ORIGINAL RESEARCH PAPER

Volume - 12 | Issue - 06 | June - 2023 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

COMBINED SPINAL AND GENERAL ANAESTHESIA VERSUS GENERAL ANAESTHESIA ALONE IN CASES WITH LAPAROSCOPIC SURGERIES- A PROSPECTIVE COMPARATIVE STUDY

Anaesthesiology

Dr. D. Sridhar Reddy Post Graduate The Department of Anaesthesia, Aarupadai Veedu Medical College, Puducherry, India.

Dr. M. Suresh Rajkumar Professor The Department of Anaesthesia, Aarupadai Veedu Medical College, Puducherry, India.

Dr. Pradeesh Johny T Assistant Professor The Department of Anaesthesia, Aarupadai Veedu Medical College, Puducherry, India.

Dr. V. Ezhilrajan Professor and Head of the Department The Department of Anaesthesia, Aarupadai Veedu Medical College, Puducherry, India.

ABSTRACT

Background: Laparoscopic surgeries are commonly performed under general anaesthesia and few procedures are done under spinal anaesthesia, depending on patient general condition, willingness, surgeon's preferences and anaesthesiologist's opinion, General anaesthesia, remains the mainstay for all kinds of laparoscopic surgeries However, the unopposed increase in systemic vascular resistance associated with pneumo peritoneum has to be managed by increasing anaesthetic drug concentrations and administering supporting therapy such as vasodilators. This leads to unnecessary deepening of anesthesia, delayed awakening,post operative nausea and vomiting and do not prove cost effective. Spinal anaesthesia (SA) is utilized for laparoscopic procedures, the sympathectomy counteracts the increased Systemic vascular resistance but with prolonged pneumoperitoneum time, patient's discomfort becomes the main limiting factor. Simultaneous use of two anaesthesia techniques for better hemodynamic variables is a widely accepted. We decided to use this technique of combining Spinal anaesthesia with General anaesthesia for patients undergoing laparoscopic surgeries **Material And Methods:** The present hospital based prospective comparative study was conducted among the patients undergoing the elective laparoscopic surgeries in Aarupadai Veedu Medical College & Hospital. The patients were grouped into two groups, as group 1 with combined spinal and general anaesthesia and group 2 patients with general anaesthesia alone. The patients were monitored for the hemodynamic changes every 15 minutes till the surgery is complete and also monitored for the requirement of analgesia, recovery time, and post operative pain. All the data were collected in proforma and entered in excel sheet and analysed Using SPSS version 22.0 (IBM SPSS, US) software operating on windows 10 with $p<0.05$ was accepted as statistically significant. **Results:** In present study with a total of 120 patients . Hemodynamic parameters showing the significant difference between the groups. On assessment of duration of the analgesia, the CSGA group showed significant longer duration of analgesia compared to GA alone.($p<0.05$) Time of duration of surgery, the intraoperative analgesia required for the longer time procedure were seen in the CSGA group compared to the spinal group alone.($p<0.05$) The requirement of analgesia adjuvant during the surgery was significantly noted in GA alone group compared to the CSGA group($p<0.05$). On assessment of pain score Using VAS scale, there was significant lower mean VAS score among the patient at rest and also at movement in the CSGA group compared to patients in the GA alone. ($p<0.05$) **Conclusion:** The present study concludes that spinal anaesthesia in low doses when combined with general anaesthesia for major laparoscopic surgeries gives a significant stable hemodynamics with better surgeon satisfaction in the aspect of field of vision, and reduces intraoperative duration and requirement of analgesics, vasodilators, Betablockers compared to general anaesthesia alone. The combined spinal general anaesthesia was superior than GA alone without any major complications and which can be practised in all major laparoscopic surgeries.

KEYWORDS

INTRODUCTION

Laparoscopic surgeries are commonly performed under general anaesthesia and few procedures are done under spinal anesthesia, depending on patient general condition, Hemodynamics, Preferences, surgeons opinion and anaesthesiologist's opinion[1,2] General anaesthesia, is the mainstay for all kinds of laparoscopic surgeries.[3] However, in the unopposed increase in systemic vascular resistance associated with pneumoperitoneum is to be managed by increasing anaesthetic drug concentrations, dosages and administering supporting therapy including vasodilators.[3] and other drugs This leads to unnecessary deepening of anaesthesia, delayed awakening, post operative nausea and vomiting and do not also expensive. Spinal anaesthesia (SA) is used for laparoscopic procedures, the sympathectomy counteracts the increased systemic vascular resistance but with prolonged pneumoperitoneum time, patient's discomfort becomes the main counterproductive factor.[4,5]

Simultaneous Use of two anaesthesia techniques for better hemodynamic variables is a novel and upcoming trend.[6] We decided to use this technique of combining Spinal anaesthesia with general anaesthesia for patients undergoing laparoscopic surgeries.

The present study is designed to compare the combination of spinal anaesthesia and general anaesthesia with GA alone in patients undergoing laparoscopic surgeries, with the hypothesis that sympathectomy of spinal anaesthesia in laparoscopic surgeries that overcomes the hemodynamic response of pneumoperitoneum. The current study is aimed to assess efficacy of subarachanoid block on heart rate and blood pressure in response to pneumoperitoneum, induction and intubation, requirement of intra operative analgesia as well as beta blockers, recovery time (time taken between closure and extubation).

MATERIAL & METHODS:

Over a period of 20 months (January 2021 to August 2022) hospitalized adults within department of general surgery and gynaecology for major laparoscopic surgical procedures. After obtaining ethics committee approval patients who were satisfying the inclusion criteria were selected and informed consent was obtained. Patients were allocated into 2 groups of 60 each in CSGA and GA. With standard monitoring baseline electrocardiogram, heart rate (HR), mean arterial pressure (MAP), and saturation were recorded. Patients were preloaded with Ringer Lactate 10 ml/kg. In GA group Standardised GA was given with premedication inj. Glycopyrollate 0.01 mg/kg, inj.Midazolam 0.03mg/kg, inj. Ondansetran 0.1mg/kg, Patients were induced with inj. Propofol 2mg/kg, inj. Fentanyl 2mcg/kg, and endotracheal intubation was facilitated by inj. Vecuronium 0.1mg/kg and anaesthesia was maintained using oxygen, nitrous oxide and Sevoflurane at MAC of 1, and neuromuscular blockade was maintained using inj. Vecuronium maintenance dose 0.02mg/kg monitored by TOF guard. Intraoperatively patient were monitored with ASA standard monitoring guidelines, Hemodynamics were monitored every 15 mins till surgery is completed, according to the hemodynamic changes adjuvants were used to blunt the hemodynamic response with use of drugs like Fentanyl and additional dose of sevoflurane, At the end of the procedure neuromuscular

blockade was reversed with inj. Neostigmine 0.05mg/kg and inj. Glycopyrrolate 0.01mg/kg patients were extubated after adequate reversal. In the CSGA group, Spinal Anaesthesia was given in sitting position with 26 G Quincke type needle in L3-L4 interspace using 8 mg of 0.5% Bupivacaine heavy with 20µg Inj. Fentanyl total volume 2ml. Then patients were made to lie supine and waited for 15 minutes for fixation of spinal anaesthesia, dermatomal level was assessed at 15 minutes after administration. Vital parameters were monitored every 3 minutes up to 15 minutes for hypotension, bradycardia and for any other spinal anaesthesia complications. Hypotension and bradycardia was treated with inj. Ephedrine 6 mg titrated doses and bradycardia with inj. Atropine 0.5 mg if any. Then the standard protocol of general anaesthesia was followed same as GA group. Hemodynamic parameters were monitored from induction till recovery at various time intervals as standard in both the groups. Intraoperative better surgical visual field or any interference from bowel dilatation due to surgical handling and use of nitrous oxide was assessed by Surgeon's satisfaction score using Numerical rating scale 1-10, 1 being the least satisfactory and poor field of vision and 10 being excellent field of vision. Duration of surgery and spinal blockade regression in CSGA group recorded. Postoperative analgesia was given as per VAS score reaches 4 or patient complaints of any pain. Postoperative pain management by Inj. Paracetamol 1000 mg IV 12 hourly as standard dose along with inj. Tramadol 50 mg. Inj. Tramadol can be repeated when VAS score ≥4 or any complaints of pain provided the maximum dosage limited to 200mg per day. The time to receive first analgesic dosage after extubation were recorded and requirement of further rescue analgesic dose Inj. Tramadol over 12 hours also recorded. Return of bowel movements & duration at which the patient mobilised out of bed early was recorded. Any postoperative complications like nausea, vomiting, respiratory depression, pruritus, urinary incontinence also noted. Data was entered in proforma and into the excel sheet and analysis was done. The Detailed history was recorded in the patients with predesigned proforma. Patients who were ASA1 & ASA2,patients with no history of previous laparoscopic surgeries and of age between 18 and 65 years were included in this study and Patient's in whom spinal anaesthesia was contraindicated , procedures longer than 4 hours , patients refusal were excluded from the study.

Statistical Analysis:

Statistical analysis using SPSS version 22.0(IBM SPSS,US)software with regression modules are used, Simple statistical methods such as pie diagram and bar charts are used for the descriptive purpose. Chi-square test is used to determine the significance between the parameters observed in this study with similar study of other authors. P <0.05 will be accepted as significant.

RESULTS:

Table No 1: Comparison of the mean age of the patients in CSGA (N=60) and GA (N=60) Groups

	Mean age of patients	SD
CSGA	47.58	10.6
GA	46.37	10.22

Table no 2: Mean pulse rate in CSGA (N=60) and GA (N=60) Groups at different time intervals

	CSGA	GA	P value
Baseline PR	77±9.45	77.63±8.28	0.348
At induction	81.42±10.24	76.72±8.28	0.003*
1 min after Induction	91.67±8.46	99.9±9.15	<0.001*
2 min after Induction	81.5±9.64	90.43±12.08	<0.001*
3 min after Induction	79.53±10.8	87.38±10.7	<0.001*
5 min after Induction	75.65±8.18	85.32±12.59	<0.001*
AT PNEUMOPERITONIUM	85.03±8.86	93.58±12.38	<0.001*
15 min	75.43±18.57	91.25±22.55	<0.001*
30 min	76.48±16.17	87.43±19.87	<0.001*
45 min	81.72±13.1	87.45±13.14	0.009*
1 hr	77.58±11.02	85.1±8.07	<0.001*
1 hr 15 min	75.56±11.88	81.7±7.27	0.003*
1 hr 30 min	77.04±7.27	81.25±7.55	0.002*
1 hr 45 min	76.3±7.49	80.91±3.92	<0.001*
2 hr	75.37±6.59	78.8±7.19	0.033*
2 hr 15min	74.16±5.62	81.47±6.02	<0.001*
2 hr 30min	86.8±12.39	92	0.211
2 hr 45 min	84	0	-
At Extubation	92.85±7.56	107.22±8.32	<0.001*
30 min post-op	77.02±8.42	86.02±5.64	<0.001*
1 hr post-op	74.58±6.23	83.7±5.63	<0.001*
2 hr post-op	74.87±5.99	82.13±6.13	<0.001*
4 hr post-op	75.97±4.4	82.77±5.65	<0.001*

(*p<0.05 is statistically significant)

Mean PR in both groups is comparable.

Table No 3 Mean Systolic Blood Pressure in CSGA (N=60) and GA (N=60) Groups at Different Time Intervals

	CSGA	GA	P value
Baseline SBP	129.15±14.32	124.43±6.93	0.012*
At induction	118.6±10.02	125.25±8.18	<0.001*
1 min after Induction	129.73±12.21	144.13±14.76	<0.001*
2 min after Induction	127.25±12.91	135.1±13.69	<0.001*
3 min after Induction	120.48±12.71	129.65±16.55	<0.001*
5 min after Induction	122.32±9.49	125.67±15.95	0.082
AT PNEUMOPERITONIUM	130.03±7.74	140.3±12.37	<0.001*
15 min	120.63±17.51	136.5±25.91	<0.001*
30 min	121.3±12.29	128.6±15.18	0.002*
45 min	126.45±12.91	127.93±14	0.274
1 hr	123.03±8.11	124.9±9.64	0.127
1 hr 15 min	122.22±11.38	129.02±10.96	<0.001*
1 hr 30 min	122.59±7.23	124.4±6.02	0.088
1 hr 45 min	121.3±7.35	126.21±10.33	0.006*
2 hr	122.93±7	121.13±8.48	0.195
2 hr 15min	124.04±6.02	136.27±1.03	<0.001*
2 hr 30min	132.07±10.71	150	0.002**
2 hr 45 min	136.57±10.69	0	<0.001*
At Extubation	138.83±8.89	145.6±10.82	<0.001*
30 min post-op	121.18±7.28	129.45±7.32	<0.001*
1 hr post-op	119.65±5.02	123.87±6.36	<0.001*
2 hr post-op	118.6±4.81	122.47±7.96	<0.001*
4 hr post-op	119.43±5.86	121.52±8.01	0.053

(*p<0.05 is statistically significant)

Table No 4: Mean Diastolic Blood Pressure in CSGA (N=60) and GA (N=60) Groups at Different Time Intervals

	CSGA	GA	P value
Baseline DBP	78.82±8.06	79.32±6.66	0.356
At induction	73.13±8.41	78.8±7.15	<0.001*
1 min after Induction	82.38±8.77	89.15±7.06	<0.001*
2 min after Induction	79.78±7.39	87.42±5.06	<0.001*
3 min after Induction	75.78±7.39	81.77±6.98	<0.001*
5 min after Induction	78.63±8.05	74.75±3.83	<0.001*
AT PNEUMOPERITONIUM	83.2±5.07	81.72±3.95	0.038*
15 min	71.85±11.77	78.5±12.46	0.002*
30 min	72.17±12.11	78.28±13.22	0.005*
45 min	74.97±12.55	74.95±12.81	0.497
1 hr	71.92±8.04	77.13±8.46	<0.001*
1 hr 15 min	76.88±10.48	78.12±7.64	0.232
1 hr 30 min	73.88±5.52	79.16±4.73	<0.001*
1 hr 45 min	73.84±9.82	76.32±4.9	0.064
2 hr	76.22±4.41	79.73±2.83	<0.001*
2 hr 15min	78.68±5.75	85.87±0.52	<0.001*
2 hr 30min	84.2±3.1	90	<0.001*
2 hr 45 min	88	0	-
At Extubation	79.6±6.54	83.9±6.06	<0.001*
30 min post-op	81.1±5.99	83.35±5.57	0.018*
1 hr post-op	77.82±4.06	83.53±5.76	<0.001*
2 hr post-op	80.18±4.19	81.5±5.59	0.074

(*p<0.05 is statistically significant)

Table No 5: Mean Recovery Time of the Patients in CSGA (N=60) and GA (N=60) Groups

Group		Mean	Std. Deviation	P value
Recovery time (minutes)	CSGA	5.5	1.282	<0.001*
	GA	6.72	2.464	

(*p<0.05 is statistically significant)

The time taken for recovery in GA group is significantly longer than CSGA group.

Table No 6: Mean VAS Scores of the Patients Post Operatively in CSGA (N=60) and GA (N=60) Groups

	CSGA	GA	P value
2nd hour at rest	1.85±1.67	2.27±1.15	0.057
2nd hour on movement	3.57±2.1	5.28±1.37	<0.001*
6th hour at rest	3.72±1.5	3.78±1.65	0.408
6th hour on movement	6.37±1.31	5.12±2.4	<0.001*
12th hour at rest	4.35±2.14	2.98±1.46	<0.001*
12th hour on movement	6.08±2.66	7.15±2.18	<0.001*

(*p<0.05 is statistically significant)

On comparison of VAS scores in both groups at rest and at movement the mean is lower at movement in CSGA group and is statistically significant.

Table No 7: Mean of Surgeon Satisfaction Score in the Study among the CSGA (N=60) and GA (N=60) Groups

Group		Mean	Std. Deviation	P value
Surgeon Satisfaction Score	CSGA	8.27	1.16	<0.001*
	GA	5.32	1.92	

(*p<0.05 is statistically significant)

On comparison of the surgeon satisfaction score, higher scores were recorded in group CSGA which is statistically significant.

Table No 8: The Mean Total Rescue Analgesic Dose Received Post Operatively Over 12 Hours In CSGA (N=60) and GA (N=60) Groups

Group		Mean	Std. Deviation	P value
Total dose of rescue analgesic (Inj. Tramadol) received over 12 hours(mg)	CSGA	138.33	33.66	<0.001
	GA	186.67	27.41	

(*p<0.05 is statistically significant)

Comparison of mean of total doses of Rescue analgesic required over 12 hours postoperatively was showing higher in GA group and is statistically significant.

DISCUSSION:

In present study total of 120 patients fulfilling inclusion criteria were included after obtaining the informed consent. The patients were grouped as group CSGA were given General Anaesthesia combined with Spinal Anaesthesia in lower doses (n=60) and group GA were given General Anaesthesia alone(n=60). Age, gender and physical characteristics were comparable between the groups.

Hemodynamic parameters showed significant difference between the groups. We found the mean pulse rate was significantly increased in GA group compared to CSGA group . Also there was significant drop in the systolic and diastolic blood pressure among the CSGA group compared to GA alone group at 15 min to 1hr 30min of interval (p<0.05).

Suryavanshi et al., documented that in the simple GA group, there was a substantial increase in heart rate, systolic blood pressure, and diastolic blood pressure. Operating circumstances were subjectively judged by surgeons as excellent in the CEGA group and poor in the ordinary GA group. In laparoscopic surgery, they employed a combined epidural and general anaesthetic strategy to reduce stress reaction, maintain better haemodynamics without hypotension and bradycardia, and have a better operative field owing to bowel contractions. Study concludes that the Efficacy of combined epidural general anaesthesia for hemodynamic responses in laparoscopic surgery is better managed than GA alone to manage hypotension & other parameters like bradycardia, with good surgical visual field.[8]

Sarakatsianou C et al., documented there was a significant change in heart rate during induction and at time of creation of pneumoperitoneum, respectively. In terms of hemodynamic stability, spinal anaesthesia is as effective as general anaesthesia and appears to provide a better result with fewer fluctuations in blood pressure and mild changes in heart rate values during TAPP inguinal hernia repair [10]. In our study shows that the recovery is enhanced in CSGA group when compared with GA alone. [11] In our study in CSGA group has stable hemodynamic parameters that is the heart rate during induction as well as at time of creation of pneumoperitoneum, when compared to GA alone group there was fall in blood pressure at time of induction in CSGA group as expected, the vital parameters were monitored at 15 minutes, 30 minutes, and 1hour 15 minutes interval shows statistically significant stable hemodynamics in CSGA group but there was no significant difference at 13 minutes and 1 hour interval the possible explanation would be in GA group received extra doses of Fentanyl and use of Betablockers and vasodilators brought down vitals to CSGA group.

Ghodki et al, documented that the requirement of Betablockers were needed in 53% of the cases in GA group where as the number was significantly lesser in spinal GA group[9], In our study 36.70% of patients required NTG during the intraoperative period and only 8.30% in CSGA group needed NTG which is significantly less.

Zdravkovic M et al., documented at 24 hours after surgery, the control group consumed 7.5 (3-8) mg of piritramide, compared to 5 (0-7.5) mg in the very-low dosage spinal analgesia group (p = 0.182) and 2 (0-2.5) mg in the low-dose spinal analgesia group (p = 0.001). Only the low dosage spinal analgesia group had constant postoperative pain ratings of 3. Which is comparable with our study where we have VAS <3. In all groups, patient satisfaction with anaesthetic treatment and involvement in study was extremely high. In laparoscopic gynaecological surgery, low-dose spinal analgesia combined with general anaesthetic minimises peri-operative opioid intake in the early postoperative period. Study concluded that the analgesia requirement during intra operative and post op period is less when two techniques are combined.[12]

Ghodki et al, found that the recovery time in spinal GA group was much earlier when compared with that of GA alone group[9], In our study the mean time taken for recovery in CSGA group was 5.5 minutes which is significantly less than GA alone group and is ststistically significant(p<0.05). Mean duration of surgery in CSGA group is 98.25 minutes which is statistically lesser than GA group.

In our study, surgeons were asked about the field of vision of the operative field on the basis of bowel interference, Surgeons satisfaction was quantified by NRS scale from 1 to 10 with 1 meaning poor operative filed and 10 meaning best operative field[9]. The surgeon satisfaction was found to be better in CSGA group with the mean of 8.27 than group GA (mean value of 5.32) alone.

Sale et al, concluded that extra analgesic requirement and rescue analgesic needs were less in spinal GA group when compared with GA alone group[14,15] , In our study, the number of patients requiring extra doses of fentanyl during the intraoperative period in both the groups were compared and the number of patients in GA was significantly higher with 56.70% when compared to CSGA group which is only 30% which can be attributed to spinal component, During the post operative period we assessed the time required to receive first dose of rescue analgesic, the time taken for the first rescue analgesic was significantly longer in CSGA group with mean of 2.17 hours(p<0.05).

On assessment of pain score using VAS scale, there was significant lower mean VAS score among the patient at rest and also at movement in the CSGA group compared to patients in the GA alone (p<0.05). Postoperative pain was also significantly reduced in the CSGA group (p<0.05) within the first 4 hours after surgery.

In our study, there was no severe hypotension or bradycardia in combined spinal general anaesthesia group during or after induction of General anaesthesia with inj. propofol 2 mg/kg. In our study we used low dose spinal anesthesia with 8 mg of 0.5% bupivacaine heavy adjuvant dose of 20µg inj. Fentanyl total 2ml volume in ASA 1 & 2 patients. The maximum dermatomal level reached was T6 with the median of T8(T6-T10).

Postoperative nausea and vomiting were seen in 10 patients and 14 patients in CSGA group and GA group respectively. The postoperative nausea & vomiting was treated with inj. Ondansetron 4mg 12 hourly. And also, there was no patients returned with postdural puncture headache (used 26G Quincke type spinal needle would be possible explanation). The hospital stay was same and one month followup was not showing any morbidities in both the groups in our study.

CONCLUSION:

The present study concludes that spinal anaesthesia in low doses when

combined with general anaesthesia for major laparoscopic surgeries gives a significant stable hemodynamics with better surgeon satisfaction in the aspect of field of vision, thus it reduces intraoperative duration and requirement of analgesics, vasodilators, Betablockers compared to General anaesthesia alone.

The combined spinal general anaesthesia was superior than GA alone without any major complications and which can be practised in all major laparoscopic surgeries.

REFERENCES:

1. Fishburne JI. Anaesthesia for laparoscopy: Considerations, complications and techniques. J Reprod Med. 1978;21(1):37–40.
2. Chui PT, Gin T, Oh TE. Anaesthesia for laparoscopic general surgery. Anaesth Intensive Care. 1993;21(2):163–71.
3. Bajwa SJ, Kulshrestha A. Anaesthesia for laparoscopic surgery: General vs regional anaesthesia. J Minim Access Surg. 2016;12(1):4-9.
4. Rodgers A, Walker N, Schug S, McKee A, Kehlet H, Van Zundert A, et al. Reduction of postoperative mortality and morbidity with epidural or spinal anaesthesia: results from overview of randomised trials. Bmj. 2000;321(7275):1493.
5. Calvo-Soto P, Trujillo-Hernández B, Martínez-Contreras A, Vásquez C. Comparison of combined spinal and general anaesthesia block and combined epidural and general anaesthesia block in laparoscopic cholecystectomy. Rev Investig Clínica. 2009;61(6):482–8.
6. Vaghadia H, Viskari D, Mitchell GW, Berrill A. Selective spinal anaesthesia for outpatient laparoscopy. I: characteristics of three hypobaric solutions. Can J Anaesth. 2001;48(3):256–60.
7. Gerges FJ, Kanazi GE, Jabbour-Khoury SI. Anaesthesia for laparoscopy: a review. J Clin Anesth. 2006;18(1):67–78.
8. Suryavanshi VS, Sahu A, Harde M. Efficacy of combined epidural general anaesthesia for attenuating haemodynamic responses in gynaecological laparoscopic surgery. Int J Contemp Med Res. 2016;3:1354–8.
9. Ghodki PS, Sardesai SP, Naphade RW. Combined spinal and general anaesthesia is better than general anaesthesia alone for laparoscopic hysterectomy. Saudi J Anaesth. 2014;8(4):498–503.
10. Sarakatsianou C, Georgopoulou S, Baloyiannis I, Chatzimichail M, Vretzakis G, Zacharoulis D, et al. Spinal versus general anaesthesia for transabdominal preperitoneal (TAPP) repair of inguinal hernia: Interim analysis of a controlled randomized trial. Am J Surg. 2017;214(2):239–45.
11. Sarakatsianou C, Georgopoulou S, Tzovaras G, Perivoliotis K, Papadonta M-E, Baloyiannis I. Hemodynamic effects of anaesthesia type in patients undergoing laparoscopic transabdominal preperitoneal inguinal hernia repair under spinal vs general anaesthesia. Hernia. 2019;23(2):287–98.
12. Zdravkovic M, Kamenik M. A prospective randomized controlled study of combined spinal-general anaesthesia vs. general anaesthesia for laparoscopic gynecological surgery: opioid sparing properties. J Clin Anesth. 2020;64:109808.
13. Sarakatsianou C, Baloyiannis I, Perivoliotis K, Georgopoulou S, Tzovaras G. Quality of life after laparoscopic trans-abdominal pre-peritoneal inguinal hernia repair: spinal vs general anaesthesia. Hernia. 2021;25(3):789–96.
14. Sale HK, Shendage VJ, Wani S. Comparative Study between General Anesthesia and Combined General Anesthesia with Spinal Anesthesia in Laparoscopic Cholecystectomy. Int J Sci Stud 2016;3(11):157-162.
15. Gutte Shreyas Hanumant, Kamat Shriganesh Dayanand, Agrawal Pushpa. General anaesthesia versus combined spinal plus general anaesthesia for elective lumbar spine surgeries: A randomized comparative study. MedPulse International Journal of Anesthesiology.2017; 4(1): 15-19