Section: Anaesthesia

Original Article

ISSN (0): 2347-3398; ISSN (P): 2277-7253

General Anaesthesia vs Spinal Anaesthesia for Laparoscopic Appendectomy; A Comparative Study.

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Abstract

Background: Laparoscopic appendectomy has replaced the traditional surgery technique recent days in India. This surgical technique has become more popular due to various advantages like less bleeding, short hospital stay, and decrease post-operative complications. Studies suggest that spinal anaesthesia technique might be a better option for laparoscopic appendectomy. Therefore the present study was designed to assess the effects of both general anaesthesia and spinal anaesthesia on hemodynamic response in laparoscopic appendectomy. **Subjects and Methods:** This was a comparative study which included 50 surgery patients of acute appendicitis via laparoscopic appendectomy. Groups I included 25 patients of general anaesthesia while, group II consisted 25 patients of spinal anaesthesia. Non-invasive arterial blood pressure, electrocardiography, and pulse oximetry were monitored continuously. Visual analog scale (VAS) on a 10-mm was used for assessment of severity of pain in all the patients. **Results:** Results of the present study showed that there was a significantly higher heart rate ($p<0.05$) in group I general anaesthesia patients compare to group II spinal anaesthesia patients. VAS score was significantly low in group II spinal anaesthesia patients (1.8 ± 0.42) compare to group I general anaesthesia patients (3.3 ± 0.8) with p value <0.05 after 1 hour of surgery. VAS score was recorded after 2 hours of surgery 3.6 ± 0.9 in group I compare to group II 2.0 ± 0.52 with p value < 0.05. **Conclusion:** Findings of the present study suggest that spinal anaesthesia using a combination of 0.5% hyperbaric bupivacaine and a fentanyl has significantly better cardiovascular reactivity compare to general anaesthesia. Moreover, post-operative recovery was hasty in spinal anaesthesia patients in comparison of general anaesthesia patients.

Keywords: Laparoscopic appendectomy, general anaesthesia, spinal anaesthesia.

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Received: August 2018
Accepted: September 2018

Introduction

Acute appendicitis is considered as one of the most important aetiological factor for acute abdominal pain throughout the world.[1] It has been suggested in studies that there is less than 10 % prevalence of appendicitis in developed countries. However, it may be higher in developing countries.[2,3]

Laparoscopy introduced in 1950 revolutionised the techniques of surgeries resulting decrease of various complications of during and after surgeries. However, this technique of surgery made surgery more complicated and required advancement in existing anaesthetic techniques.[4] More appropriate anaesthetic techniques are needed for the laparoscopy to sustain the hemodynamic responses.[5] Advancements in anaesthesiology have been made on many fronts besides clinically relevant scales.[6-8]

Laparoscopic appendectomy has replaced the traditional surgery technique recent days in India.[9] This surgical technique has become more popular due to various advantages like less bleeding, short hospital stay, and decrease post operative complications.[10] Studies suggest that spinal anaesthesia technique might be a better option for laparoscopic appendectomy.[10,11] Compare to general anaesthesia technique spinal anaesthesia has better hemodynamic response.[12]

General anaesthesia is considered to control cardiovascular responses in better way compare to spinal anaesthesia.[13] Spinal anesthesia (SA) has different advantages for inducing analgesic effects along with relaxation of muscles and rapid postoperative recovery.[14]

General anaesthesia is extensively preferred by majority of surgeons both in traditional and laparoscopic appendectomy in spite of numerous advantages of spinal anaesthesia over general anaesthesia.[14] Reports suggest that spinal anaesthesia is free from different side effects which are caused by general anaesthesia like nausea, vomiting, pain and altered hemodynamic responses.[15] Therefore the present study was designed to assess the effects of both general anaesthesia and spinal anaesthesia on hemodynamic response in laparoscopic appendectomy.

Subjects and Methods

This was a comparative study which was conducted from October 2016 to June 2018 in the Department of Anaesthesia. This study included 50 patients which were going to operated for acute appendicitis via laparoscopic appendectomy. These 50 patients of age 18 to 50 years were further randomly subdivided into two groups. Groups I included 25 patients of general anaesthesia while, group II consisted 25 patients of spinal anaesthesia. Patients having BMI < 30 kg/m^2 and ΛSΛ physical status I/II were included in the present study. All the patients of both group gave the informed written consent before taking part in the present study.

All the patients were informed in detail about the spinal anaesthesia and general anaesthesia to group II patients and group I respectively.

All the patients of group II were free to choose option of general anaesthesia if they feel pain or discomfort from spinal anaesthesia during the procedure in spite of administration of intravenous analgesics.

All the acute appendicitis patients contraindication to laparoscopic procedure were converted to traditional surgical procedure and excluded from the study.

Baseline values of each and every patient were recorded before the onset of anaesthetic procedure in both groups. After this all patients of both groups were introduced 10 ml/kg of Ringer lactate via a peripheral vein with an 18-gauge intravenous catheter. The patients under both the groups were premedicated with Inj. Glycopyrollate 0.2 mg, 2 mg of midazolam hydrochloride, 4 mg ondanosetron, and 8 mg dexamethasone before the induction of anaesthesia.

Patients of general anaesthesia group were induced with iv Propofol 2.5 mg/kg, fentanyl 1 µg/kg and succinyl chlorine 1.5 mg/kg, and intubated with suitable sized cuffed endotracheal tube. Sevoflurane 2-3% and 50% nitrous oxide in Oxygen and atracurium besylate (0.5 mg/kg) were used to maintenance of anaesthesia via neuromuscular blocking.

Spinal needle of 27 gauge was used at L4-3 or L4-5 lumber interspace vertebrae in the midline under complete aseptic conditions for spinal anaesthesia. The patients of spinal anaesthesia were introduced 15 mg hyperbaric bupivacian with 25 µg fentanyl in a total volume 3.5 ml. Sensory blockade up to T4 was checked via asking patients to lie in a supine position.

Non-invasive arterial blood pressure, electrocardiography, and pulse oximetry were monitored continuously. Various complaints like shoulder pain, headache, and abdominal discomfort, hypotension, nausea, vomiting etc during surgery were recorded.

Visual analog scale (VAS) on a 10-mm was used for assessment of severity of pain in all the patients. Where 0 was for no pain and 10 was for intense pain.

All the vital readings of cardiovascular system and SPO2 were observed at the following times.

- Before induction.
- After onset of induction.
- After pneumoperitoneum
- During surgery after every 15 minutes up to 1 hour.
- After surgery 1st, 2nd, 4th, 8th and 12th hour.

Statistical analysis

Quantitative data was presented as mean ± sd whereas, qualitative data was presented as number and percentages. Paired students t test was used to asses the difference between bothy groups. IBM SPSS version 20 manufactured by USA was used for the statistical analysis. The p-value <0.05 was considered as significant.

Results

The current study included total 50 patients of laparoscopic appendectomy; which were divided into two groups of 25 patients each. Group I general anaesthesia had 14 male patients and 11 female patients; whereas group II spinal anaesthesia patients consisted 12 male patients and 13 female patients. Results of the present study showed that there was a significantly higher heart rate (p<0.05) in group I general anaesthesia patients compare to group II spinal anaesthesia patients. [Table 1]

Table 1: Comparison of heart rate at different measuring times in both groups.

Heart Rate (per min)	Group I	Group II	p value
Basal	85 ± 1.86	84 ± 1.97	>0.05
After induction	89 ± 1.64	78 ± 2.05	<0.05
Pneumo-peritoneum	101 ± 1.77	83 ± 1.84	<0.05
During surgery 15 min	98 ± 1.85	81 ± 2.24	<0.05
During surgery 30 min	94 ± 2.18	86 ± 1.66	<0.05
During surgery 45 min	92 ± 1.89	85 ± 2.34	<0.05
During surgery 60 min	91 ± 1.56	80 ± 1.62	<0.05
Post-surgery 1 hr	92 ± 2.68	82 ± 2.58	<0.05
Post-surgery 2 hr	93 ± 2.43	83 ± 3.14	<0.05
Post-surgery 4 hr	94 ± 2.89	81 ± 2.33	<0.05
Post-surgery 8 hr	91 ± 1.98	82 ± 2.86	<0.05
Post-surgery 12 hr	88 ± 2.66	84 ± 3.23	<0.05

Table 2: Comparison of arterial blood pressure at different measuring times in both groups.

Arterial blood pressure (mm Hg)	Group I	Group II	p value
Basal	101.63 ± 2.54	101.23 ± 2.46	>0.05
Pneumo-peritoneum	97.56 ± 2.74	86.56 ± 3.62	<0.05
During surgery 15 min	95.61 ± 2.96	88.6 ± 3.12	<0.05
During surgery 30 min	94.34 ± 2.68	86.8 ± 3.19	<0.05
During surgery 45 min	90.28 ± 2.96	84.12 ± 3.68	<0.05
During surgery 60 min	93.55 ± 3.98	87.19 ± 5.18	<0.05
Post surgery 1 hr	105.74 ± 4.39	94.6 ± 4.62	<0.05
Post surgery 2 hr	110.38 ± 2.92	92.78 ± 3.48	<0.05
Post surgery 4 hr	107.11 ± 3.94	97.42 ± 2.58	<0.05
Post surgery 8 hr	104 ± 4.66	99 ± 3.22	<0.05
Post surgery 12 hr	103.46 ± 4.38	97.25 ± 2.92	>0.05

[Table 2] shows that there was significant high arterial blood pressure in group I general anaesthesia patients compare to group II spinal anaesthesia patients with p value < 0.05.

Table 3: Comparison of systolic blood pressure at different measuring times in both groups.

Systolic blood pressure (mm Hg)	Group I	Group II	p value
Basal	120.92 ±6.708	120.60 ±6.185	>0.05
Pneumo-peritoneum	142.96 ±5.799	118.28 ±6.4	<0.05
During surgery 15 min	139.88 ±4.961	112.64 ±6.177	<0.05
During surgery 30 min	136.72 ±4.354	109.36 ±7.216	<0.05
During surgery 45 min	148.88 ±4.91	117.80 ±6.232	<0.05
During surgery 60 min	139.48 ±5.987	114.44 ±5.709	<0.05
Post surgery 1 hr	133.44 ±4.184	110.80 ±6.09	<0.05
Post surgery 2 hr	126.68 ±5.031	107.24 ±6.139	<0.05
Post surgery 4 hr	128.88 ±4.711	108.32 ±5.61	<0.05
Post surgery 8 hr	124.46 ±5.06	109.34 ±6.19	<0.05
Post surgery 12 hr	122.67 ±4.9	110.47 ±5.16	<0.05

It is evident from [Table 3] that there was an insignificant difference between the base line systolic blood pressure of both groups (p>0.05). However, systolic blood pressure was significantly higher in group I general anaesthesia patients during the surgical procedure at every time point (p<0.05). Further, systolic blood pressure was significantly low in group II spinal anaesthesia patients (p>0.05) after laparoscopy. [Figure 1]

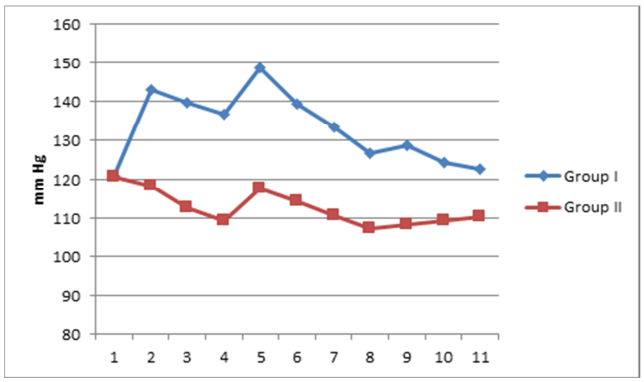

Figure 1: Systolic blood pressure in both groups.

VAS score was significantly low in group II spinal anaesthesia patients (1.8 ± 0.42) compare to group I general anaesthesia patients (3.3 ± 0.8) with p value <0.05 after 1 hour of surgery. VAS score was recorded after 2 hours of surgery 3.6 ± 0.9 in group I compare to group II 2.0 ± 0.52 with p value < 0.05.

After 4 hours of surgery VAS was 3.6 ± 0.76 in group I and 2.6 ± 0.74 in group II. Further, VAS was 2.5 ± 0.65 in group I patients and 1.9 ± 0.39 in group II patients with p value < 0.05 after 12 hours of surgery. Consumption of analgesic was higher in group I patients compare to group II patients (1.7 ± 0.7 ampoule vs 0.7 ± 0.35 ampoule, p value <0.05).

Shoulder pain was observed 3 (6%) patients of group II spinal anaesthesia patients while no patients of group I general anaesthesia patients made complaint about shoulder pain. Among these 3 patients, all the three patients were relieved by administration of sedation.

Four patients of group I while 2 patients of group II had vomiting. Early postoperative mobilization was recorded in spinal anaesthesia group II at 12.5 ± 2.2 hours as compared to 17.2 ± 2.9 hours for group I general anaesthesia patients with p-value<0.05. On the other hand, return of the bowel sounds were heard after surgery in mean time of 8.4 ± 2.6 hours in group I and 7.1 ± 1.7 hours in group II patients with p value >0.05.

Discussion

Nausea, vomiting, longer stays at hospital and delayed recovery are among the most important disadvantages of general anaesthesia after surgery. Recent studies found local anaesthesia was effectively used in laparoscopic surgeries. Gross relaxation of muscles during spinal anaesthesia facilitates the laparoscopic procedure as it provides plentiful space for the operation. Moreover, rapid recovery, decrease use of analgesics and lesser duration of hospital stay are important aspects of spinal anaesthesia.[16]

However, hypotension is among the most common complication of spinal anaesthesia which may be due to increased abdominal pressure and use of trendelenburg position.[14] Nevertheless, this can be confined via use of vasopressors, decreasing the intra abdominal pressure and decreasing the tilt of patient's head.[17,18]

General anaesthesia is the most acceptable and profoundly used anaesthetic technique for laparoscopic surgeries. Spinal anaesthesia is used for the patients in which general anaesthesia cannot be used due to various reasons like asthma, cardiovascular diseases etc. Further, spinal anaesthesia has various advantages over general anaesthesia including better management of post operative pain and hasty recovery.

Findings of the present study showed that heart rate, arterial blood pressure and systolic blood pressure were significantly lower in spinal anaesthesia patients compare to general anaesthesia patients. These findings are consistent with the earlier study of Jun GW et al,[19] as they recorded significantly improved hemodynamic responses if spinal anaesthesia compare to general anaesthesia. Similarly, Mehta PJ et al,[20] observed significantly lower heart rate and blood pressure in spinal anaesthesia in comparison of general anaesthesia.

Results of the current study recorded bradycardia in 8 %

patients. These results are consistent with the previous study of Gurudatta et al,[21] as they recorded bradycardia in 12% patients among the study population of spinal anesthesia in lower abdominal surgeries. In contrast to this Mehta et al,[20] did not found bradycardia in any patients of spinal anaesthesia group or general anaesthesia group.

Further, findings of the present study revealed that VAS score was significantly low in spinal anaesthesia patients compare to general anaesthesia patient. These findings confirmed the results of previous studies of Gurudatta et al,[21] as they recorded similar lower VAS score in spinal anaesthesia group compare to general anaesthesia patients. Similarly Imbelloni et al,[22] observed significantly lower VAS score in spinal anaesthesia group in comparison of general anaesthesia patients. On the other hand, Bessa et al,[15] showed an insignificant difference between VAS score of both groups.

Results of our study showed that use of analgesic ampoules were significantly high in general anaesthesia patients compare to spinal anaesthesia patients. These findings are consistent with the findings of the previous studies of Bessa et al,[15] as they recorded a significantly decreased use of analgesic ampoules in spinal anaesthesia group compare to general anaesthesia patients.

Furthermore, shoulder pain was observed 3 (6%) patients of group II spinal anaesthesia patients while no patients of group I general anaesthesia patients made complaint about shoulder pain. These observations are far lesser than the earlier studies of Gurudatta et al,[21] and Van Zandart et al,[23] as they recorded shoulder pain in spinal anaesthesia patients more than 20 % Patients.

Current study recorded early mobilization and the return of bowel sounds after surgery in spinal anaesthesia patients compare to general anaesthesia patients. This may be due better pain control outcome.

Conclusion

Findings of the present study suggest that spinal anaesthesia using a combination of 0.5% hyperbaric bupivacaine and a fentanyl has significantly better cardiovascular reactivity compare to general anaesthesia. Moreover, post operative recovery was hasty in spinal anaesthesia patients in comparison of general anaesthesia patients. Therefore, we strongly recommend the use of spinal anaesthesia in the patients of laparoscopic appendectomy especially for the patients who cannot endure general anaesthesia.

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How to cite this article: Shrivastava D, Bhadkaria DA. General Anaesthesia vs Spinal Anaesthesia for Laparoscopic Appendectomy; A Comparative Study. Asian J. Med. Res. 2018;7(3):AN06-AN10.
DOI: dx.doi.org/10.21276/ajmr.2018.7.3.AN2

Source of Support: Nil, **Conflict of Interest:** None declared.