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Comparative analysis of effectiveness of general versus spinal anaesthesia in laparoscopic appendicectomy

Govind Goyal
Assistant Professor, Department of Anaesthesiology, Dholpur Medical College, Dholpur, Rajasthan, India

Narendra Singh Tomar
Junior Specialist, Department of Anaesthesiology, Dholpur Medical College, Dholpur, Rajasthan, India

Lokesh Kumar Aggarwal
Senior Consultant, Laparoscopic, General and Uro Surgery, Raman Hospital, Dholpur, Rajasthan, India
*Corresponding author email: drlokesh1975@gmail.com

***Abstract*---**Introduction: Appendicectomy is one of the most common emergency surgical procedures that attempts to define several strategies to ensure early, effective and safe post-surgical management and recovery. Materials and Methodology: General anaesthesia (group G) with 45 patients and spinal anaesthesia (group S) with 45 patients. All 45 patients in spinal anaesthesia group, were informed in prior about the spinal anaesthesia technique in detail in case of pain or un-satisfactory during the procedure or in case of discomfort even after administration of i.v analgesics or sedatives. Results: When comparing the post-operative pain, VAS score was noted for both the groups with mean score 3.2 ± 0.7 in group (G) and 1.7 ± 0.36 in group (S) at 1-hour post-operative with p-value <0.001. At 2-hour postoperative mean score was found 3.3 ± 1.14 in group (G) and 1.8 ± 0.78 in group (S) with p-value < 0.001. It was observed to be 3.6 ± 0.91 in group (G) and 2.8 ± 0.98 in group (S) at 4 h with p-value = 0.001. At 12 h post-operatively, the mean score was 2.75 ± 0.78 in group (G) and 2.2 ± 0.39 in group (S) with p – value < 0.001. Conclusion: Combination of 0.5% hyperbaric bupivacaine and a fentanyl provided effective anaesthesia for laparoscopic appendicectomy with low-pressure CO2 pneumo-peritoneum. It offers better pain management for the patients, rapid recovery and reduced operating room costs. It is recommended to increase the usage of spinal anaesthesia for laparoscopic appendicectomy.

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Introduction

Acute appendicitis is due to various virus, bacteria or parasites which are present in the digestive tract or it may be due to the blockage of stool at the junction of the tube that joins large intestine and appendix. [1]Abdominal pain is one of the most common symptoms in acute appendicitis. It's been found that around 250,000 cases per year undergoes surgical removal appendectomy procedure for appendicitis.[2] Several studies suggest the intake of antibiotics in order to treat initial symptoms of appendicitis, followed by surgery which is considered as one of the gold standard technique among this there are several advantages during laparoscopic approach when compared to the open technique.[3]Appendectomyisconsidered as one of the non-complex procedure which is fast, effective and safe management in uncomplicated cases the recovery is within few days.[4]The laparoscopic approach of surgical invasion is found to be rapidly increased among population, studies suggest laparoscopic appendectomy procedure had earlier recovery, short span of hospital stay and reduced infectious complications.[5,6]

The anaesthetic technique is one of the key factors for providing a better control over post-operative pain and the use of spinal anaesthesia had good result in controlling pain and is considered a safe technique during laparoscopic intra-abdominal surgical procedures.[7] The advantages of spinal anaesthesia is that the patient is awake and well oriented throughout the procedure and absence of side effects like nausea, vomiting and less pain when compared to general anaesthesia.[8]The main objective of this study is to compare the postoperative pain in patients who had underwent laparoscopic appendicectomy under spinal anaesthesia versus general anaesthesia.

Materials and Methods

This comparative study was intended to be conducted in this hospital. The stipulated time for the study is followed to be one year. 90 patients belonging to the age group from 20-40 years, body mass index (BMI) with less than 30 kg/m^2 and ASA I/II undergoing laparoscopic appendectomy were included in this study after obtaining a written informed consent. Those patients who are contraindicated to laparoscopic appendectomy or patients who are treated or converted to open surgical procedure were excluded from this study. Before the start of the surgical procedures, both anaesthetic techniques such as general anaesthesia or spinal anaesthesia were segregated for each patient and all the patients were randomly allocated and blinded using sealed envelopes to receive one of the anaesthetic techniques. General anaesthesia (group G) with 45 patients and spinal anaesthesia (group S) with 45 patients. All the patients were evaluated before the start of the procedure and standardized. All 45 patients in spinal anaesthesia group, were informed in prior about the spinal anaesthesia technique in detail in case of pain or un-satisfactory during the procedure or in case of discomfort even after administration of i.v analgesics or sedatives.

Patients who failed after spinal anaesthesia or those who are not able to tolerate the shoulder pain were converted to general anaesthesia and but still are categorized under spinal anaesthesia. The baseline vital signs are obtained for both the groups and were preloaded with 10 ml/kg of Ringer lactate solution through peripheral vein using 18-gauge intravenous catheter. The patients belonging to both general and spinal anaesthesia groups are given premedication of 2 mg of midazolam hydrochloride, 4 mg ondansetron and 8 mg dexamethasone before the start of induction of anaesthesia. The data were collected, revised and entered to the Statistical Package for Social Science (IBM SPSS) version 20. The qualitative data and quantitative data were presented as number and percentages and as mean and standard deviations respectively. Independent t-test is used to test the comparison between two independent groups with quantitative data and parametric distribution. The p – value of less than 0.001 is considered statistically significant.

Results

This study included 90 patients with the age group from 20-40 years. The data shows that there was no statistically significant difference between both the general and spinal anaesthesia study groups with regard to age, gender distribution, mean value of body mass index (BMI), and the incidence rate of associated comorbidities as listed in table - 1. Both the general and spinal anaesthesia study groups, all the 90 patients were treated laparoscopically with no surgical intervention. Two cases (3.5%) under the spinal anaesthesia study group (S) were converted to open surgical method due to shoulder pain and inappropriate level of anaesthesia. The operative time between both groups was statistically insignificant with mean operative time in group (G) 42.41 minutes and in group (S) 44.79 minutes. Intra and post-operative vital data were recorded in Table 2,3.

On observing the data with regard to pain factor, it was found that intra-operative shoulder pain in 2 patients (5%) in group (S), 1 of which was relieved by the administration of fentanyl and midazolam injection and in the other one they had to be converted to general anaesthesia because of intolerable intraoperative shoulder pain. When comparing the post-operative pain, VAS score was noted for both the groups with mean score 3.2 ± 0.7 in group (G) and 1.7 ± 0.36 in group (S) at 1-hour post-operative with p-value <0.001. At 2 h postoperative mean score was found 3.3 ± 1.14 in group (G) and 1.8 ± 0.78 in group (S) with p-value<0.001. It was observed to be 3.6 ± 0.91 in group (G) and 2.8 ± 0.98 in group (S) at 4 h with p-value=0.001. At 12 h post-operatively, the mean score was 2.75 ± 0.78 in group (G) and 2.2 ± 0.39 in group (S) with p – value<0.001. Group (G) is in need of analgesics ranging from 1 to 3 ampules of diclofenac sodium (75 mg) with mean 1.6 ± 0.5 ampule per patient whereas in group (S) the need for analgesics was in the range from 0 to 3 ampules with mean was 0.7 ± 0.31 ampule per patient with p-value =<0.001.

Two patients (5%) of group (G) had nausea and 1 patient (2.5%) had vomiting. No patients of group (S) had back pain because of the usage of small spinal needle. Two patients (5%) in group (S) had retention and needed catheterization using nelaton catheter to void the bladder but no one needed further catheterization.

Early post-operative mobilization was observed in group (S) at 11.0 ± 1.3 h as compared to 16.2 ± 2.8 h for group (G) with p-value <0.001. As for the return of bowel sounds, they were noted after mean of 7.28 ± 2.2 h in group (G) and 6.8 ± 1.3 h in group (S) with p-value=0.371. Group (G) had a higher mean cost of the operation and hospital stay due to the use of anaesthetic drugs and more pain killers but it was statistically non-significant.

Table 1
Demographic details

Variables	Group (G)	Group (S)
Age(years)	35±2.3	33±1.4
Gender		
Male	39	41
Female	6	4
ASA Score		
ASA I	22	24
ASA II	23	21

Table 2
Comparison between group G and group S regarding mean heart rate at different measuring times

Mean HR	Group (G)	Group (S)	P – value
Basal	87 ± 1.82	84 ± 2.61	0.162
After induction	91 ± 1.11	76 ± 1.77	<0.001
Pneumo-peritoneum	101 ± 1.31	79 ± 2.07	<0.001
Intra op 15	98 ± 2.49	81 ± 3.19	<0.001
Intra op 30	96 ± 2.85	86 ± 1.22	<0.001
Intra op 45	92 ± 2.09	86 ± 1.21	<0.001
Intra op 60	89 ± 1.31	79 ± 2.11	<0.001
Post op 1h	94 ± 3.81	85 ± 1.61	<0.001
Post op 2h	95 ± 3.11	86 ± 3.71	<0.001
Post op 4h	97 ± 2.38	81 ± 2.84	<0.001
Post op 8h	93 ± 1.29	82 ± 2.69	<0.001
Post op 12h	87 ± 2.88	81 ± 3.70	<0.001

Table 3
Comparison between group G and group S regarding mean arterial blood pressure at different measuring times

Mean ABP	Group (G)	Group (S)	P – value
Basal	101.13 ± 1.27	100.19 ± 2.09	0.833
Pneumo-peritoneum	95.22 ± 3.21	85.12 ± 3.95	<0.001
Intra op 15	92.88 ± 2.88	84.9 ± 3.68	<0.001
Intra op 30	92.38 ± 2.85	86.2 ± 3.72	<0.001
Intra op 45	92 ± 3.51	85.63 ± 4.21	<0.001
Intra op 60	91.92± 4.21	86.32± 5.91	0.003
Post op 1h	107.81± 2.81	93.2± 2.9	<0.001

Post op 2h	109.73 ± 2.91	94.21± 3.41	<0.001
Post op 4h	105.32± 2.52	96.47± 2.84	<0.001
Post op 8h	103.8± 2.82	98± 2.62	<0.001
Post op 12h	101.42± 3.42	98.22± 3.83	0.007

Table 4
Post-operative pain (VAS Score)

Mean VAS	Group (G)	Group (S)	P – value
At 1 hr	3.2 ± 0.7	1.7 ± 0.36	<0.001
At 2 hr	3.3 ± 1.14	1.8 ± 0.78	<0.001
At 4 hr	3.6 ± 0.91	2.8 ± 0.98	=0.001
At 12 hr	2.75 ± 0.78	2.2 ± 0.39	<0.001

Discussion

For the laparoscopic procedures to be performed, general anaesthesia is the most commonly used and most widely accepted form of anaesthesia in the routine clinical practice. Few patients are more susceptible to the risks associated with general anaesthesia than the others (smokers, asthmatic patients etc.). Basal atelectasis, rise in the airway pressure, hypercapnia and post-operative nausea and vomiting are associated with the risks that are closely related with general anaesthesia. Spinal anaesthesia offers an effective and a safer alternative to general anaesthesia with some advantages reported over the general anaesthesia group in the pain management and therefore very much helpful in the early recovery of the patients and their return to work& day to day activities. Moreover, many literatures were not written about the comparison between general and spinal anaesthesia in laparoscopic appendectomy, few papers were discussing this comparison in laparoscopic cholecystectomy so the comparison with them might not be as effective as in some parameters like shoulder pain due to the difference in the operative fields.

In our study, 7.5% of the spinal group (S) of patients observed with bradycardia, which was similar to the results obtained by Gurudatta KN et alin their study about spinal anaesthesia in lower abdominal surgeries in which they found that 12% of the patients developed bradycardia,[9] while *Mehta* et al compared general and spinal anaesthesia in laparoscopic cholecystectomy and reported no evidence of bradycardia.[10] Only 5% of group (S) patients had hypotension (>20% fall in BP) in our study, while it was 24% in Gurudatta KN et al,[9] 30% in *Mehta* et al(>30% fall in BP),[10] 18.21% in *Sinha* et al research paper where the discussion about laparoscopic surgeries under spinal anaesthesia.[11] Post-operative pain as measured by the VAS score was in favour of group (S) throughout the post-operative period (1, 2, 4, 12 h) with p - value <0.001 whereas Gurudatta KN et al 's study,[9] and Bessa et al study observed that the difference was non-significant after 6 h.[12] but Imbelloni et al observed significant difference at 2, 4, 6 h but non-significant difference at 12 h in his study comparing general and spinal anaesthesia in laparoscopic cholecystectomy.[13]

The mean number of analgesic ampoules needed was significant lower in the spinal anaesthesia group 0.6 ± 0.29 ampules/patient as compared to 1.6 ± 0.5

ampules/patient the general anaesthesia group. Bessa et al did a study and compared general and spinal anaesthesia in laparoscopic cholecystectomy and also found significantly lower values being 0.5 to 1.1.[12] Shoulder pain was observed in 2 cases (5%) of group (S) which was less than that reported by Gurudatta KN et al 24%,[9] and Van Zandart et al.+ 25% in a study of laparoscopic cholecystectomy under spinal anaesthesia[14] and this pain was easily relieved by sedation administration in 1 patient and the other was converted to GA. In the postoperative period, shoulder pain was reported in 2 cases in both groups (2.5%) and resolved after 5-6 h with the help of analgesia administration. Other complications as PONV were in 3 cases (7.5%) of group (G) and none of group (S) compared to 32% and 8% respectively in Gurudatta KN et alstudy.[10]As for urinary retention, 2 patients (5%) of group (S) suffered from it and were in need of catheterization whereas the study by Imbelloni et al inferred no cases of retention.[13]

Early and rapid post-operative mobilization and the return of bowel sounds were observed in favour of the spinal anaesthesia group over the general anaesthesia group mostly because of better pain control outcome. The mean hours for postoperative mobilization were 16.0 ± 2.5 h for group (G) and was 11.0 ± 1.3 h for group (S) which was significant on statistical level p-value <0.001. On the other hand, bowel sounds were restored earlier in group (S) after mean of 6.8 ± 1.3 h as compared to 7.3 ± 2.1 h in group (G) but it was non-significant statistically.

Conclusion

To conclude, when using a combination of 0.5% hyperbaric bupivacaine and a fentanyl provided effective anaesthesia for laparoscopic appendectomy with low-pressure CO_2 pneumo-peritoneum. It offers better pain management for the patients, rapid recovery and reduced operating room costs. Therefore, it has been recommended that an increase in the usage of spinal anaesthesia for laparoscopic appendectomy particularly in patients with risks for general anaesthesia.

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