

## COMPARATIVE STUDY OF OPEN VERSUS LAPAROSCOPIC APPENDICECTOMY OUTCOME IN OUR LOCAL AREA

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### ABSTRACT

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#### AIM

It is a comparative study between open appendicectomy and laparoscopic appendicectomy.

#### MATERIALS AND METHODS

The study subjects of this dissertation consist of 126 Patients who have undergone Appendicectomy; 60 Patients had undergone Appendicectomy by the conventional open method and the remaining 66 patients underwent surgery by the laparoscopic method with abdominal pain and with clinical features simulating acute appendicitis.

#### RESULTS

In most of the patients (95%) of the open Appendicectomy group and the entire laparoscopic group, the position of the appendix was retrocaecal. It also shows that the blood loss was below 50 mL in 93% of the patients who underwent open Appendicectomy and 98% among those who underwent laparoscopic (P=0.2). There was no instance of adjacent organ injury in the open Appendicectomy procedure and in the laparoscopic group one had injury. The duration of laparoscopic procedure was 73 mins. as compared to 64 mins. for the open procedure. The difference was not statistically significant (P=0.07). Laparoscopic Appendicectomy was of longer duration 73+26 mins. than open Appendicectomy which took 64+30 mins. Even though this did not turn out to be statistically significant, when theatre charges are levied by the hour and may be in future by the minute. Negative appendicectomy was similar in both the groups to the mild increase in the laparoscopy group. This difference was not statistically significant. There was a significant difference (P=0.02) in the wound infection rate which was around 8 % in the open group while none of the patients in the laparoscopic group.

#### CONCLUSION

It can be concluded that laparoscopic appendicectomy was better than open appendicectomy with respect to pain, wound infection, tackling co-existing pathology, duration of hospital stay, earlier return to normal activity, excellent cosmetic end result, lesser use of antibiotics, and earlier resumption of oral feeds.

#### KEYWORDS

Acute Appendicitis, Open Appendicectomy, Laparoscopic Appendicectomy.

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**INTRODUCTION:** Appendicitis is the common surgical emergency in the world. It can occur in any age, though it is rare under the age 5 years. The treatment is straight forward in most of the cases and depends upon the stage of the disease. In early appendicitis, appendicectomy is the treatment of choice. It can be done by open or laparoscopic approach. Minimal invasive surgery had a considerable impact on common surgical techniques and has almost replaced established operative procedures such as cholecystectomy. However, the laparoscopic approach for

the treatment of acute appendicitis is nowadays getting popular.

The main advantages of the laparoscope in abdominal surgery are related to the avoidance of laparotomy wound. In most of the patients, the wound required for an open appendicectomy is not much larger than the wound for laparoscopic appendicectomy and thus the advantages of the laparoscopic appendicectomy is not obvious. The role of laparoscopic appendicectomy remains controversial as many researchers have suggested that overall morbidity is primarily a function of the degree of the appendicitis rather than the operative approach. Though several independent studies and Meta-analysis of those studies have been done, but the final word has not been said as yet. In cholecystitis, the laparoscopic approach has emerged as that clear gold standard. But, in appendicectomy different schools of thought exist regarding the method to be followed, since the protocols are still in their nascent state of standardization.

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Here we try to provide an overview of the current status of laparoscopic surgery as it is applied to the management of conditions of the gastrointestinal tract that are considered to require surgical intervention. In brief, it documents the techniques and balances the applications against potential advantages and disadvantages. In essence, this overview proposes to shine a light on a surgical technique which has languished too long in the dark.

**MATERIALS AND METHODS:** The study subjects of this dissertation consist of 126 Patients who have undergone Appendicectomy at the Prathima Institute of Medical Sciences, Karimnagar. 60 Patients had undergone Appendicectomy by the conventional open method and the remaining 66 patients underwent surgery by the laparoscopic method. All patients had come with abdominal pain and with clinical features simulating acute appendicitis. The patients' preoperative diagnosis had to be firm enough so that the surgeon would have done a right lower quadrant incision open Appendicectomy in the absence of laparoscopic technology. Patients who were scheduled for interval Appendicectomy were also included. All patients who presented with an appendicular mass and/or features with generalised peritonitis were excluded. Once a case fit this criterion, depending on the patient's option, either open or a laparoscopic surgery was performed. Either the technique for Appendicectomy, open or laparoscopic, was left entirely to the surgeon's discretion.

There was no specifically defined criterion for hospital discharge after Appendicectomy. This too was left to the discretion of the surgeon. Data was collected on a program basis; clinical examination, preoperative findings as well as postoperative recovery and follow-up were all done by the respective units. In all possible cases, the surgery was done by an assistant professor and/or the Consulting Surgeon. For this study, Patient's age, sex, race, height, weight, history of previous abdominal surgery, concomitant illness, chronic medication usage, and ASA class (American Society of Anaesthesiologists risk classification) were recorded. Preoperative fever, leucocytosis, right lower quadrant pain, right lower quadrant tenderness, nausea, vomiting and anorexia were recorded.

The duration of preoperative symptoms, final pathologic findings (Either normal appendix, acute appendicitis, or perforated appendicitis), how the stump of the appendix was technically handled, operating time (Time from Initial Incision to Closure), complications, duration of postoperative intramuscular (IM) or intravenous (IV) analgesic Administration, time until resumption of regular diet, and length of Postoperative hospital stay was recorded. Time until return to work or normal activities was determined by examination of the postoperative outpatient medical records and by a 1-month postoperative follow-up interview.

In the 1-month postoperative interview, patients were also asked to grade their perception to the cosmetic result on a scale of one to five (One being the worst and five being the best). The various criteria, which have been taken into account for the study were patient selection for each type, 126 patients who had either minimal symptoms or were scheduled for interval appendectomies, patients who had an appendicular mass, appendicular abscess or generalised peritonitis were excluded from the study, duration of the surgery was taken into account, amount of blood loss in each type of procedure was estimated, number of days of use of parenteral and oral antibiotics in each case, number of days of use of parenteral and oral analgesics in each case, total number of days the patient spent in the hospital following surgery, intra-operative and post-operative complications like bleeding, adjacent organ injury, wound infection were taken into account, time taken by the patient to resume routine work, patient perception and satisfaction regarding cosmetic end result, total cost involved in both types of surgery.

**RESULTS:** In present study, patients who presented with acute symptoms between the months of November 2008 and October 2011, preoperatively diagnosed to have acute appendicitis, admitted and operated by the surgical ward were studied. The total number of patients admitted by various surgical units during the study period was 576, of which as many as 122 cases were admitted and operated at the surgical ward.

No. of Cases Admitted	01-11-2012 to 31-12-2016	01-01-2013 to 31-12-2013	01-01-2014 to 30-09-2014	Total
Total Hospital Admissions	13324	46463	39170	98957
General Surgery Admissions	633	6044	6191	12868
Appendicitis Admissions	70	412	94	576

**Table 1: Hospital Incidence of Acute Appendicitis**

Table 1: Shows that appendicitis has a hospital incidence of 0.6% of all hospital admissions and 4.5% of all general surgical admissions.

Characteristic	Appendicectomy				P value --
	Open (60 patients)		Laparoscopic (66 patients)		
	Number	Percentage	Number	Percentage	
Patient Analysed	60	100	66	100	
<b>Complaint</b>					
Abdominal pain	60	100	66	100	--
Vomiting	55	92	63	95	0.06 (NS)
Fever	53	88	64	97	0.09 (NS)
Loss of Appetite	40	67	59	89	<0.01(S)
<b>Previous History</b>					
Diabetes Mellitus	4	7	5	8	>0.2 (NS)
Heart Disease	1	2	0	0	>0.2 (NS)
Pain	6	10	6	9	>0.2 (NS)
Sex					
Males	34	57	26	39	0.08(NS)
Females	26	43	40	61	
<b>Age</b>					
Below 30	43	72	46	70	>0.2(NS)
30-49	14	23	18	27	
50 & Above	3	5	2	3	
Mean Age	28		27		

**Table 2: Presenting Complaints, History, Age and Sex Distribution**

Table 2 shows that thirty four (57%) of the patients of open Appendicectomy and twenty six (39%) of laparoscopic Appendicectomy were males. The mean age of the Patients in the two groups were 28 and 27 years, respectively. Both the groups were similar with respect to their age and sex distribution. It also shows the details on presenting complaints. All the patients complained of abdominal pain in both the groups. The other complaints were vomiting, fever and loss of appetite. Descriptions of past history of the patients like diabetes mellitus, heart disease, previous episodes of similar pain.

Habits	Appendicectomy				P value
	Open (60 patients)		Laparoscopic (66 patients)		
	Number	Percentage	Number	Percentage	
Alcoholism	4	7	3	5	>0.2 (NS)
Smoking	8	13	2	3	0.05 (S)
Vegetarian	12	20	14	21	>0.2 (NS)
<b>Build and Nutrition</b>					
Good	3	5	4	6	>0.2 (NS)
Moderate	55	92	61	92	
<b>Anaemia</b>					
Negative	60	100	66	100	--
<b>Lymph Nodes</b>					
Negative	60	100	66	100	--
<b>CVS</b>					
Normal	59	98	66	100	0.05(S)
<b>Respiratory system</b>					
Normal	60	100	66	100	--
<b>Details of Local Examination</b>					
RIF Tenderness Yes	60	100	66	100	
Abdominal Mass No	60	100	66	100	

**Table 3: Habits, Build & Nutrition and Details of Local Examination in Present Study**

Table 3 shows that both the groups were similar with respect to percentage of patients consuming alcohol. 13% of the patients who were on open group and 3% on the laparoscopic group were smokers. About one fifth of the patients were vegetarian in both the group. It also shows the findings of systemic examination of the patients in the two groups in terms of

build and nutrition, anaemia, lymphadenopathy, CVS & RS. Both the groups were similar with respect to these parameters. It also shows that all the patients in both the groups had right iliac fossa tenderness.

Physical Examination	Appendicectomy		P value
	Open (60 Patients)	Laparoscopic (66 Patients)	
Blood Pressure (mmHg)	131/81	133/86	(NS)
Pulse (per min.)	87	84	0.07 (NS)
Temperature (F)	99.3	99.4	>0.2 (NS)
<b>Lab Parameters</b>			
Hb (g%)	12.3±2.0	12.1±1.8	>0.2 (NS)
PCV (cells/cmm)	31±4.8	31±3.7	>0.2 (NS)
TWBC (cells/cmm)	12626±2820	12282±2637	>0.2 (NS)
<b>Differential Count</b>			
P (%)	77±7.3	75±7.1	0.04 (NS)
L (%)	19±6.7	20±5.4	0.06 (NS)
E (%)	2±2.1	2±1.4	>0.2 (NS)
B (%)	1±0.9	2±1.0	>0.2 (NS)
M (%)	1±0.9	1±0.8	0.1 (NS)
Bun (%)	8.9±4.4	8.9±2.8	>0.2 (NS)
Serum creatinine (%)	0.8±0.2	0.7±0.1	>0.2 (NS)

**Table 4: Physical Examination, Lab Parameters, Differential Count, Abdominal Ultrasound Results and ASA Status**

Table 4 shows that the two groups were similar with respect to their mean blood pressure, pulse rate and temperature.

Abdominal Ultrasound	Number	Percentage	Number	Percentage	
Normal	59	9	66	100	>0.2 (NS)
Abnormal	1	2	0	0	
<b>ASA Status</b>					
1	57	95	62	64	>0.2 (NS)
2	2	3	4	6	
3	1	2	0	0	
Median Score	1		1		

**Table 5: Ultrasound and ASA status in Study**

It shows that all patients in the study except one in the open Appendicectomy group had normal results for abdominal ultrasound. It shows the distribution of patients according to their ASA scores. It may be noted that the median score was 1 for both the groups. It also shows laboratory parameters.

Position of Appendix	Appendicectomy				P value
	Open (60 patients)		Laparoscopic (66 patients)		
	Number	Percentage	Number	Percentage	
Retrocaecal	57	95	66	100	0.1 (NS)
Ileal	3	5	0	0	
Pelvic	0	0	0	0	
<b>Blood Loss in Appendicectomy</b>					
Below 50 mL	56	93	65	98	0.2 (NS)
50-100 mL	4	7	1	2	
Adj. organ injury	60	100	65	98	>0.2(NS)
Duration of surgery	64±30		73±26		0.07(NS)
Operation (min.)	15-150		30-135		

**Ability to Tackle Other Pathology**

Coexisting pathology -ve	60	100	6	95	0.2 (NS)
HPE Acute Appendicitis	48	80	47	71	>0.2 (NS)
RLH	12	20	19	29	
<b>Wound Infection</b>					
Wound Infection Rate	8%		0%		0.02 (S)
<b>Antibiotics Used</b>					
Parenteral (days)	2±0.8 (1-4)		1.5±0.5 (1-2)		<0.001 (S)
Oral (days)	2±0.6 (1-3)		3±0 (3)		
<b>Analgesics Used</b>					
Parenteral (Days)	2±0.7 (1-4)		2±0 (2)		-
Oral (Days)	2±0.5 (1-3)		1±0 (1)		
<b>Table 6: Position of Appendix, Result of Appendicectomy, Ability to Tackle Other Pathology, Wound Infection and Medication</b>					

Table 6 shows that for most of the patients (95%) of the open Appendicectomy group and the entire laparoscopic group the position of the appendix was retrocaecal. It can be inferred that the 60 patients who underwent open Appendicectomy and 66 patients who underwent laparoscopic Appendicectomy had similar baseline characterization from the results. It also shows that the blood loss was below 50 mL in 93% of the patients who underwent open Appendicectomy and 98% among those who underwent laparoscopic (P=0.2). There was no instance of adjacent organ injury in the open Appendicectomy procedure and in the laparoscopic group one had injury. The duration of laparoscopic procedure was 73 mins. as compared to 64 mins. for the open procedure. The difference was not statistically significant (P=0.07). Laparoscopic Appendicectomy was of longer duration 73+26 mins.

Than open Appendicectomy which took 64+30 mins. Even though this did not turn out to be statistically significant, when theatre charges are levied by the hour and may be in future by the minute. The advantage of laparoscopic surgery is best illustrated when we are able to tackle other pathology without extending the incision which would not be possible in the open method. We had 3 cases in lap method where other pathology was tackled namely Ectopic gestation – left fallopian tube, bilateral ovarian cyst and Twisted ovarian cyst. All the three conditions were successfully tackled with laparoscopy. Negative appendicectomy was similar in both the groups to the mild increase in the laparoscopy group. This difference was not statistically significant. There was a significant difference (P=0.02) in the wound infection rate which was around 8% in the open group while none of the patients in the laparoscopic group.

Voveran was the analgesic of choice and we found no significant difference in its usage in both the groups. Even though, we did not find a difference in the total days of usage of antibiotics. But, we found that the number of days of parenteral usage of antibiotics to be more in the open appendicectomy group.

**Post-operative Recovery:** Oral feeds were resumed on an average in about one day in lap surgery, while it took about 1½ days in open surgery. But, whether this confers any significant benefit to the patient remains to be same.

**Duration of Hospital Stay:** Duration of hospital stay was one day more in open surgery than in Laparoscopic surgery. This difference was statistically significant.

**Return to Normal Activity:** Most importantly, all the patients who underwent laparoscopic surgery were able to return to normal activity, on an average, 5 days earlier than patients who underwent open surgery. (P=0.001).

**Cosmesis:** 89% of the patients undergoing laparoscopic Appendicectomy felt that they had an excellent cosmetic end result while only 2% of open group felt the same. In our hospital, the patients decided whether to undergo laparoscopy or open surgery and this is bound to have bias in their perception about the cosmesis achieved. Only 57% of the patients perceived that they had an acceptable scar in the open group.

**DISCUSSION:** Few studies have been reported regarding the comparison of open and laparoscopic appendicectomy. In one of the earlier studies presented to the associations of surgeons Great Britain and Ireland, J. Mc Anena et al demonstrated that laparoscopic appendicectomy was a feasible option in the management of acute appendicitis in most cases.<sup>1</sup> They showed that it shortened hospital stay and significantly reduces the risk of post-operative wound infection. They showed that patient satisfaction was of the highest order and they predicted that laparoscopic appendicectomy would have an important role to play in the future management appendicitis. J. J. Tate et al<sup>2</sup> in their study took 155 consecutive cases with suspected acute appendicitis compared laparoscopic and open surgery concluded that the proposed benefits of laparoscopic surgery—reduction in pain, wound infection, patient satisfaction, hospital stay and return to work were all realized in their study, but the operative time was significantly elevated in laparoscopic surgery.

Cost and cosmesis were not accessed. Ortega et al<sup>3</sup> in their study concluded along the usual lines in that they showed that laparoscopic appendectomy to be beneficial in terms of pain reduction, early discharge and early return to work with an increase in wound infection. L.K. McCahill et al<sup>4</sup> in their study "A Clinical Outcome and Cost Analysis of Laparoscopic Versus Open Appendectomy" have in contrast to the other studies reviewed, have shown that laparoscopic appendectomy had no demonstrable benefit of reduction in hospital stay and complication and rather substantial increase in the cost was seen.

They cautioned that laparoscopic appendectomy should not be used until and unless a significant benefit is shown and until then should only be limited to clinical trials. Patients who underwent video laparoscopic appendectomy typically had a shorter length of stay (3.9 days), according to our results. Mc Anena et al,<sup>1</sup> Attwood et al,<sup>5</sup> Ortega et al<sup>3</sup> and Cox et al<sup>6</sup> presented similar results in their work. On the other hand, Kum et al,<sup>7</sup> Zaninotto et al<sup>8</sup> and Minne et al<sup>9</sup> did not find any difference.

C. K. Kum et al<sup>7</sup> in their study conducted in Singapore in 1993 concluded that a reduction in the incidence of wound infection and earlier return to work were the two most important advances of laparoscopic appendectomy.

Excellent cosmetic result was an added advantage. No change in the operative time or analgesics used was found. There were no significant differences in the time of resumption fluid and diet. The main point against laparoscopic appendectomy was the increase in the cost. Another perceived theoretical advantage is the reduction in longterm complications like adhesions.

Abe. Kingerhut et al<sup>10</sup> in their meta-analysis of most of the randomised controlled trials done till now have cited methodological flaws in most of the studies which prevented them from generalisation of results. S. Chung et al<sup>11</sup> in their article have concluded that laparoscopic appendectomy offers significant advantages in reduced post-operative pain and wound infection rate. The laparoscopic operation allows for a faster convalescence rate, although the effect size is only marginally significant hospital stay and complications are not significantly different in both. The single disadvantage of laparoscopic appendectomy is significantly increased operating times which translate into higher costs. Larissa K. F. Temple, MD et al<sup>12</sup> in their study show the results from their meta-analysis suggest that laparoscopic appendectomy can be performed safely although operative time is lengthened. Hospital stay is similar with either procedure but return to normal activity may be shorter after laparoscopic appendectomy.

At present, therefore the decision whether to perform appendectomy open or laparoscopic may depend on local expertise and the availability of operative and hospital resources. There is a real need for further trials before adopting or disregarding laparoscopic appendectomy because of the methodological concerns of the published trials. As well, the laparoscopic expertise of most surgeons has increased.

Future trials should be performed by experienced laparoscopists. Besides, the usual methodological necessity, binding is essential before any firm conclusions can be made about the real benefit of laparoscopic appendectomy to patients. Future trials should probably also incorporate patient-preferences, quality of life assessments and an economic analysis. Merhoff AM et al<sup>13</sup> in their study found that laparoscopic appendectomy is more expensive than open appendectomy, but does not reduce length of hospital stay nor change in time to return to work. However, wound complications are less common. The advocacy for laparoscopic appendectomy is slowly gaining ground and this fact can be gauged from trials that go on to say that in children laparoscopic appendectomy does not carry a greater risk of intra or post-operative complications and can there for safely be established as a standard procedure.

**CONCLUSION:** On analysing the data, we find that laparoscopic appendectomy is similar to open appendectomy in the parameters like blood loss, adjacent organ injury. Laparoscopic appendectomy was better than open appendectomy with respect to pain, wound infection, tackling co-existing pathology, duration of hospital stay, earlier return to normal activity, excellent cosmetic end result, lesser use of antibiotics, and earlier resumption of oral feeds. All available information indicates that laparoscopic appendectomy has slightly increased duration of surgery and higher overall cost but with superior results and will become the standard of care.

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