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A COMPARATIVE STUDY OF LAPAROSCOPIC AND OPEN APPENDECTOMY

General Surgery

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ABSTRACT

Background: The modern era of laparoscopic surgery has brought a remarkable change in the approach to many surgical diseases. The trend towards minimally invasive surgery has prompted surgeons to scrutinize nearly all operations traditionally performed by open surgery for possible conversion to laparoscopic techniques.

Objectives: Laparoscopic appendectomy is compared with open surgical technique with respect to duration of surgery, incidence of complications, post-operative pain and duration of analgesia, duration of hospital stay and time taken to resume routine work.

Methods: A prospective and comparative study of laparoscopic appendectomy and open appendectomy was conducted from December 2014 to May 2016 and it involved 100 cases (50 cases open and 50 cases lap) which were randomly selected, at AIMS Hospital, B.G. Nagara, Karnataka.

Results: In this study, laparoscopic appendectomy group had the least pain score, shorter duration of analgesics, lesser postoperative complications like ileus, surgical site infections, shorter hospital stay and early return to routine work. However, these advantages were at the cost of slightly increased duration of surgery.

KEYWORDS

Appendicitis, Appendectomy, Laparoscopy

INTRODUCTION

Laparoscopic surgery has dramatically changed the field of surgery. With improvements in the equipment and increasing clinical experience, it is now possible to perform more and more types of surgeries by laparoscopy.

In 1894, Charles McBurney described the oblique right lower quadrant incision and muscle splitting approach for performing surgery on appendix which continued to be used until the late 20th century. A Rockey-Davis or transverse right lower quadrant incision just lateral to the rectus muscle and through McBurney point is thought to provide a better cosmetic outcome and more access to pelvis.

Semm, a German gynaecologist and pioneer of laparoscopic surgery, performed the first laparoscopic appendectomy in 1980.[1] His attempts to bring this new technique to mainstream surgery was met by a great deal of scepticism and backlash from the surgical community. Over the next several years, his efforts to promote laparoscopic surgery ultimately brought about the "laparoscopic revolution" leading to its widespread adoption in not only appendectomy but also cholecystectomy.

Pier A, Gotz F, Bacher C, published the first large series of laparoscopic appendectomies for acute appendicitis and demonstrated that the procedure could be applied to most cases of appendicitis with a high degree of success, a low complication rate such as adhesive intestinal obstruction and operative speed comparable to traditional open appendectomy.[2] After these, many studies have been conducted to compare laparoscopic appendectomy versus open appendectomy.[3,4,5]

A study of discharge abstracts of 43,757 patients concluded laparoscopic appendectomy had significant advantages over open appendectomy with respect to the length of hospital stay, rate of routine discharge, and postoperative in-hospital morbidity.[6]

AIMS AND OBJECTIVES:

This study was conducted to compare the outcomes in 100 patients undergoing Appendectomy by Open versus Laparoscopic techniques with respect to duration of surgery, incidence of complications, postoperative pain and duration of analgesia used, duration of hospital stay and time taken to resume work.

Methodology:

This prospective and comparative study was conducted on 100 patients admitted to AIMS hospital, B.G. Nagara with clinical diagnosis of acute or recurrent appendicitis from December 2014 to May 2016. After random selection, 50 patients underwent Open appendectomy (OA) and 50 patients underwent Laparoscopic appendectomy (LA).

Criteria for allotting patients to lap or open group: The qualifying patients were informed of the risks and benefits of each operation and were asked to sign a detailed informed consent. Further the patients were divided into two groups using a computerized randomized chart. Group A underwent Laparoscopic appendectomy. Group B underwent open appendectomy.

Inclusion criteria: Patients with a clinical picture consistent with the diagnosis of acute appendicitis with appropriate investigations, Patients with a clinical picture consistent with diagnosis of recurrent appendicitis with appropriate investigations, Age 11 to 70 years, Both sexes.

Exclusion criteria: Age < 11years and > 70 years, Patients unfit for General anaesthesia (severe cardiac and /or pulmonary disease), Generalized peritonitis, Appendicular mass or abscess,
Pregnancy.

Open appendectomy was performed by Gridiron incision and muscle splitting procedure. Appendix base was crushed, ligated and divided. Appendix stump was not buried. Duration of surgery taken for open procedure was from the time of skin incision to skin closure.

Laparoscopic appendectomy was done using open Hasson technique for port insertion and standard three port technique. Appendix was ligated with endoloop and divided. The appendix was removed through the infraumbilical trocar in a retrieval bag to prevent wound contamination. Duration of surgery taken for lap was from the time of port site incision to closure of the port by suturing. In both types of operation meticulous attention was given to surgical steps to prevent intra-operative complications like damage to bowels and adjacent organs.

The following parameters were observed in post-operative period in comparison between two procedures, post-operative pain using a visual analogue pain scale and duration of analgesic used in number of days. Post-operative complications like reactionary haemorrhage, vomiting, ileus and surgical site infections were observed. Patients in both study groups were discharged once they were fully mobile and able to tolerate a normal diet and pain relief was adequate. The duration of patient stay and duration of analgesics (oral + IV) used after surgery in number of days was noted.

RESULTS

The analysis of data is as follows:

In present study 23 (46%) patients of LA and 29 (58%) patients of OA were males. 27 (54%) patients of LA and 21 (42%) OA were females. Samples are gender matched with P=0.230.

All 50 (100%) patients in laparoscopic group and 50 (100%) patients in open group complained of abdominal pain. History of nausea/ vomiting was present in 12 (24%) patients in laparoscopic and in 17 (34%) patients in open group. The other complaints were fever 5 (10%) in laparoscopic group and 8 (16%) in laparoscopic group. In the present study 24% and 28% of the patient of laparoscopic and open group respectively, had the history of episodes of abdominal pain in the past. USG finding suggestive of acute appendicitis was present in 43 (86%) and 37 (74%) patients in laparoscopic and open group respectively. P=0.134, so there was no significant difference between two groups.

The haemorrhage as an intra-operative complication occurred in 1 case (2%) and in 3 cases (6%) in laparoscopic and open groups respectively. P=0.617, which is not significant and haemorrhage in laparoscopic group was due to port site bleeding.

38 patients (76%) were operated in 60 to120 min with mean duration of 113.60±33.61 min in laparoscopic group and 41 (82%) patients were operated in 60 to 120 min with mean duration of 67.80±18.13 by open procedure with p value of <0.001 which is significant. So laparoscopic appendectomy was more time consuming than open appendectomy and this may be attributed to the learning curve of operating surgeons.

In present study, 13 cases (26%) had minimum pain score of one and 3 cases (6%) had maximum pain score of three in laparoscopic group, whereas in open group, 29 cases (58%) had minimum pain score of three and 3 cases (6%) had maximum pain score of five with p value <0.001 which is strongly significant.

In laparoscopic group, all 50 cases (100%) had 1-5 days of duration of analgesic use (oral+ IV), whereas in open group 49 cases (98%) had 6-10 days and 1 case (2%) > 10 days' duration of analgesic use (oral+ IV) with p value of <0.001 which is strongly significant. So laparoscopic group experienced least pain and duration of analgesics used was shorter compared to open group.

Superficial incisional infection was present only in 1 case (2%) in laparoscopic group and 8 cases (16%) in open group with p value 0.031 which is significant. Deep incisional infection was present only in 1 case (2%) in open group and was absent in laparoscopic group with p value of 1.000 which is not significant.

In this study, laparoscopic group had lesser postoperative ileus and surgical site infections compared to open group whereas reactionary haemorrhage was absent in both groups.

In laparoscopic group all 50 cases (100%) was discharged in 1-5days with mean hospital stay of 2.28±0.78 days, whereas in open group 12 cases (24%) in 1-5 days, 34 cases (68%) in 6 -10 days and 4 cases (8%) were discharged in > 10 days with mean hospital stay of 7.26±2.15 days with P value <0.001 which shows laparoscopic procedure significantly reduced the hospital stay.

The mean hospital stay for laparoscopic procedure was 2.28±0.78 days and for open procedure was 7.26±2.15 days with P value <0.001 which shows laparoscopic procedure significantly reduced the hospital stay. The mean time taken to resume routine work for laparoscopic procedure was 14.56±1.94 days and for open procedure was 18.24±3.24 days with P value <0.001, which signifies laparoscopic group resumed routine work early compared to open group.

DISCUSSION

Laparoscopic appendectomy (LA) has become the procedure of choice by many surgeons in the treatment of both simple and complicated cases of acute appendicitis.[7, 8] Laparoscopic approach allows a full exploration of the peritoneal cavity, thus can be used as diagnostic tool in difficult cases, when diagnosis is in doubt.[9] The relative advantages of LA vs OA are measured primarily in terms of duration of surgery, post-operative pain score and duration of analgesics used, intra-operative complication like haemorrhage and post-operative complications like reactionary haemorrhage, surgical site infections, ileus in hrs, hospital stay and time taken to resume routine work. [10,11]

Patients are more likely to be discharged from hospital and return to activities of daily living sooner than those who have undergone open appendectomy. The other advantages include decreased wound infection, cosmetic scar, ability to explore the entire peritoneal cavity for diagnosis of other conditions and effective peritoneal toileting without the need for extending the incision.

Although all patients can be offered LA, the Table No. 1 offers a rough guide in selection of patients for LA vs OA.

Table 1: Indications for Surgical Treatment of Appendicitis (LA vs OA)

Laparoscopic Appendectomy (LA)	*Open Appendectomy (OA)*
Female of reproductive age group	Complicated appendicitis
Female of premenopausal group	COPD or Cardiac disease
Suspected appendicitis	Generalised peritonitis
High working class	Previous lower abdominal surgery
Obese patients	Hypercoagulable sates
Disease conditions like Cirrhosis of liver and sickle cell disease	Stump appendicitis after previous incomplete appendectomy
Immunocompromised patients	

In the present study, LA consumed more time than OA. This was attributed to the learning curve of operating surgeon, level of surgical experience, time taken for careful slow insufflation and routine diagnostic laparoscopy before doing any laparoscopic procedure.

Laparoscopic procedure allowed early resumption of oral feeds compared to open procedure with p value <0.001 which is significant. The extraction of specimen with an endobag and through a trocar port rather than directly through the surgical wound as in open procedures, can explain this reduction in incidence of postoperative infection.

CONCLUSION:

The comparative study between LA and OA concluded that Laparoscopic appendectomy group had the least pain score, shorter duration of analgesics, lesser postoperative complications like ileus, surgical site infections, shorter hospital stay and early return to routine work. However, these advantages were at the cost of slightly increased duration of surgery.

Statistical Methods:

Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean ± SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5 % level of significance.

The following assumptions on data are made:

1. Dependent variables should be normally distributed,
2. Samples drawn from the population should be random. Cases of the samples should be independent. Student t test (two tailed, independent) has been used to find the significance of study parameters on continuous scale between two groups (Inter group analysis) on metric parameters. Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups.

Significant figures + Suggestive significance (P value: 0.05<P<0.10) * Moderately significant (P value: 0.01<P £ 0.05) ** Strongly significant (P value: P£0.01)

Statistical software: The Statistical software namely SAS 9.2, SPSS 15.0, Stata 10.1, MedCalc 9.0.1, Systat 12.0 and R environment ver.2.11.1 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.

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