ORIGINAL RESEARCH

Combined Femoral and Sciatic Nerve Block for Knee Surgery in ASA Grade 3 Patients: A Series of 36 Patients

Karuna Kumar Das[1], Devajyoti Sharma[2], Amio Kumar Deori[3], Ranjit Kumar Baruah[4], Russel Haque[5], Pradip Kumar Tiwari[6]

ABSTRACT

Introduction: ASA grade 3 patients undergoing knee surgery present with several risk factors for both general and neuraxial anaesthesia. In an attempt to find a more suitable anesthesia technique for these patients, we have, over the past one year,performed combined femoral and sciatic block in 36ASA grade 3 patients scheduled to undergo knee surgery.

Materials and Methods: 36 patients belonging to ASA grade 3 were administered combined femoral and sciatic block for knee surgery. SBP, DBP, MAP and HR were recorded before and after the anaesthetic procedure and then at every 15 min interval until the end of the surgery. The adequacy of anaesthesia was deemed as excellent, good, sufficient and poor. The degree of muscle relaxation obtained with this procedure was graded by the orthopaedic surgeon on a three point scale. Postoperative use of analgesics were initiated on patients' request and the time to first use of the analgesic was noted. Motor blockade was measured ever hour postoperatively using the modified Bromage scale. The time to first urine output was recorded. The discharge readiness was assessed with the modified Aldrete score. The cost analysis of this procedure was performed.

Results: There was no significant change in the hemodynamic variables (SBP, DBP, MAP and HR) compared to the baseline values.The mean time of onset of femoral block, sciatic block, motor block (onset of B2 on modified Bromage scale) and duration of sensory block were 7.4 min, 9.6 min, 13.2 min and 316 min respectively.The mean time to first urine output was 170 min. After the first hour after surgery, the modified Aldrete score was 10 in all patients.

Conclusion: The combined femoral and sciatic block for knee surgeries in ASA grade 3 patients is a better alternative to spinal and general anaesthesia in terms of superior hemodynamics and absence of side effects associated with general and spinal anaesthesia.

Keywords: Femoral Block, Spinal Block, Knee Surgery, Asa Grade 3

How to cite this article: Karuna Kumar Das, Devajyoti Sharma, Amio Kumar Deori, Ranjit Kumar Baruah, Russel Haque, Pradip Kumar Tiwari. Combined femoral and sciatic nerve block for knee surgery in ASA grade 3 patients: a series of 36 patients. International Journal of Contemporary Medical Research 2015;2(4):977-984

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Source of Support: Nil

Conflict of Interest: None

INTRODUCTION

The ideal anaesthesia technique for the ASA grade 3 patients who are generally in the geriatric age group and present with uncontrolled hypertension, recent history of MI/TIA,moderately decrease ejection fraction or valvular heart diseaseis that which does not produce either hypotension or hypertension and tachycardia. Hypotension in these patients can decrease myocardial perfusion pressure, while hypertension and tachycardia can increase myocardial oxygen demand, both of which will be deleterious for such patients. Also the ideal anesthetic technique should be such that it does not necessitate the use of large volumes of fluid as this may precipitate congestive cardiac failure. For such patients undergoing knee surgery, three techniques of anaesthesia are generally considered-neuraxial, general anaesthesia and peripheral nerve block. Hypotension which can be sometimes profound.[1] To correct this we may have to use large volume of fluid with vasoconstrictors. Therefore both the hypotensive effects of spinal anaesthesia and its management in the form of fluid administration have dangerous consequences for these patients and influence post-operative outcome.[2] Epidural anaesthesia causes fall of blood pressure although gradually. Nonetheless,

it can require use of extra fluids to correct the hypotensive episode. General anaesthesia on the other hand pose problems in patients with cardiac compromise. Most general anaesthetics are cardiac depressants and vasodilators. Deep anaesthesia will cause hypotension[3] while a lighter plane of anaesthesia will cause hypertension and tachycardia. Also for patients with airway diseases such as moderately severe COPD, it is better if we can avoid endotracheal intubationand not involve the lungs in our anaesthetic technique.[4] General anaesthesia is also associated with postoperative cognitive dysfunction and dementia in the elderly.[5] It is suggested that the combined femoral and sciatic nerve block can provide a potentially beneficial alternative to neuraxial and general anaesthesia in such patients.[6,7] This case series is an attempt to validate the above suggestion.Aims and objectives of the study were to study the combined femoral and sciatic nerve block for knee surgery in ASA grade 3 patients in terms of hemodynamic stability, adequacy of anaesthesia, degree of muscle relaxation, postoperative analgesia, motor blockade, time to first urine output and time to discharge.

METHODS AND MATERIALS

The type of study was a Case series at the Operation theatre, Department of Orthopedics, Assam Medical College and Hospital.The type of surery was TBWfor fracture knee, diagnostic arthroscopy and duration of study was 1 year with a sample size of 36 patients

The inclusion criteria was ASA grade 3 patients belonging to age group of 40 to 80 years undergoing knee surgery and exclusion criteria was patients' refusal and patients with psychiatric disorder.

After approval from the institutional ethical committee and following written consent from each patient after having explained to them the study procedure in their own language, each of these patients was visited in the ward for pre anaesthetic check up in the evening before the day of surgery. A detailed history was taken and thorough clinical examination was done. Each patient received bowel cleansing procedure and tablet alprazolam .5mg the night before surgery. Patients were kept nil orally for 8 hours before surgery. On arrival to the OT, the patients were positioned in the OT table and cannulated with an 18 G peripheral cannula and a lactated Ringer's drip connected, followed by attachment of the ECG leads, non-invasive blood pressure cuff and the pulse oxymetry probe. Baseline SBP, DBP, MAP and HR were noted. Due to the nature of our study, none of the patient received any pre medication, except for pantoprazole 40mg I.V before the anaesthetic procedure. The patients were catheterized before the procedure and an urobag connected. For performance of the combined femoral and sciatic block, a stimuplex 21 gauge and a B BRAUN stimuplex Dig RC PNS set to a frequency of 2 Hz and an initial current of 1.00 mA was used.

For the femoral block, the patient was positioned supine and the inguinal area of the involved lower limb was exposed. Taking standard aseptic and antiseptic measures, the needle was inserted according to the Winnie approach.[8] A line was drawn between the anterior superior iliac spine and the pubic tubercle (inguinal ligament). The needle entry was identified 2 cm laterally to the femoral artery under the inguinal ligament. Quadriceps contraction on nerve stimulation was used to confirm the right position. When contractions were achieved at a current strength of .5 mA or less, 25 ml of local anaesthetics (10ml of .5% bupivacaine + 10 ml of 2% lignocaine with epinephrine diluted to 25 ml) was injected. A mild compression of the zone was performed for about 10 min. For sciatic block, the patient was positioned in lateral position with the involved limb on the upside. The involved limb was flexed 90 degrees at hip and sciatic nerve block was performed according to the classic Labat approach.[9] A line was drawn from the posterior superior iliac spine to the midpoint of the greater trochanter. A perpendicular line was drawn to cross this line and extend 5 cm caudally. A second line was drawn from the greater trochanter to the sacral hiatus. The intersection of this line with the perpendicular one showed the point of needle entry. When planter flexion of the foot was achieved with a current strength of .5 mA or less, 20ml of local anesthetic (10ml of .5% bupivacaine + 5ml of 2% lignocaine with epinephrine, diluted to 20 ml). After the procedure the patient was again positioned supine for the surgery. The onset of both the femoral and the sciatic blocks were estimated by pin prick method in their respective dermatomes. The onset of motor block was determined by the modified Bromage scale.

Intraoperatively, the SBP, DBP, MAP and HR were recorded immediately after administration of combined femoral and sciatic block, at the start of surgery and then, every 15 min from the start to the end of surgery. The adequacy of anaesthesia was measured as (a) excellent, when the surgical procedure was carried out with no need for additional pharmacological support; (b) good, when only extra sedation was necessary (single dose of diazepam 10mg slow i.v.); (c) suffi-

cient, when additional analgesia was required (tramadol1.5mg/kg i.v.) in order to complete surgery; and (d) poor, when general anesthesia had to be given to allow the surgical operation to be completed.Degree of muscle relaxation was evaluated by the surgeon according to a 3-level scale of (a) good, when no resistance was encountered to surgical manipulation of the knee; (b) fair, when there was a little resistance to surgical manipulation of the knee, but the outcome of the operation was not affected; and (c) poor, when pain and/or muscle contracture did not allow the surgeon to manipulate the knee as required.

Postoperatively, the use of analgesics were initiated on patients' request and the time to first use of the analgesic was noted. The duration of analgesia provided by the block was taken as the time from the onset of the block up to the time when analgesics were administered at patients' request. The modified Bromage scale was used every hour postoperatively to assess the return of motor function. The duration to return of motor function was taken as the time from the onset of B 2 score on the modified Bromage scale to the attainment of B0 postoperatively. The time to first urine output postoperatively was recorded. The time to discharge ready was evaluated using the modified Aldrete score immediately after OT, and then hourly until the score of 10 was achieved.

STATISTICAL ANALYSIS

The statistical analysis was done using the IBM SPSS 20.0. AP value <0.05 was considered significant. SBP, DBP, MAP and HR were compared using the paired sample t test. The onset of femoral, sciatic and motor block and the duration of sensory block were compared using the one sample t test.

RESULTS

The intraoperative time for the knee surgery was 1 hour on average. In figure 1 we can see that male were mostly affected. In figure 2 we can see that Age distribution: scatter plot shows accumulation between 50-

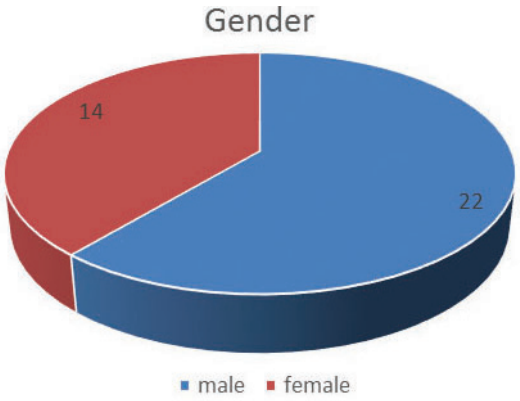

Figure-1: Gender distribution: Male 22. Female 14

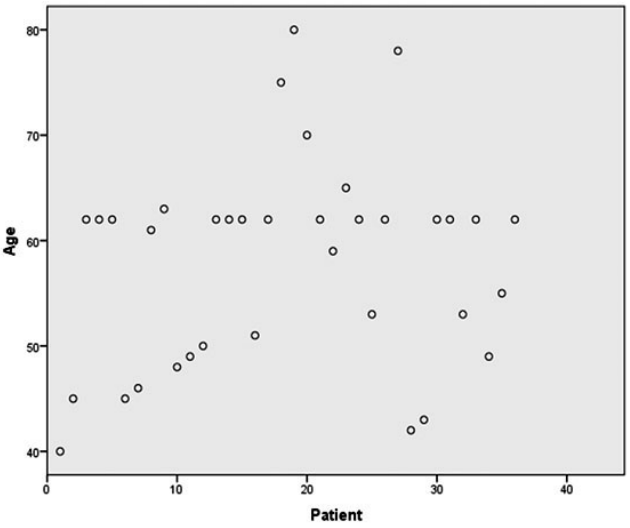

Figure-2: Age distribution: scatter plot. Range 40 to 80 years

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	tb_sbp - ta_sbp	-1.00000	2.40613	.53803	-2.12610	.12610	-1.859	19	.079
Pair 2	tb_sbp - t0_sbp	.05000	4.53611	1.01431	-2.07297	2.17297	.049	19	.961
Pair 3	tb_sbp - t1_sbp	.65000	2.25424	.50406	-.40501	1.70501	1.290	19	.213
Pair 4	tb_sbp - t2_sbp	.55000	2.23548	.49987	-.49624	1.59624	1.100	19	.285
Pair 5	tb_sbp - t3_sbp	-.20000	1.73509	.38798	-1.01205	.61205	-.515	19	.612
Pair 6	tb_sbp - t4_sbp	.05000	1.63755	.36617	-.71640	.81640	.137	19	.893

Figure-:3 SBP at designated intervals compared to the baseline value. P value > .05

60 years. In FIG 3 we can see that SBP at designated intervals compared to the baseline value with P value > .05.In figure 4 DBP at designated intervals has been compared to the baseline value with P value >.05. In figure 5 MAP at designated intervals was compared to the baseline value with P value >.05 In figure 6 HR at designated intervals was compared to the baseline value with P value >.05. In figure 7 Onset of femoral block: median value was seen to be 7.4 min. In figure 8 Onset of sciatic block: median value was seen to be

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	tb_dbp - ta_dbp	.70000	1.83819	.41103	-.16030	1.56030	1.703	19	.105
Pair 2	tb_dbp - t0_dbp	.40000	1.42902	.31954	-.26880	1.06880	1.252	19	.226
Pair 3	tb_dbp - t1_dbp	.35000	1.18210	.26433	-.20324	.90324	1.324	19	.201
Pair 4	tb_dbp - t2_dbp	.25000	1.29269	.28905	-.35500	.85500	.865	19	.398
Pair 5	tb_dbp - t3_dbp	.75000	2.44680	.54712	-.39514	1.89514	1.371	19	.186
Pair 6	tb_dbp - t4_dbp	.50000	2.76253	.61772	-.79290	1.79290	.809	19	.428

Figure-4: DBP at designated intervals compared to the baseline value. P value >.05

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	tb_map - ta_map	-.43333	1.69657	.37937	-1.22735	.36069	-1.142	19	.268
Pair 2	tb_map - t0_map	.16667	2.97455	.66513	-1.22547	1.55880	.251	19	.805
Pair 3	tb_map - t1_map	.55000	1.51898	.33965	-.16091	1.26091	1.619	19	.122
Pair 4	tb_map - t2_map	.45000	1.53049	.34223	-.26629	1.16629	1.315	19	.204
Pair 5	tb_map - t3_map	.11667	1.43993	.32198	-.55724	.79057	.362	19	.721
Pair 6	tb_map - t4_map	.20000	1.46459	.32749	-.48545	.88545	.611	19	.549

Figure-5: MAP at designated intervals compared to the baseline value. P value >.05

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	tb_hr - ta_hr	-.40000	1.39170	.31119	-1.05134	.25134	-1.285	19	.214
Pair 2	tb_hr - t0_hr	-.15000	1.53125	.34240	-.86665	.56665	-.438	19	.666
Pair 3	tb_hr - t1_hr	.15000	1.38697	.31014	-.49912	.79912	.484	19	.634
Pair 4	tb_hr - t2_hr	.05000	2.21181	.49458	-.98516	1.08516	.101	19	.921
Pair 5	tb_hr - t3_hr	-.70000	1.59275	.35615	-1.44543	.04543	-1.965	19	.064
Pair 6	tb_hr - t4_hr	-.20000	1.88065	.42053	-1.08017	.68017	-.476	19	.640

Figure-6: HR at designated intervals compared to the baseline value. P value >.05

One-Sample Test						
	Test Value = 7.4					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Onset_of_femoralblock	1.756	35	.088	.15833	-.0247	.3414

Figure-7: Onset of femoral block: median value 7.4 min.

One-Sample Test						
	Test Value = 9.6					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Onset_of_Sciatic_block	-1.324	35	.194	-.21111	-.5349	.1127

Figure-8: Onset of sciatic block: median value 9.6 min.

One-Sample Test						
	Test Value = 13.2					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Onset_of_Motor_block	.899	35	.375	.15278	-.1921	.4977

Figure-9: Onset of motor block: median value 13.2 min

One-Sample Test						
	Test Value = 316					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Duration_of_sensoryblock	-.266	35	.792	-.27778	-2.4002	1.8447

Figure-10: Duration of sensory block: median value 316 min.

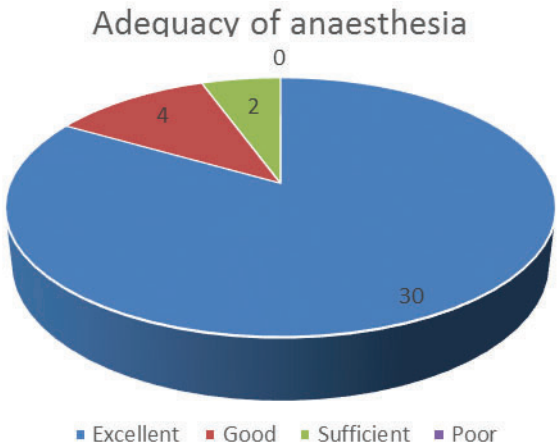

Figure-11: Adequacy of anaesthesia: Excellent 30. Good 4. Sufficient 2

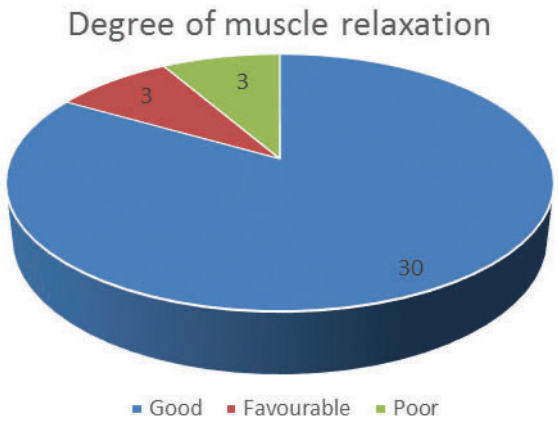

Figure-12: Degree of muscle relaxation: Good 30. Favourable 3. Poor 3

9.6 min. In figure 9 Onset of motor block: median value was seen to be 13.2 min. In figure10 Duration of sensory block: median value was seen to be 316 min. In figure 11 Adequacy of anaesthesia was as follows: Excellent 30. Good 4. Sufficient 2. In figure 12 Degree of muscle relaxation was as follows: Good 30. Favourable

3. Poor 3.Immediately after the administration of the block and during the intraoperative time, there was no significant change in the hemodynamic variables (SBP, DBP, MAP and HR) compared to the baseline values. There was also no significant change in the post-operative hemodynamic parameters as compared to the baseline values. After the administration of the drug, the mean time of onset of femoral block as determined by pin prick sensation was 7.4 min while that of the sciatic block was 9.6 min.Onset of motor block (attainment of B2 on modified Bromage scale) occurred after a mean time of 13.2 min. Out of the 30 cases, only in 4 cases sedation (a single dose of diazepam10mg slow iv) had to be given and in two of the cases, additional analgesic in the form of tramadol 1.5mg/kg body weight had to be administered in addition to the sedative drug (diazepam). None of the cases had to be converted to GA. The degree of muscle relaxation, as evaluated by the surgeon was good in 30 cases, fair in 3 cases and poor in the remaining 3 cases. The mean time at which the patient demanded analgesic support (duration of analgesia provided by the block) was 316 min. At the end of the first and the second hour after administration of the block, the motor block did not wear off in any of the patients (all patients were at B2 stage in the modified Bromage scale). And the end of the third hour, all but fourteen patients had regressed to B1 stage. By the end of the forth hour all patients had regressed back to the B0 stage. The mean time to first urine output was 170 min. The modified Aldrete score was 10 in 30 patients immediately after OT and 9 in the remaining patients. After the first hour the modified Aldrete score was 10 in all patients.

DISCUSSION

In ASA grade 3 patients undergoing knee surgery, the preferred anaesthetic method among the anaesthesiologists was general anaesthesiacompared to neuraxial anaesthesia.[10] However there are several demerits of general anaesthesia in ASA grade 3 patients who are general old and debilitated. As mentioned in the introduction, hypotension during general anaesthesia can cause insufficient myocardial perfusion[11] while failure to prevent hypertension and tachycardia can result in increased myocardial oxygen demand.[12] Hypotension is spinal anesthesia is well known.[13] One cannot afford such hemodynamic perturbation, particularly in ASA grade 3 patients. In our study we found no significant change in the hemodynamic variables compared to the patients' baseline values. Another requirement for general anaesthesia is endotracheal intubation which is a known factor for aggravation of preexisting lung diseases, difficulty in extubation and prolonging the weaning of these patients.[14-16] In our study the major benefit that the combined femoral and sciatic block provided was that it bypassed endotracheal intubation in our study group, many of whom had preexisting COPD. Use of LMA for maintaining airway during general anaesthesia however may not be having any such adverse effects.There are some evidence that general anaesthesia in ASA grade 3 patients is associated with increased incidence of postoperative cognitive dysfunction (POCD) and postoperative delirium (POD), as compared to regional anaesthesia or peripheral nerve block. Studies show that the incidence of POD ranges from 5 to 15 percent, with higher figures in some high risk groups. The incidence of POCD is high at 25 percent.[17] In spinal anesthesia supplemented with IV sedation, the incidence of post-operative delirium is equivalent.[18] None of the patients in our study group suffered from any cognitive dysfunction after the procedure. Lastly compared to our technique, general anaesthesia delays the post-operative recovery and discharge of the patient. In our study, the modified Aldrete score was9 or more for all the patients right after the surgery was concluded. Studies reveal that after general anaesthesia, time to achieve a score of 9 or more on the modified Aldrete score is 16.9 +/- 2.5 min.[19] The meantime for recovery of GI function is considerably prolonged after general anaesthesia compared to spinal anesthesia or combined spinal epidural anaesthesia.[20] In our study, bowel sounds were present immediately after the conclusion of surgery. One study puts the mean timeto first urine output after surgery under spinal anaesthesia at 240 min[21] while another study done by Siano and colleges put it at 269 min. The time to first urine output after surgery under general anaesthesia is 199 +/- 65 min, as shown by Niazi and colleagues.[22] In our case, the time to first urine output was only 170 min. General anaesthesia associated PONV increases PACU and causes greater resource and manpower utilization. In one retrospective database analysis from a teaching hospital, the incidence of nausea and vomiting in the PACU were reported in 16% and 3% of the patients, respectively.[23] None of the patients in our study had any incidence of nausea or emesis. PDPH associated with spinal anaesthesia likewise increase hospital stay.[24] The incidence of PDPH with the 26 G Quincke needle is 2% to 12%, while that with the pencil tip Whitacre needle is .63- 4 %.[25] PDPH cannot occur in our technique. As per our institutional protocol, the patients having

knee surgery such as TBW or diagnostic arthroscopy, were allowed to walk with support the next day and discharged after 3 days.

One hindrance of our technique is its cost. The cost of the 21 gauge 10cm stimuplex needle, bupivacaine .5%, and 2% lignocaine with adrenaline are Rs. 925, Rs. 77 and Rs. 28 respectively; the total rounds up to around Rs. 1030. The total cost of spinal anaesthesia is considerably less. Spinocaine needle 25 G costs Rs. 100 and the cost of inj. bupivacaine heavy is Rs. 38; the total cost comes to Rs. 138. General anaesthesia would generally cost around Rs. 1200. However, the technique we used prevented post-operative complications known to be associated with general and spinal anaesthesia and did not delay hospital stay of any of the patients under study. Therefore the decrease in the cumulative cost arising out of general or spinal anaesthesia associated complication and the consequent increase in the duration of hospital stay, which would otherwise have to be borne by the health sector and the patient would easily outweigh the cost of our technique.

CONCLUSION

In conclusionwe can say that the combined femoral and sciatic nerve block technique for knee surgeries in ASA grade 3 patients is a worthwhile alternative to spinal and general anaesthesia due to its more stable hemodynamics, absence of complications associated with general and spinal anaesthesia and therefore a reduction in cost arising out of these complications, and a shorter time to achieve a score of 9 or more on the modified Aldrete scoring system.

REFERENCE:

1. Chinachoti T, Tritrakarn T.Prospective study of hypotension and bradycardia during spinal anesthesia with bupivacaine: incidence and risk factors, part two. J Med Assoc Thai. 2007; 90:492-501.
2. Doherty M, Buggy D. Intraoperative fluids: how much is too much?British Journal of Anaesthesia. 2012; 109:69-79.
3. Reich D, Hossain S, Krol M, Baez B, Patel P, Bernstein A et al. Predictors of Hypotension After Induction of General Anesthesia. Anesthesia & Analgesia. 2005;101:622-628.
4. Hausman M, Jewell E, Engoren M. Regional versus General Anesthesia in Surgical Patients with Chronic Obstructive Pulmonary Disease. Anesthesia & Analgesia. 2015; 120:1405-1412.
5. Mason SE, Noel-Storr A, Ritchie CW.The impact of general and regional anesthesia on the incidence of post-operative cognitive dysfunction and post-operative delirium: a systematic review with meta-analysis. J Alzheimers Dis. 2010; 22:67-79.
6. Sansone V, De Ponti A, Fanelli G, Agostoni M. Combined sciatic and femoral nerve block for knee arthroscopy: 4 years' experience. Archives of Orthopaedic and Trauma Surgery. 1999; 119:163-167.
7. Spa Sian O A, Flore I, Pesamosca A, Della Rocca G. Comparison between spinal anaesthesiaand sciatic- femoral blockfor arthroscopic knee surgery. Minerva anestesiol 2007;73:13-21
8. Wedel DJ. Nerve blocks. In: Miller RD, editor. Anesthesia.4th edition. Philadelphia: ChurcillLivingstone; 2000.p.1520-48.
9. Sciatic nerve block: posterior and alternative approaches. In: Buckenmaier C, Bleckner L. Military advanced regional anesthesia and analgesia handbook. Washington, DC: Borden Institute, Walter Reed Army Medical Center; 2009.
10. Shevde K, Panagopoulos G. A survey of 800 patients'knowledge, attitudes and concerns regarding anesthesia. AnesthAnalg 1991;73: 190–198.
11. Singh A, Antognini J. Perioperative hypotension and myocardial ischemia: Diagnostic and therapeutic approaches. Ann Card Anaesth. 2011;14:127.
12. Hoffman J, Buckberg G. The Myocardial Oxygen Supply:Demand Index Revisited. Journal of the American Heart Association. 2013;3:e000285-e000285.
13. Norris M. Hypotension During Spinal Anesthesia for Cesarean Section. Obstetric Anesthesia Digest. 1988;8:84-85.
14. Henzler D, Rossaint R, Kuhlen R. Anaesthetic considerations in patients with chronic pulmonary disease. Current Opinion in Anaesthesiology. 2003;16:323-330.
15. Squadrone E, Frigerio P, Fogliati C, Gregoretti C, Conti G, Antonelli M et al. Noninvasive vs invasive ventilation in COPD patients with severe acute respiratory failure deemed to require ventilatory assistance. Intensive Care Med. 2004;30:78-80
16. Nava S. Noninvasive Mechanical Ventilation in the Weaning of Patients with Respiratory Failure Due to Chronic Obstructive Pulmonary Disease. Annals of Internal Medicine. 1998;7:128-721.
17. Deiner S, Silverstein J. Postoperative delirium and cognitive dysfunction. British Journal of Anaesthesia. 2009;103:i41-i46.
18. Chung F, Chung A, Meier R, Lautenschlaeger E, Seyone C. Comparison of perioperative mental function after general anaesthesia and spi-

nal anaesthesia with intravenous sedation. Can J Anaesth. 1989;36:382-387.
19. Arya M, Garg R, Dua CK. Comparison of recovery profile in selective spinal anaesthesia using lignocaine and sufentanyl with propofol based general anaesthesia for gynaecological laparoscopy surgery – a randomized controlled study. Anaesth Pain & Intensive Care 2011;15:40-43
20. BorendalWodlin N, Nilsson L, Kjølhede P, for the GASPI study group. The impact of mode of anaesthesia on postoperative recovery from fast-track abdominal hysterectomy: a randomised clinical trial. BJOG 2011;118:299–308
21. Gebhardt V, Monnard M, Weiss C, Schmittner M. Discharge times for knee arthroscopy in spinal vs. general anesthesia. Open Medicine. 2014;9:50-55
22. Niazi A, Taha M. Postoperative urinary retention after general and spinal anesthesia in orthopedic surgical patients. Egyptian Journal of Anaesthesia. 2015;31:65-69.
23. Habib AS, Chen YT, Taguchi A, Hu XH, Gan TJ. Postoperative nausea and vomiting following inpatient surgeries in a teaching hospital: a retrospective database analysis.Curr Med Res Opin. 2006;22:1093-9.
24. Angle P, Tang SL, Thompson D, Szalai JP. Expectant management of postdural puncture headache increases hospital length of stay and emergency room visits.Can J Anaesth. 2005;52:397-402.
25. Turnbull D. Post-dural puncture headache: pathogenesis, prevention and treatment. British Journal of Anaesthesia. 2003;91:718-729.