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A COMPARATIVE STUDY OF LAPAROSCOPIC APPENDICECTOMY VS OPEN APPENDICECTOMY

Surgery

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ABSTRACT

Introduction: Acute appendicitis is caused by inflammation of the appendix and usually causes pain in the right lower abdominal quadrant. Appendicectomy is one of the most common procedures performed in general surgery and accounts for approximately 1% of all surgeries being performed worldwide. Laparoscopic appendicectomy is more advantageous as it combines diagnosis and treatment in one procedure with the least morbidity. Patients undergoing appendicectomy using a laparoscopic technique usually have less postoperative pain and a shorter hospital stay with earlier restoration to normal activities as compared to those who have undergone open appendicectomy. This study has been undertaken to compare laparoscopic appendicectomy to open appendicectomy in order to compare the efficacy of both the procedures and the adoption of the best method for appendicectomy. **Methodology:** This prospective observational study was conducted in the Department of Surgery, at SGT Medical College and Hospital, Gurugram, Haryana after obtaining approval from the Institutional Ethical Committee and written informed consent from fifty patients, who presented with appendicitis were included in this study over a period of 18 months. All 50 patients diagnose with appendicitis and requiring appendicectomy were included in the study while patients with an appendicular lump, carcinoma appendix, and carcinoid appendix were excluded. A hospital-based sequential sampling technique and a convenient sampling technique were used. **Results:** There is a significant difference in operating time between the open and laparoscopic appendicectomy groups (p–value - < 0.001). It took a longer time for open appendicectomy as compared to laparoscopic appendicectomy (87.80 minutes vs 52.20 minutes) respectively. The patients were required to stay longer in the open group as compared to laparoscopic appendicectomy group (5.04 vs 3.12) in the post operative period and the difference was significant (p-value <0.004). There was a significant difference in the VAS score between the two groups at 6 hours (3.84 vs 3.00, p-value-0.008) respectively while no significant difference in VAS score at 12 hours and 24 hours. The rest of the parameters between the two groups have been tabulated above. The comparison of change in VAS over time between the two groups was not significant. **Conclusion:** Laparoscopic appendicectomy is superior to open appendicectomy, with lower post-operative pain, shorter operative time, lesser incidences of post-operative complications, shorter duration of post-operative hospital stay, and early return to normal work.

KEYWORDS

Appendicectomy, Acute Appendicitis, Post-operative Pain

INTRODUCTION

Acute appendicitis is caused by inflammation of the appendix and usually causes pain in the right lower abdominal quadrant. It is shifting in nature which starts in the umbilical area and shifts to the right iliac fossa, with the clinical signs of rebound tenderness, local guarding, and cutaneous hyperesthesia.[1] The most common intra-abdominal condition is appendicitis which requires emergency surgery and carries a lifetime occurrence risk of 6%.[2]

Acute appendicitis has the highest incidence in the second and third decades of life, although the condition is prevalent in all age groups.[3]

Appendicectomy is one of the most common procedures performed in general surgery and accounts for approximately 1% of all surgeries being performed worldwide.[4] The first known appendicectomy was performed in 1736 by Claudius Amyand.[5] Since then open appendicectomy has been the hallmark procedure for removing an inflamed appendix.[4]

The current era of advanced laparoscopic procedures has made remarkable changes in the approach to surgical conditions. This increasing preference for minimally invasive procedures has provided general surgeons with an opportunity to rethink nearly all operations, with the possibility to be performed by modern laparoscopic techniques.[6]

Laparoscopic appendicectomy is more advantageous as it combines diagnosis and treatment in one procedure with the least morbidity.[7] Patients undergoing appendicectomy using a laparoscopic technique usually have less postoperative pain and a shorter hospital stay with earlier restoration to normal activities as compared to those who have undergone open appendicectomy.[7]

This study has been undertaken to compare laparoscopic appendicectomy to open appendicectomy in order to compare the efficacy of both the procedures and the adoption of the best method for appendicectomy.

MATERIALS AND METHODS

This prospective observational study was conducted in the Department of Surgery, at SGT Medical College and Hospital, Gurugram, Haryana after obtaining approval from the Institutional Ethical Committee and written informed consent from fifty patients, who presented with appendicitis were included in this study over a period of 18 months. All 50 patients diagnose with appendicitis and requiring appendicectomy were included in the study while patients with an appendicular lump, carcinoma appendix, and carcinoid appendix were excluded. A hospital-based sequential sampling technique and a convenient sampling technique were used.

Pre-operative scanning included the demographic details, basic investigations, and the pre-anaesthetic check-up. After the scanning, informed consent for surgery as well as for conversion from laparoscopic to open surgery was obtained.

Randomization of patients was done by envelope method and patients were divided into 2 groups- A and B undergoing open and laparoscopic appendicectomy respectively.

During both procedures, careful note was made for 1) Operative time 2) Any conversion to standard open appendicectomy 3) assessment for pain (visual analogue pain scale), 4) the requirement of analgesia in post -the operative period, and 5) postoperative hospital stay time.

Patients were followed up after 7 days, 15 days, and after 1 month. A note was made of any fever (>38.6°C), wound infection (SSI), post-operative pain, or any other complaint. USG was done to look for any collection, if required.

Statistical Method

Descriptive statistics were analysed with SPSS version 26.0 software, continuous variables were presented as mean +/- SD. Categorical variables were expressed as frequencies and percentages. The Wilcoxon-Mann-Whitney U test and chi-square test were used to compare the parameters for laparoscopic/open appendicectomy. $p < 0.05$ was considered statistically significant.

Observations

A total of 50 patients were included in our study with 25 patients in each group. In our study, there was no statistically significant difference in both groups with respect to gender, the mean age, signs and symptoms at presentation, drain insertion, need for rescue analgesics, post-operative SSI and follow up parameters in terms of SSI and drain in situ.

Table 1 Comparison between group A and B based on different parameters

Parameters	Group		p value
	A(open) (n = 25)	B (laparoscopic) (n = 25)	
Age (Years)	27.36 ± 11.71	26.36 ± 10.30	0.749
Age			0.670
≤20 Years	7 (28.0%)	7 (28.0%)	
21-30 Years	11 (44.0%)	11 (44.0%)	
31-40 Years	4 (16.0%)	6 (24.0%)	
41-50 Years	2 (8.0%)	0 (0.0%)	
51-60 Years	0 (0.0%)	1 (4.0%)	
61-70 Years	1 (4.0%)	0 (0.0%)	
Gender			0.083
Male	18 (72.0%)	12 (48.0%)	
Female	7 (28.0%)	13 (52.0%)	
Presentation: Nausea/ Vomiting (Yes)	20 (80.0%)	17 (68.0%)	0.333
Presentation: RIF Pain (Yes)	25 (100.0%)	25 (100.0%)	1.000
Presentation: Fever (Yes)	4 (16.0%)	8 (32.0%)	0.185
Operative Time (Minutes)	87.80 ± 35.12	52.20 ± 21.80	<0.001
Drain Inserted (Yes)	7 (28.0%)	3 (12.0%)	0.157
Post-Operative Hospital Stay (Days)	5.04 ± 3.88	3.12 ± 1.13	0.004
Need For Rescue Analgesics (Yes)	7 (28.0%)	2 (8.0%)	0.138
Post-Operative SSI (Yes)	2 (8.0%)	0 (0.0%)	0.490
Follow-Up (7 Days)			0.235
Recovered completely	22 (88.0%)	25 (100.0%)	
SSI Present	2 (8.0%)	0 (0.0%)	
Drain In Situ	1 (4.0%)	0 (0.0%)	
Follow-Up (15 Days)			1.000
Recovered completely	24 (96.0%)	25 (100.0%)	
SSI Present	1 (4.0%)	0 (0.0%)	
Drain In Situ	0 (0.0%)	0 (0.0%)	
Follow-Up (1 Month)			1.000
WNL	25 (100.0%)	25 (100.0%)	
SSI Present	0 (0.0%)	0 (0.0%)	
Drain In Situ	0 (0.0%)	0 (0.0%)	

Table 2 Comparison of VAS between group A and B

VAS	Group		P value for comparison of the two groups at each of the timepoints (Wilcoxon-Mann-Whitney Test)
	A	B	
	Mean (SD)	Mean (SD)	
6 Hours	3.84 (1.14)	3.00 (0.91)	0.008
12 Hours	3.12 (1.01)	2.68 (0.95)	0.142
24 Hours	2.36 (1.29)	1.88 (0.67)	0.257
48 Hours	1.84 (0.90)	1.32 (0.56)	0.019
P Value for change in VAS over time within each group (Friedman Test)	<0.001	<0.001	
Overall P Value for comparison of change in VAS over time between the two groups (Generalized Estimating Equations)	0.673		

In our study, there is a significant difference in operating time between the open and laparoscopic appendicectomy groups (p–value - < 0.001). It took a longer time for open appendicectomy as compared to laparoscopic appendicectomy (87.80 minutes vs 52.20 minutes) respectively.

The patients were required to stay longer in the open group as compared to laparoscopic appendicectomy group (5.04 vs 3.12) in the post operative period and the difference was significant (p-value <0.004). There was a significant difference in the VAS score between the two groups at 6 hours (3.84 vs 3.00, p-value-0.008) respectively while no significant difference in VAS score at 12 hours and 24 hours. The rest of the parameters between the two groups have been tabulated above. The comparison of change in VAS over time between the two groups was not significant.

DISCUSSION

Laparoscopic surgery is a major surgical advancement that has enabled the general surgeon to stretch his hands in the super speciality era. The controversy that currently exists over the potential benefits of laparoscopic appendicectomy motivated us to analyse our experience with this procedure.

The results of this study compare favourably with other figures published in the literature in terms of operative time. Laparoscopic appendicectomy took a mean of 52.20 mins (range 20-95 mins) in our study while open appendicectomy took a mean of 87.80 mins (range 30-165 mins) ($p < 0.05$), which was in line with the results. Nazir A et al and Yau KK et al reported a mean operative time of 46.98 ± 2.99 minutes and 55 minutes (45-65 mins) respectively for laparoscopic group, and 53.02 ± 2.88 minutes and 70 mins (60-80 mins) respectively for the open group which was comparable to our result.[8,9] In contrast, Mohamed AA et al and Lin HF et al reported a longer operative duration in the laparoscopic approach.[10,11] This variation reported in the literature in mean operating time may be because of variation in the level of skill and experience with laparoscopic techniques in different centres. Overall, as the experience of a surgeon with laparoscopy increases, the operative time for the laparoscopic group decreases. The better visualization of anatomy in the laparoscopic group was also a factor contributing to lower the operative time in our study.

The post-operative hospital stay between the two groups is comparable. In our study, the average post-operative hospital stay for the laparoscopic group was 3.12 days while for the open group was 5.04 days and was found to be statistically significant ($p = 0.004$). Our findings were consistent with Fleming F et al who in their study had an average post-operative hospital stay of 1.8 days (+/- 2.7) in the laparoscopic group and 2.3 days (+/- 5.5) in the open group.[12] It has been shown that those patients who underwent successful laparoscopic appendicectomy had better postoperative recovery. The reduced trauma to the abdominal wall was a very significant factor in postsurgical discomfort. The better mobility of the abdominal musculature and the earlier ambulation may have been the reason for the shorter post-operative stay.

Our study compared post-operative pain at 4 time points - at 6 hrs, 12hrs, 24 hrs, and 48hrs post-surgery. At 6 hours post-surgery, the mean by VAS score was 3.00 (0.91) in the laparoscopic group and 3.84 (1.14) in the open group which was statistically significant. ($p = 0.008$). At 12 hours, though mean score was lower in the laparoscopic group, i.e. 2.68 (0.95) as compared to the open group, i.e. 3.12 (1.01), this was not statically significant ($p = 0.142$). At 24 hours, findings were similar to the 12th hour as the result was not statistically significant ($p = .0257$) despite the laparoscopic group having a lower mean, i.e. 1.88 (0.67) as compared to open group, i.e. 2.36 (1.29). At the 48th hour, the mean VAS score for the laparoscopic group was 1.32 (0.56) as compared to

1.84 (0.90) of the open group, which was statistically significant (p = 0.019). This was comparable to our result in the 6th hour. The overall trend in both groups, i.e. open and laparoscopic was a decreasing trend with time post-operatively, with VAS decreasing from a maximum mean of 3.84 at 6 hrs to 1.84 at 48 hours in the open group and from 3.00 to 1.32 in the laparoscopic group. This change in mean VAS over time in both groups was statistically significant (p =0.673). Jaschinski et al reported decreased pain in the laparoscopic group on day 1 which is similar to our results.[13] Moore DE et al showed results in line with ours and reported lesser post-operative pain in the laparoscopic group as compared to the open group.[14] There is literature available that is in contrast with our results. Ignacio RC et al in his double blinded randomised trial reported no difference in post-operative pain in both the groups.[15] Katkhouda N et al in his prospective randomised study concluded that there was no difference in pain scores as well as analgesics used in both the groups.[16] The literature is divided on this subject, but lesser pain due to smaller incisions might have been the reason for our findings.

Our data showed that while comparing the need for drain insertion in both the groups, 3 (12%) cases undergoing laparoscopic appendicectomy needed drain insertion as compared to 7 (28%) cases undergoing open appendicectomy, but this result was not statistically significant. Perhaps the lower drain insertion needs in laparoscopic surgeries was due to better intra- abdominal visualisation and an opportunity to suction the peritoneal cavity under vision.

In our study, 2 (8%) people in the laparoscopic group and 7 (28%) people in the open group required rescue analgesics, though this result was not statistically significant. (p=0.138). Similar findings were noted in the study by Katkhouda N et al.[16] They concluded that narcotic medication used to control postoperative pain was also equivalent between the 2 groups. There was no significant difference between the total number of parenteral doses of narcotics or the number of doses of oral analgesics used between the 2 groups.

In our study, 2 (8.0%) of the participants in the open group had SSI, while 0 patients in the laparoscopic group had SSI, though this result was not statistically significant (p = 0.490). In the literature available to us, it had been established that there were lesser SSI rates in patients undergoing laparoscopic appendicectomy as compared to open appendicectomy.[17,18]

Hence, we concluded that laparoscopic appendicectomy is superior to open appendicectomy, with lower post-operative pain, shorter operative time, lesser incidences of post-operative complications, shorter duration of post-operative hospital stay, and early return to normal work.

Limitations-

Limitations of this study include a smaller number of patients, less duration of post-operative follow-up (1 month only), and different surgical experience of operating surgeons in our hospital.

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