutes, mean level was L_1 in 76 ± 1.08 in group I patients and $T_{12\text{ in }58}$ ± 1.07 in group II patients. At 90 minutes, mean level was L_4 in 081 in group I patients and L_2 in 76 ± 1.08 in group II patients.

It was observed that immediately in recovery room (0 minutes) sensory level was $T_9 - T_{11}$ was noted in maximum number of patients of group I and $T_9 - T_{10}$ in maximum number patients of group II but there was no significant difference.

At 30 minutes, the maximum number of patients of group I had sensory level at T_{12} to L_1 but in group II maximum number of patients were having $T_{10} - T_{11}$ level. Thus statistically significant higher level of analgesia was noted I maximum number of patients of group II as compared to group I.

At 60 minutes, in group I maximum number of patients sensory regression $L_2 - L_3$ but in group II maximum number of patients had sensory level at $T_{10} - L_1$ and was significantly higher in group II as compared to group I patients.

At 90 minutes, in group I there was almost complete regression of sensor level below L_5 in all patients but in group II level of analgesia was upto $L_2 - L_4$ in maximum number of patients. Thus the regression of sensory level as delayed in more number of patients of group II as compared to group I.

At about 90 minutes, there was complete regaining of motor functions in both groups, somewhat more faster in group I as compared to group II patients.

The changes in pulse rate were noted before and after orthostatic challenge at various time intervals as shown in Table 12.

It was noted that at all time intervals, % change in mean pulse rate was more significant in group II patients as compared to group I patients. It signifies

that, group II patients are at more risk for orthostatic challenges as compared to group I patients.

The changes I mean arterial pressure before and after orthostatic challenge in both groups at various time intervals was as shown in 13.

The percentage (%) change in mean arterial pressure after orthostatic challenge was more significant in group II patients at all time intervals as compared to group I patients. These group II patients are at more risk of orthostatic challenge for mean arterial pressure immediately in recovery room and also upto I hour. As the tim passes the risk of changes after orthostatic challenges decreases and remains very less after 90 minutes onwards.

Table 1: Age wise distribution of patients group I

Age in years	Group I No. of Patients	Percentage	Age in Years	Group II No. of Patients	Percentage
20-25	1	2	60-65	24	48
26-30	15	30	66-70	17	34
31-35	22	44	71-75	8	16
36-40	12	24	76-80	1	2
Total	50	100	Total	50	100

Table 2: Gender wise distribution of patients

Gender	Group I No. of patients	Percentage	Group II	Percentage
Male	33	66	32	64
Female	17	34	18	36
Total	50	100	50	100

Table 3: Weight wise distribution

Weight in Kg	Group I No. of patients	Percentage	Group II No. of patients	Percentage
41-50	7	14	9	18
51-60	24	48	28	56
61-70	13	26	10	20
71-80	6	12	3	6
Total	50	100	50	100

Table 4: Showing height distribution

Height in Cm	Group I No. of patients	Percentage	Group II No. of patients	Percentage
141-150	8	16	7	14
151-160	17	34	22	44
161-170	20	40	20	40
171 & above	5	10	1	2
Total	50	100	50	100

Table 5: Showing ASA grading

ASA grade	Group I No. of patients	Percentage	Group II No. of patients	Percentage
I	36	72	31	62
II	14	28	19	38
Total	50	100	50	100

Table 6: Showing operative procedures performed

Operative procedures	Group I No. of patients	Group II No. of patients
Hernia repair	26	24
Vaginal Hysterectomy	12	13
Abdominal hysterectomy	5	5
Hydrocele	7	8
Total	50	50

Table 7: Showing Maximum Height of Sensory Blockade

Dermatome Level	Group I No. of patients	Group II No. of patients
T_5	1	3
T_6	5	7
T_7	10	20
T_8	24	12
T_9	6	6
T_{10}	4	2
Total	50	50

Table 8: Showing Total duration of operative procedure

Group I	Mean duration of operative procedure	77.6 ± 15.5 mints
Group II	Mean duration of operative procedure	81.0 ± 14.6 mints

Table 9: Intraoperative Total IV fluid requirement

Group I	Total IV fluids Mean	1201 ± 141 ml
Group II	Total IV fluids Mean	1225 ± 155 ml

Table 10: Showing Intraoperative complications

Intraoperative Complications	Group I No. of patients	Group II No. of patients
Hypotension	11	17
Bradycardia	2	4
Shivering	4	8
Nausea	1	1
Vomiting	0	0
Respiratory Inadequacy	0	0
Higher level of block	0	0

Table 11: Showing Sensory Level in Recovery room at various Time Intervals

Dermatome level	Time Interval							
	0 minutes		30 minutes		60 minutes		90 minutes	
	Gr. I	Gr. II	Gr. I	Gr. II	Gr. I	Gr. II	Gr. I	Gr. II
T_7	0	2						
T_8	3	6						
T_9	7	14	1	4				
T_{10}	28	23	5	10	0	2		
T_{11}	9	4	8	22	1	6		
T_{12}	3	1	24	9	6	12	0	1
L_1	-	-	10	5	10	21	0	5
L_2	-	-	2	4	22	7	2	13
L_3	-	-	-	-	9	2	9	19
L_4	-	-	-	-	2	0	27	10
L_5	-	-	-	-			12	2

Table 12: Showing changes in mean pulse rate After Orthostatic Challenge

Group	Time Interval in mints	Mean Pulse rate Before orthostatic challenge	Mean Pulse rate After Orthostatic Challenge	% change
I	0	79.64 ± 4.10	85.28 ± 4.37	7.38%
	30	79.42 ± 4.18	81.0 ± 4.31	1.99%
	60	78.98 ± 4.60	80.32 ± 4.56	1.99%
	90	80.30 ± 4.10	80.98 ± 4.0	0.77%
II	0	77.6 ± 3.84	84.94 ± 4.10	9.46%
	30	78.72 ± 4.06	84.30 ± 4.07	7.09%
	60	80.42 ± 3.82	85.16 ± 3.72	5.89%
	90	80.44 ± 3.90	82.64 ± 3.96	2.70

Table 13: Showing MAP changes After Orthostatic challenge

Group	Time Interval in mints	Mean Pulse rate		
		Before orthostatic challenge	After Orthostatic Challenge	% change
I	0	87.34 ± 3.58	82.40 ± 4.0	5.66%
	30	87.32 ± 3.76	86.38 ± 3.69	1.08%
	60	89.40 ± 3.48	88.68 ± 3.72	0.81%
	90	91.16 ± 3.27	90.02 ± 4.01	1.25%
II	0	88.94 ± 3.27	82.62 ± 3.52	7.11%
	30	89.44 ± 3.06	84.42 ± 3.26	5.61%
	60	89.92 ± 3.0	85.94 ± 3.22	4.43%
	90	90.18 ± 2.45	87.78 ± 2.79	2.66%

Discussion

Subarachnoid block after its introduction by J.L. Corning and August Bier has its own place in the practice of anaesthesia. Now a days it is most accepted technique of anaesthesia by administering anaesthesiologist, operating surgeon and many times by the patients also. As far as anaesthesiologists are concerned it is somewhat safe, do not require any sophisticated instruments and equipments for monitoring, easily administered by less trained or junior anaesthesist. But it should be given with all monitoring devices and resuscitative measures to avoid dreadful complications. The technique has got its own merits and demerits and limitations that should be known before administration. Again with introduction of epidural block and combined spinal+ epidural, the safety has been much more increased even in complicated patients where conventional general anaesthesia is contraindicated. As far as surgeons are concerned, there is complete analgesia, muscle relaxation and operative satisfaction but limited to regional surgeries. Here the patient is not completely anaesthetized, aware and there is postoperative pain relief.

Despite of various advantages, anaesthesiologist continue to face confusion about balancing risk and benefits of spinal anaesthesia because of autonomic complications as unpredictable level of block, bradycardia and hypotension. So it is necessary to monitor these patients intraoperatively and also in postoperative recovery room. The empirical discharge criteria are patient in supine position, haemodynamic stability, regression of sensory level below T_{10} dermatome and return of motor activity (toe movement) In busy operative schedules, the recovery room is over crowded and delays the discharge of patients from recovery room to wards.

Modifying discharge criteria based on checking recovery of autonomic functions by subjecting the patients to orthostatic challenges in recovery room (Alexander CM 1989, Zaidi MN 2008) this innovation is coming up in the practice.

M Pitkanon (1984), J P Racle (1987), B T Veering (1987) and many others, have noted that there is differential spread of blockade as far as sensory and motor functions are concerned after subarachnoid block. They observed that, sensory level to be significantly higher in elderly patients as compared to young adults. Our observations coincides with above authors. The peripheral motor and sensory conduction velocities slowed progressively and onset latencies of F-waves and somatomotor evoked potentials increased gradually with advancing age.

B T Veering (1991), M N Zaidi (2008), Leslie J, observed more number of patients having hypotension and bradycardia after spinal anaesthesia intraoperatively in elderly patients as compared to young patients. In their opinion, it may be due to associated cardiovascular instability, autonomic imbalance which is common in elderly patients. As age advances, these are bound to be there due to physiological changes in geriatric patients. The incidence of hypotension and requirement of vasopressor is considerable higher in elderly patients as compared to adult patients.

In the recovery room, sensory level was comparatively higher and regression of sensory block was slower in elderly group than adults. The observations were statistically significant at 0 minutes and highly significant at 30, 60 and 90 minutes time intervals. Same were observations of M Pitkanan etal (1984), B T Veering (1987, 1991) and M N Zaidi etal (2004). Motor recovery was identical in both groups at 0, 30, 60, and 90 minutes in recovery room.

Orthostatic challenge comprises 60^0 head up tilt for 2 minutes after subarachnoid block in the recovery room. It mainly assess the recovery of autonomic nervous system after subarachnoid block. Normal pulse rate and blood pressure response to orthostatic challenge is modest tachycardia with increase by 3-10 beats per minute. Systolic blood pressure does not fall significantly. Diastolic blood pressure and mean arterial pressure increases there by decreasing mean

arterial pressure. These modest changes of tachycardia and vasoconstriction are due to increased sympathetic activity due to rapid translocation of blood to lower extremity which is a normal response. These autonomic reflexes are less effective in elderly patients.

In the present study, after orthostatic challenge, the changes in pulse rate at various time intervals were statistically insignificant in young adult patients of group I. In group II, the changes in mean pulse rate at 0 and 90 minutes were insignificant and significant at 30 and 60 minutes time interval in elderly patients.

In the present study, MAP after orthostatic challenge was statistically significant at 0 minutes in group I patients and no change at 30, 60 and 90 minutes time interval. In group II, fall in mean arterial pressure (MAP) after orthostatic challenge was highly significant at all time intervals in the recovery room.

Same were Findings of M N Zaidi Etal (2008)

The autonomic recovery was found to be slower in elderly patients as compared to adult patients. As age advances it is associated with alteration in vascular reactivity manifested clinically as exaggerated changes in blood pressure like hypotension and orthostatic hypotension. Orthostatic hypotension is quite common (about 20%) in the elderly due to diminished baroreceptor responsiveness in spite of increased norepinephrine levels.

Alexendar etal (1989), D V Koneri etl, M N Zaidi etal were of opinion that, application of orthostatic challenge is good alternative test for discharge criteria for patients from recovery room to wards after spinal anaesthesia. A E Pfhy etal (1978), Roe & kim etal quotes that sympathetic nervous system recovers earlier than sensory and motor functions. Thus orthostatic haemodynamic stability (< 10% decrease in MAP) in presence of high levels of sensory and motor blockade could have resulted either from early return of sympathetic functions or fro local vasomotor factors. This can be safely applied as discharge criteria following subarachnoid block even in presence of higher sensory or motor block without compromising patients' safety.

Conclusions

In elderly patients intraoperative hypotension and bradycardia is more common as compared to adult patients after subarachnoid block. Overall, the level of sensory block is higher in elderly patients as compared to adults and also the recovery from the subarachnoid block is slower in elderly. Orthostatic challenge test application in recovery room in patients receiving subarachnoid block, with less than 10% decrease in MAP is safe in all patients for discharging patient from recovery room to respective wards. It is of help to decrease over crowding in the recovery room. It is safe as it does not hampers patients safety.

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