ORIGINAL RESEARCH PAPER

General Surgery

A COMPARATIVE STUDY OF LAPAROSCOPIC SURGERY VS OPEN SURGERY FOR INTERVAL APPENDICECTOMY

KEY WORDS: Comparison, open vs laparoscopic, appendectomy.

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ABSTRACT

BACKGROUND: This was a prospective study of the outcomes of patients undergoing laparoscopic appendectomy compared with outcomes for patients undergoing open appendectomy.

MATERIAL AND METHODS: This was a prospective study of the outcomes of patients undergoing laparoscopic appendectomy compared with outcomes for patients undergoing open appendectomy in terms of Duration of operation, Postoperative analgesia, postoperative recovery, Hospital stay &Complications total no. of patients in our study was 45 .

CONCLUSION : The laparoscopic appendicectomy was better than the open appendicectomy with respect to reduced pain scores(VAS), lesser duration of analgesics used,. Post operative recovery was faster in respect with duration of hospital stay & early return to normal routine work.

INTRODUCTION

Appendicitis is most common between the ages of 10 and 20 years, but no age is exempt. Appendectomy may be performed as a laparoscopic or as an open operation. .Open appendectomy has been the gold standard for more than a century as far as surgical removal of appendix is concernedThe first appendectomy was performed in 1736 by Claudius Amyand, surgeon to west-minster and St. George's Hospitals [1]. Laparoscopic appendectomy combines the advantages of diagnosis and treatment in one procedure with least morbidity[2].Laparoscopic appendectomy for suspected appendicitis is considered safe and effective.[3-4] Laparoscopic appendectomy was first reported by the gynaecologist Kurt Semm in 1982.[5]Laparoscopic appendectomy have the advantages to have less postoperative pain and 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, better cosmesis, ability to explore the entire peritoneal cavity for diagnosis of other conditions and effective peritoneal toileting without the need for extending the incision.

METHODOLOGY

This prospective study was carried out from 1 october 2015 to 30 september 2017 on patients admitted with acute appendicitis. in Department of surgery, Government Medical College and Dr. Sushila Tiwari Government Hospital, Haldwani, Nainital uttarakhand. A total number of 45 patients with 20 patients of open surgery and 25 patients laparoscopic surgery for acute appendicitis were enrolled in this study.

INCLUSION & EXCLUSION CRITERIA

INCLUSION CRITERIA

a. Patients of acute appendicitis reporting after 48 hours or with complications of acute appendicitis like appendicular lump , abscess and perforation who will be taken for interval appendectomy.
b. All those cases of acute appendicitis patients not willing for emergency appendectomy .

2. EXCLUSION CRITERIA

a) Patients with signs and symptoms of acute appendicitis.
b) All those cases of acute appendicitis patients willing to undergo emergency appendectomy.
c) Clinically doubtful cases of acute appendicitis requiring further evaluation

Diagnostic tools:-

1) History and Clinical Examination
2) Blood investigations;
a) Complete blood count
b) Coagulation profile
c) Renal function tests
d) Liver function tests e)Serum electrolytes
f) Viral markers
3) X ray chest and abdomen 4)Ultrasonography of whole Abdomen.
5) CECT whole abdomen.

OBSERVATIONS AND RESULTS

TABLE 1: DISTRIBUTION OF THE STUDY PARTICIPANTS ACCORDING TO TYPE OF APPENDICECTOMY

APPENDICECTOMY	N	%
OPEN	20	**44.4**
LAPAROSCOPIC	25	**55.6**
TOTAL	**45**	**100**

In this study, out of the total 45 study participants majority (55.6%) had undergone laparoscopic appendicectomy while 44.4% had undergone open appendicectomy.

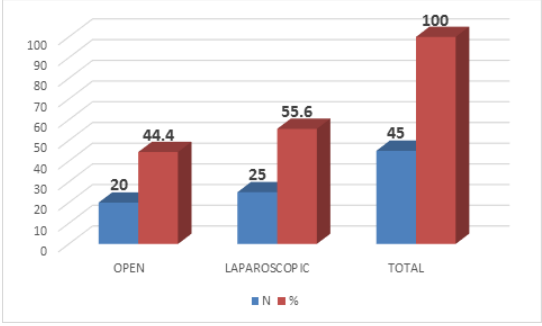


TABLE 2.1: GENDER DISTRIBUTION OF THE STUDY PARTICIPANTS

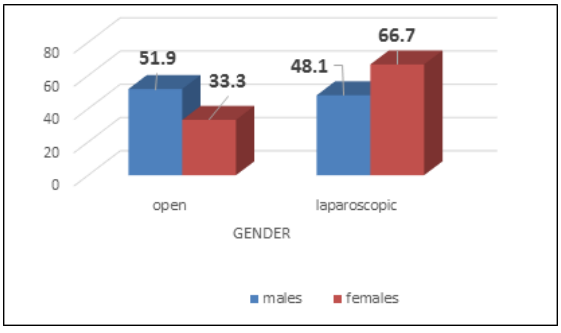
CHARACTERISTICS OF PATIENTS		APPENDICECTOMY			
		OPEN (n=20)		LAPAROSCOPIC (n=25)	
		N	%	N	%
GENDER	MALES	14	51.9	13	48.1
	FEMALES	6	33.3	12	66.7

TABLE 2.2: AGE DISTRIBUTION OF THE STUDY PARTICIPANTS

CHARACTERISTICS OF PATIENTS		APPENDICECTOMY			
		OPEN (N=20)		LAPAROSCOPIC (N= 25)	
		N	%	N	%
AGE (years)	10-20	5	25.0	14	56.0
	21-30	5	25.0	8	32.0

	31-40	5	25.0	3	12.0
	41-50	2	10.0	0	0
	>50	3	15.0	0	0
MEAN AGE ± S.D.		32.30±3.09		22.48±1.58	

In present study 14 (51.9%) patients of open appendicectomy and 13 (48.1%) patients of laparoscopic appendicectomy were males. 6 (33.3%) patients of open appendicectomy and 12 (66.7%) laparoscopic appendicectomy were females. Among those who had undergone open appendicectomy, one-fourth (25%) of them were of 10-20, 21-30 and 31-40 years of age while those who had laparoscopic appendicectomy, approximately more than half (56%) were of age group 10-20 years.



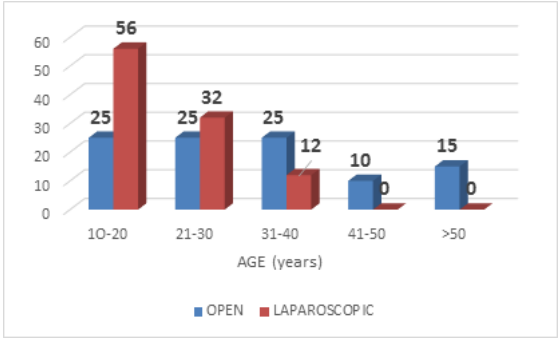


TABLE 3: DISTRIBUTION OF PATIENTS ACCORDING TO PRESENTING COMPLAINTS

PRESENTING COMPLAINTS	APPENDICECTOMY			
	OPEN (N=20)		LAPAROSCOPIC (N=25)	
	N	%	N	%
ABDOMINAL TENDERNESS	4	20.0	2	8.0
NAUSEA/VOMITTING	1	5.0	1	4.0
FEVER	3	15.0	2	8.0

In the present study 4 (20%) in open group and 2(8%) in laparoscopic group complained of abdominal pain. History of nausea/vomiting was present in 1(5%) in open and 1(4%) in laparoscopic group. The other complaints like fever was present in 3(15%) of open group and 2(8.0%) of the laparoscopic group.

TABLE 4: DISTRIBUTION OF PATIENTS ACCORDING TO RECURRENCE OF ABDOMINAL PAIN

RECURRENCE OF ABDOMINAL PAIN	APPENDICECTOMY			
	OPEN (N=20)		LAPAROSCOPIC (N=25)	
	N	%	N	%
PRESENT	10	50.0	12	48.0
ABSENT	10	50.0	13	52.0

In the present study 10 (50%) and 12 (48%) of the patient of open and laparoscopic group respectively had the history of recurrence of abdominal pain.

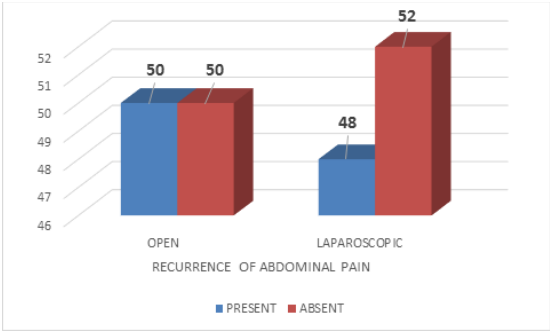


TABLE 5: DISTRIBUTION OF PATIENTS ON THE BASIS OF LOCAL EXAMINATION

LOCAL EXAMINATION FINDINGS		APPENDICECTOMY			
		OPEN (N=20)		LAPAROSCOPIC (N=25)	
		N	%	N	%
TENDERNESS	PRESENT	4	20.0	2	8.0
	ABSENT	16	80.0	23	92.0
GAURDING/ RIGIDITY	PRESENT	0	0	0	0
	ABSENT	20	100	25	100

In present study 4(20%)patients in open group and 2(8%) of laparoscopic group had right iliac fossa tenderness. None of the patients in both the groups had guarding / rigidity.

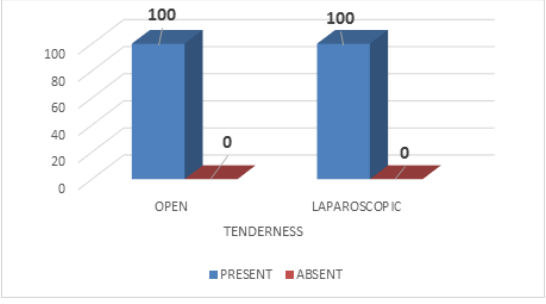
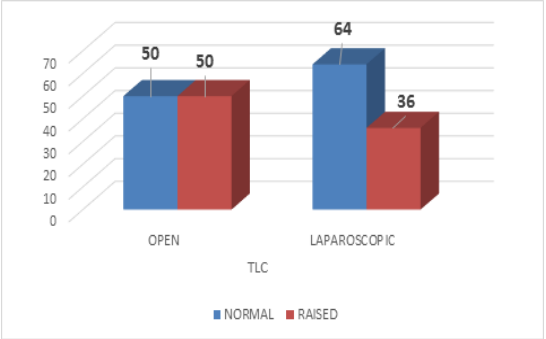


TABLE 6: DISTRIBUTION OF PATIENTS ON THE BASIS OF LABORATORY PARAMETERS

PARAMETERS		**APPENDICECTOMY**			
		OPEN (N=20)		**LAPAROSCOPIC (N=25)**	
		N	**%**	**N**	**%**
TLC	NORMAL	10	50.0	16	64.0
	RAISED	10	50.0	9	36.0
	MEAN±SD	**10365±899.7**		**10596±677.6**	
DIFFERENTIAL COUNT WITH SHIFT TO LEFT	PRESENT	12	60.0	17	68.0
	ABSENT	8	40.0	8	32.0

In present study the laboratory parameters of patients in open and laparoscopic group were comparable. Almost 50% patients of open appendicectomy had raised TLC while less than two-fifth (36%) patients of the laparoscopic group had raised TLC. 12(60%) and 17(68%) of open and laparoscopic group respectively were showing differential count with shift to the left.



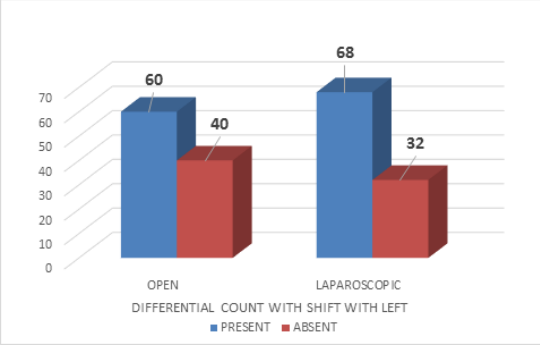


TABLE 7: DISTRIBUTION OF PATIENTS ON THE BASIS OF ULTRASOUND FINDINGS

ULTRASOUND FINDINGS	APPENDICECTOMY			
	OPEN		LAPAROSCOPIC	
	N	%	N	%
NORMAL PATHOLOGY NOTED	1	5.0	3	12.0
ABNORMAL PATHOLOGY NOTED	19	95.0	22	88.0

In my study abnormal pathology was noted in 19(95%) and 22(88%) in open and laparoscopic group respectively. Ultrasound was normal in 1(5%) of open group and 3(12%) in laparoscopic group.

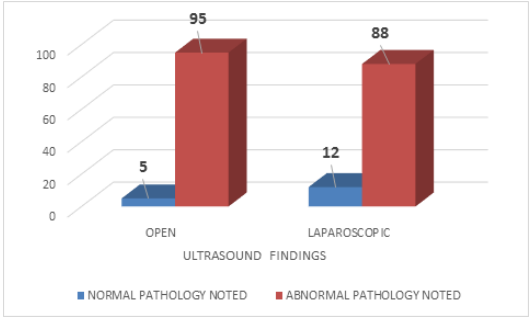


TABLE 8: DURATION OF SURGERY OF THE STUDY PARTICIPANTS

DURATION OF SURGERY (minutes)	APPENDICECTOMY			
	OPEN (N=20)		LAPARAOSCOPIC (N=25)	
	N	%	N	%
<30	1	5.0	3	12.0
31-60	15	75.0	18	72.0
61-90	2	10.0	2	8.0
91-120	2	10.0	1	4.0
121-180	0	0	1	4.0
MEAN±SD	52.60±5.22		49.44±4.71	

In the present study, for open appendectomy mean duration of surgery was 52.60 mins &49.44 minutes for laparoscopic surgery. So open appendectomy is less time consuming than laparoscopic appendectomy.

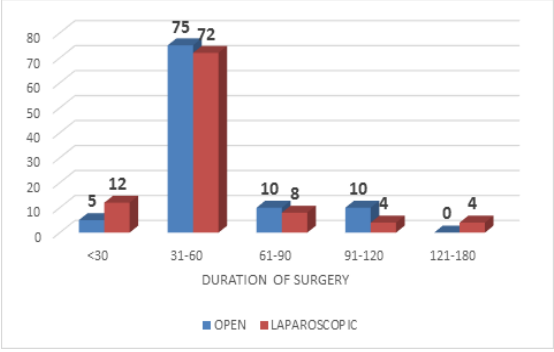


TABLE 9: DISTRIBUTION OF STUDY PARTICIPANTS ACCORDING TO SEVERITY OF POST-OPERATIVE PAIN

VISUAL ANALOGUE SCORE	APPENDICECTOMY			
	OPEN (N=20)		LAPARAOSCOPIC (N=25)	
	N	%	N	%
NO PAIN	0	0	3	12.0
MILD PAIN	6	30.0	12	48.0
MODERATE PAIN	12	60.0	9	36.0
SEVERE PAIN	2	10.0	1	4.0

Majority (60%) of the patients of the open appendicectomy group had moderate pain followed by mild pain (30%), severe pain (10%) and no pain (0). Among those of the laparoscopic appendicectomy group, majority (48%) had mild pain followed by moderate pain (36%), no pain (12%) and severe pain(4%).

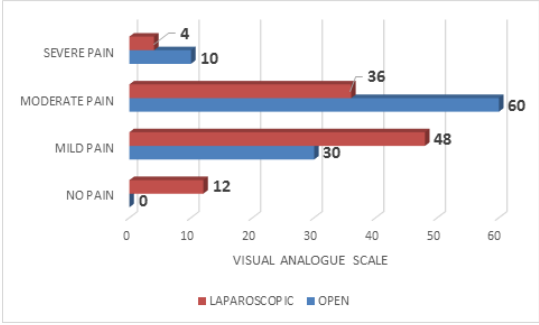


TABLE 10: DISTRIBUTION OF STUDY PARTICIPANTS ACCORDING TO SEVERITY OF POST-OPERATIVE DURATION OF ANALGESIA

DURATION OF ANALGESIA (Days)	APPENDICECTOMY			
	OPEN		LAPARAOSCOPIC	
	N	%	N	%
2-4	2	10.0	21	84.0
4-6	13	65.0	3	12.0
6-8	5	25.0	11	4.0

Almost two-third (65%) of the patients of the open group had duration of analgesia of 4-6 days, followed by 25% with 6-8 days and 10% with 2-4 days. Majority (84%) of the patients in the laparoscopic group had duration of analgesia of 2-4 days followed by 12% with 4-6 days and 4% with 6-8 days.

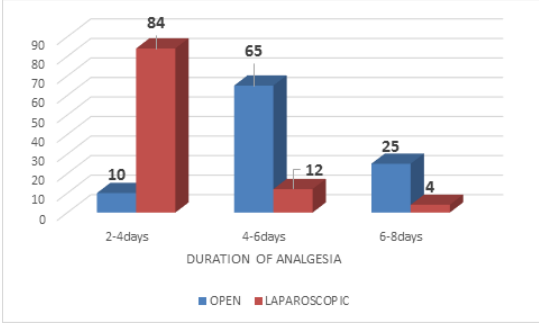


TABLE 11: COMPARISON OF STUDY PATICIPANTS ON THE BASIS OF POST-OPERATIVE PAIN PARAMETERS

POST-OPERATIVE PAIN PARAMETERS	APPENDICECTOMY		t Value	P VALUE*
	OPEN (N=20)	LAPAROSCOPIC (N=25)		
	Mean±SD	Mean±SD		
PAIN SCORE(VAS)	4.40±0.88	2.44±0.87	7.450	0.0001
DURATION OF ANALGESIA (parental and oral in days)	5.80±1.36	3.24±1.39	6.188	0.0001

***Independent t test p<0.01**

Above analysis revealed that both pain and analgesics used were significantly reduced in laparoscopic appendicectomy as compared to open appendicectomy.

TABLE 12:COMPARISON OF STUDY PATICIPANTS ON THE BASIS OF POST-OPERATIVE COMPLICATIONS

VOMITTING	6	30.0	2	8.0	4.114	0.044
ABDOMINAL ABSCESS	2	10.0	0	0	2.616	0.19
WOUND INFECTION	5	25.0	1	4.0	4.240	0.035
ILEUS (hours)**	34.90±0.55		18.08±0.26		27.486#	0.0001

***Fischer exact test p<0.05, **independent t test p<0.05, #t value**

In present study postoperative complications were analysed in detail: vomiting ileus, intra-abdominal abscess, and wound infection. The incidence of vomiting was higher following open appendectomy (30%) Average post-operative ileus was 34.90 (+/- 0.55) hrs for open and 18.08 (+/-0.26) hrs for laparoscopic group was noted. Wound infection was more common after open 5 (25%) than laparoscopic 1(4%) Intra-abdominal abscesses developed in 10% of the open group and in no case of the laparoscopic group

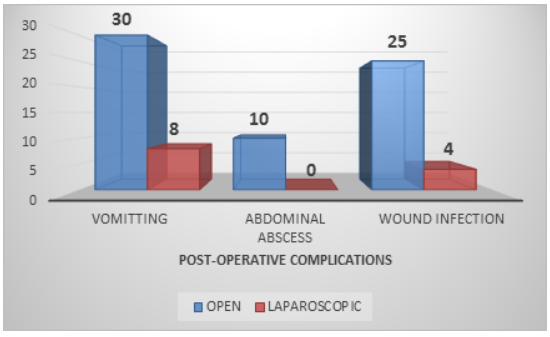
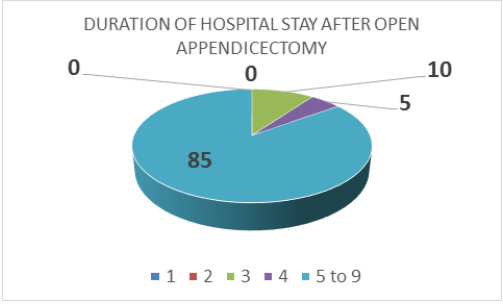


TABLE 13: COMPARISON OF THE STUDY PARTICIPANTS ON THE BASIS OF POST-OPERATIVE STAY IN HOSPITAL

DURATION OF HOSPITAL STAY AFTER SURGERY (DAYS)	APPENDICECTOMY			
	OPEN		LAPARAOSCOPIC	
	N	%	N	%
1	0	0	1	4.0
2	0	0	5	20.0
3	2	10.0	0	0
4	1	5.0	8	32.0
5-9	17	85.0	11	44.0
MEAN±SD	**5.35±0.34**		**4.24±0.28**	
Chi Square Value	**13.628**			
***P* Value**	**0.001***			

***Fischer Exact test p<0.01**

85% patients of open appendicectomy stayed for 5-9 days while only 39% patients stayed for this longer duration and there is a highly statistically significant difference in duration of stay between the two groups. The study shows that laparoscopic appendicectomy has significantly reduced the hospital stay (P<0.01).



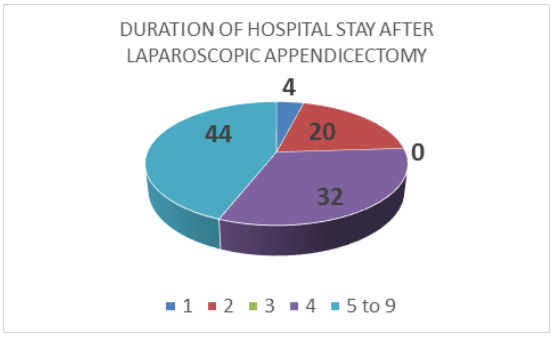
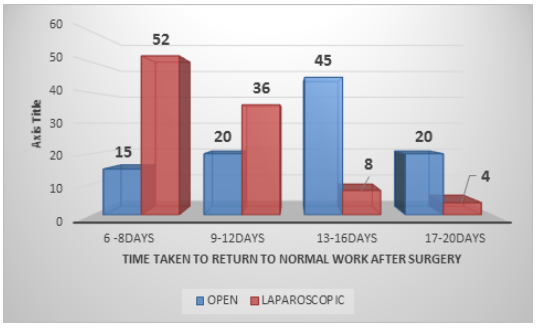


TABLE 14: COMPARISON OF STUDY PARTICIPANTS ACCORDING TO POST OPERATIVE TIME TAKEN TO RETURN TO NORMAL WORK

DAYS FOR RECOVERY	APPENDICECTOMY			
	OPEN		LAPAROSCOPIC	
	N	%	N	%
6-8	3	15.0	13	52.0
9-12	4	20.0	9	36.0
13-16	9	45.0	2	8.0
17-20	4	20.0	1	4.0
MEAN±SD	**13.25±0.87**		**9.12±0.58**	
Chi Square Value	**13.680**			
***P* Value**	**0.002***			

***Fischer Exact test p<0.05**

Again, this difference was highly statistically significant (P<0.01) and clearly reveals that patients with laparoscopic appendectomy return to routine work earlier than those of open appendectomy.



DISCUSSION

Appendectomy is the treatment of choice for acute appendicitis[6] and is by far the most commonly performed emergency abdominal operation[7]. Although, open appendectomy is considered a safe and effective operation for acute appendicitis with low morbidity, It has also been associated with potential disadvantages like post - operative pain, wound sepsis and complications like intestinal obstruction which may delay recovery[8]. With the development of laparoscopic technique, it has emerged as a modus operandi for both diagnosis and treatment of acute appendicitis. Studies have shown the procedure to be effective and with improved cosmesis, reduced postoperative pain, days of hospitalization and early return to work [9].

Laparoscopic appendectomy was first reported in 1983 and has since been considered safe with high accuracy and complication rates as low as zero to 1.4% [10-11]. A major benefit of laparoscopy apparently derives from the reduced abdominal wall trauma as compared to traditional open procedures[12].In present study 14 (51.9%) patients of open appendectomy and 13 (48.1%) patients of laparoscopic appendectomy were males. 6(33.3%) patients of open appendectomy and 12 (66.7%) laparoscopic appendectomy were females. So, majority of patients undergoing open appendectomy were males and laparoscopic appendectomy were females. This is in consistent with the findings of Shirazi B et al (2010) [9] but in contrast to that by Mac Anena oj et al [13] where

open appendectomy was more in females. The mean age of the patients in open and laparoscopic groups was 32.30±3.09 and 22.48±1.58 years, respectively. This is in near concordance to the study by Shirazi B et al (2010)[9] in which the mean age in open and laparoscopic group was 25.8 ± 3.5 years and 26.5 ± 4.2 years respectively. However, in a study by Mac Anena Oj et al the median age was 24 (range 14–64) years for open appendectomy and 18 (range 14–60) years for the laparoscopic procedure.In present study 4(20%) patients in open group and 2 (8%) of laparoscopic group had right iliac fossa tenderness while in the study by Shirazi B et al (2010)[9] all the patients in both the groups had tenderness. This is attributed to the difference in the study design of their study with that of ours ,in our study patients were taken after 4-6 weeks of conservative management with of resolution of sign & symptoms of acute inflammation.. They had done a prospective quasi-experimental study while our study is a cross-sectional study determining the point prevalence of the exposure and outcome variables. In present study the laboratory parameters of patients in open and laparoscopic group were also comparable and this was in concordance with Shirazi B et al (2010)[9]. In the present study, mean duration of surgery was 49.44 ± 4.71 minutes in open and 52.60±5.22 minutes in laparoscopic. So open appendectomy is less time consuming than laparoscopic appendectomy. The result is in accordance with RC Frazee et al [14] where mean duration of surgery was 65 minutes for open appendectomy and 87 minutes for laparoscopic appendectomy and it was statistically significant ($p < 0.001$). Similarly, N katkhauda et al[15] in their study, showed that operating time was significantly longer in the laparoscopic group (80 minutes versus 60 minutes; $P = 0.000$). Setting up laparoscopy equipment generally took longer than setting up traditional surgical equipment.

The present study has also revealed that both pain scores (VAS) and duration of analgesics used (parental and oral in days) were significantly reduced in laparoscopic appendectomy as compared to open appendectomy which is in line with studies performed in other setups. However, this finding is in contrast to the study by Ortega et al [16] in which it was documented that the number of days patients required pain medications overall was not significantly different between groups, but a subgroup analysis of 134 patients who rated their postoperative pain on a visual analogue scale revealed a significantly lower mean level among patients undergoing Laparoscopic Appendectomy versus Open Appendectomy ($P < 0.001$). Even N katkhauda et al[15] study did not observe any significant difference in pain scores and medications between the open and Laparoscopic group which is again in disagreement with our findings. This can be attributed to the fact that a major benefit of laparoscopy apparently derives from the reduced abdominal wall trauma as compared to traditional open procedures A more limiting factor in the postoperative course of acute appendicitis may be sequelae of the inflammatory/infectious process itself. Patients require time for resolution of inflammatory changes and return of bowel function[13].

In present study postoperative complications like vomiting, ileus, intra-abdominal abscess, and wound infection were also comparable in the two surgical groups. The incidence of vomiting was higher following open appendectomy than laparoscopic which was significant. Average post-operative ileus was higher for open as compared to laparoscopic group which was highly statistically significant. Wound infection was significantly more common after open than laparoscopic appendectomy. Intra-abdominal abscesses developed in 10% of the open group and in no case of the laparoscopic group. However, this difference was not significant. Similarly, Mac anena oj et al[13] observed in their study that the wound infection rate was higher for open as compared to laparoscopic appendicectomy. Our results for wound infection are in contrast to the study by Jamy L. Yong (2006)[4] who reported that there was no difference in terms of wound complications, and conversion of laparoscopic to open appendicectomy also did not lead to a higher wound complication rate. Moreover, in this study the occurrence of intra abdominal abscess was higher in those patients undergoing laparoscopy which is in discordance to our study where none of the patients of laparoscopic group developed intra abdominal abscess but this association was non-significant[4]. Even N kathkauda et al[15] also reported contrast findings. The small size and convenient sampling technique can be responsible for this erratic observation and many other factors are also responsible for the post-operative complications so the above results only predict the possibility of these complications. More studies should be conducted in this regard[15].

Our study has also revealed that the mean duration of post-operative stay in the open appendicectomy group was 5.35+/-0.34 days and 4.24±0.28 days in laparoscopic group. So, it can be seen that laparoscopic appendicectomy has significantly reduced the hospital stay of the patient ($P<0.01$). This is in agreement with the study by Shirazi B et al (2010)[9]where they have reported that mean hospital stay was significantly less (1.5±0.06 days) for laparoscopic group compared to open (4.1±0.8 days) ($P<0.01$). The extended hospital stay in the open group may be attributed to delay in mobilization, initiation of oral diet and the psychological effect of having an incision. However, many researchers have not shown this difference[9].

The present study has also documented that patients with laparoscopic appendectomy return to routine work earlier than those of open appendectomy and this difference was highly statistically significant ($P<0.01$). Our results are in consistent with the study of RC Frazee et al[17]who have reported in their study that all patients were instructed to return to full activities by 2 weeks postoperatively and this occurred at an average of 25 days for the open appendectomy group versus 14 days for the laparoscopic appendectomy group ($p< 0.001$).

CONCLUSION

From the study of 45 patients(n=25,laparoscopic and n=20 open appendectomy) we found that there was a significant difference between two groups in terms of postoperative pain (p=0.0001), post operative ileus(p=0.0001) and hospital stay (0.001), however on other parameters viz. wound infections, complications like nausea and vomiting ,intra abdominal abscesses, both the groups were same(no statistical difference).

Overall we conclude that laparoscopic surgery is a better alternative in patients undergoing elective/interval appendectomy.

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