Original Research

To Assess The post operative Symptoms Of Laparoscopic And Open Appendectomy In Patients Of Acute Appendicitis

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Abstract:
Background: The acute onset inflammation of the appendix, called acute appendicitis and its subsequent sequelae has been responsible for hundreds of thousands of deaths in history. The present study was planned in order to assess the postop symptoms of laparoscopic and open appendectomy in patients of acute appendicitis.
Material & Methods: The present study was conducted in the Department of Surgery of MAMC, Agroha over the course of 12 months, from February 2021 to March 2022. After the diagnosis of acute appendicitis was made, allocation of patients for laparoscopic and open appendectomy was done. Complications of both groups were noted. The collected data was analyzed with the statistical program Statistical Package for the Social Sciences (IBM SPSS, version 22).
Results: It was seen that the postoperative pain as measured by the visual analogue scale(VAS) was significantly higher among the patients undergoing the open appendectomy as compared to those undergoing laparoscopic appendectomies (p-value 0.043). 32% of the study participants of the open appendectomy group and 28% of those of the laparoscopic group had postoperative incidence of vomiting. 24% of the study participants of the open appendectomy group had a postoperative wound infection as compared to 4% of the laparoscopic appendectomy group (p-value 0.002). It was seen that 12% of the study participants of the open appendectomy group had a postoperative paralytic ileus as compared to none of the laparoscopic appendectomy group (p-value 0.037). It was found that the mean time to return of bowel sounds for patients undergoing open appendectomy was 20.2±2.1 hours, and that of the patients undergoing laparoscopic appendectomy was 6.3±2.2 hours (p-value 0.013).
Conclusion: It is concluded that the laparoscopic appendectomy is a better alternative to open appendectomy in terms of post operative pain, wound infection, paralytic ileus, returnof bowel sounds.
Keywords: Laparoscopic appendectomy, open appendectomy, complications.

Introduction:

In the general surgical practice, acute appendicitis is one of the commonest causes for acute abdominal pain encountered for which emergency surgery is mandated. Historically considered as a vestigial organ with no discernible function, its inflammation produces one of the most common causes of acute abdomen presenting to the emergency department across the globe.[1] Appendicitis is a condition characterized by the inflammation of the vermiform appendix, caused by the obstruction of the lumen due to the hyperplasia of the lymphoid follicles or by impaction of fecolith in older patients. The lifetime incidence of acute appendicitis is around 8.6% for men and 6.9% for women.[2] The condition shows a predisposition to affect women, with sex distribution of acute appendicitis being 1:1.3. The most important goal in patients with acute appendicitis is early diagnosis based on history, laboratory investigations, clinical examination and radiological findings. Fortunately, the characteristic pain that the condition is associated with is very apparent clinically, and modern radiological techniques can diagnose the condition with almost perfect accuracy, which makes prompt diagnosis and treatment very viable for the condition. Surgical removal of the inflamed appendix via appendectomy is the management of choice for

acute appendicitis.[3] The first recorded appendectomy was performed in the late 18th century and the modern open appendectomy procedure was introduced by McBurney as early as in 1894, the incidence of mortality associated with the procedure was more than 50%.[4] After the introduction of modern diagnostic techniques, refinements made to the surgical procedure, expert surgical skills, and advent of newer generations of antibiotics, the mortality rates have plummeted to less than 0.01%.[5] Now a days, the primary cause of concern in appendectomies is ensuring that the procedure is associated with the least amount of intraoperative and postoperative pain and complications, so that patients can resume their normal life and lifestyle at the shortest possible amount of time.[6] For this reason, the laparoscopic method of access to and operation on the inflamed appendix has gained popularity over the years. Laparoscopic appendectomy is a minimally invasive procedure of surgery which has been seen to be associated with even lower mortality rates, lesser rates of wound infection, less postoperative pain, and an overall faster return to general lifestyle.[7] However, the laparoscopic approach to appendectomy is significantly more complicated than the open approach, requiring complex machinery and a higher expertise of the operating surgeon to perform. Furthermore, many surgeons do not advocate laparoscopic appendectomy for emergency acute appendicitis procedures due to the perceived non-inferiority of the open procedure.[8] In this context, the present study was planned in order to assess postop symptoms of laparoscopic and open appendectomy in patients of acute appendicitis.

Material & Methods:

The present study was an institution-based observational study with a prospective longitudinal design conducted in the Department of Surgery of MAMC, Agroha over the course of 12 months, from February 2021 to March 2022. The Institutional Ethics Committee of Maharaja Agrasen Medical College Agroha, the study institution reviewed and approved the project before it was carried out. All of the participants were informed in their own language about the study and their rights for participation before providing data for the researcher-administered questionnaire. The study population was comprised of those patients presenting to the study institution with a diagnosis of acute appendicitis and scheduled to undergo appendectomy either via open or laparoscopic procedure. Patients aged 14 years or above, patients providing written informed consent to take part in the present research and patients diagnosed with acute appendicitis and scheduled to undergo appendectomy either by open or laparoscopic method were included in the study. Patients not providing written informed consent, patients aged <14 years , patients with palpable mass in the right iliac fossa, patients with severe medical disease (hemodynamic instability, psychiatric illness, cirrhosis, coagulopathies) requiring intensive care and patients with other conditions such as pregnancy, neoplasms, and generalized peritonitis were excluded from the study. All the patients with age more than 14 years with appendicitis admitted in Department of Surgery were subjected to a detailed history using a structured questionnaire and were examined clinically. Baseline investigations of the patients were done. USG findings were taken into account or if required CT scan was also done. After the diagnosis of acute appendicitis was made using ALVARADO score, USG whole Abdomen and in some cases by CT Scan, informed consent for surgery was taken. Allocation of patients for laparoscopic and open appendectomy was done through the double blinding technique in order to avoid the bias. Patients undergoing laparoscopic surgery were explained about the possible conversion to open surgery and separate consent was taken. In the present study sample was taken as 25 in each group. A consecutive sampling technique was employed for the present study. Each of the participants who fulfilled the inclusion and exclusion criteria were assigned a unique identification four-digit number. A random number table was used to assign patients to either the open or the laparoscopic appendectomy groups. The study was conducted using a predesigned questionnaire to obtain the sociodemographic and clinical data of the patients. Following the collection of the data, operative and post-operative complication related data were obtained for each patient. All the patients in both groups received 1 gm of cefotaxime every 8 hours intravenously from the time of diagnosis until surgery. Open appendicectomy- At McBurney point Grid-Iron muscle-splitting incision 1.5 inches in the right lower quadrant. A double ligation of the stump was performed with an absorbable suture. Appendix was removed, and the distal ileum was visualized for detection of possible Meckel‘s diverticulum. The closure was done in multiple layers with peritoneum and muscles closed with 3-0 vicryl and sheath with 1-0 vicryl. The skin incision was closed with 2-0 nylon . Nonsuction drainage were left in situ in cases of abscess and residual cavity. Laparoscopic appendicectomy was performed using 3 ports, with the laparoscope positioned at the umbilicus. One 10-mm port was inserted in supraumbilical region and two 5mm ports were inserted in suprapubic and left iliac region. The abdominal cavity was explored to locate the appendix and rule out other possible diagnoses. Mesoappendix was cauterized with bipolar or harmonic scalpel. Two pretied endoloop of vicryl no. 1 was applied at the base of the appendix. Appendix was cut above the tied loop. And taken out after putting in endobag through 10mm port. The right lower quadrant, the right colic gutter and the subhepatic space in the

case of purulence were irrigated and the fluid was suctioned. Fascial defects in the port sites were closed using 0 Vicryl suture. The skin incisions was closed in every case using 2-0 nylon. Nonsuction drainage were left in situ in cases of abscess and residual cavity. Bowel sounds were checked every 4 hours. Once present, the patients were started on a clear liquid diet and passing flatus were observed. Postoperative pain assessment was done using Visual Analogue Scale and Dose of analgesia (NSAIDs) was administered if on visual analogue scale pain score grade was more than 2. Wound was inspected on post op day2 for any soakage or signs of infection. Patients were discharged when they tolerated a regular diet, had a normal white blood cell count under 10,000/mL (WBC done on post op day2), were afebrile for 24 hours, passed flatus and were ambulatory. The collected data were checked for consistency, completeness and entered into Microsoft Excel (MS-EXCEL, Microsoft Corp.) data sheet. Analyzed with the statistical program Statistical Package for the Social Sciences (IBM SPSS, version 22). Data were organized and presented using the principles of descriptive and inferential statistics. The continuous data were expressed as mean±SD.

Results:

The highest number of participants in the open appendicectomy group were aged between 20 and 40 years, while that for the laparoscopic appendectomy group were aged between 20 and 30 years. It was found that the mean age of the patients undergoing open appendectomy was 31.2±10.6 years, and that of the patients undergoing laparoscopic appendectomy was 29.7±8.4 years. The difference between the ages of the two study groups were not found to be statistically significant on analysis (p-value 0.568). It was seen that 52% of the study participants of the open appendectomy group were men, as compared to 28% of the laparoscopic appendectomy group. The difference between the two study groups according to their sex distribution was foundto be statistically non-significant (p-value 0.083). It was seen that the postoperative pain as measured by the visual analogue scale (VAS) was significantly higher among the patients undergoing the open appendectomy as compared to those undergoing laparoscopic appendectomies (p-value 0.043). Each patient was given dose of NSAIDs in post op period and pain wasassessed after 6 hours of first dose and dose of analgesia administered if pain on VAS grade was >2. It was seen that 32% of the study participants of the open appendectomy group and 28% of those of the laparoscopic group had postoperative incidence of vomiting. The difference between the two groups with respect to the incidence of postoperative vomiting was not found to be statistically significant on analysis (0.758). It was seen that 28% of the study participants of the open appendectomy group had a postoperative fever as compared to 24% of the laparoscopic appendectomy group. Open appendectomy was found to be associated with a higher proportion of postoperative fever. However, the difference between the two study groups according to the incidence of postoperative fever was found to be statistically non-significant (p- value 0.747). It was seen that 24% of the study participants of the open appendectomy group had a postoperative wound infection as compared to 4% of the laparoscopic appendectomy group. Open appendectomy was found to be associated with a higher proportion of postoperative wound infection, and the difference between the two study groups according to the incidence of postoperative wound infection was found to be statistically significant (p-value 0.043). It was seen that 12% of the study participants of the open appendectomy group had a postoperative paralytic ileus as there was no return of bowel activities evenafter 24 hours compared to none in the laparoscopic appendectomy group. Open appendectomy was found to be associated with a higher proportion of postoperative paralytic ileus, and the difference between the two study groups was found to be statistically significant (p-value 0.037).

It was found that the mean time to return of bowel sounds for patients undergoing open appendectomy was 20.2±2.1 hours, and that of the patients undergoing laparoscopic appendectomy was 6.3±2.2 hours. Laparoscopic appendectomy was associated with a faster return of bowel sounds, and the difference between the two study groups were found to be statistically significant on analysis (p- value <0.001). It was seen that 8% of the study participants of the open appendectomy group had a postoperative urinary retention compared to none in the laparoscopic appendectomy group. Open appendectomy was found to be associated with a higher proportion of postoperative urinary retention, and the difference between the two study groups was found to be statistically significant (p-value 0.013).

Discussion:

A total of 50 patients of acute appendicitis scheduled to undergo appendectomy in the study institution were recruited for the purposes of the study, 25 patients in each of the two study groups. The mean age of the patients of the open appendectomy group was found to be 31.2±10.6 years, and that of the patients undergoing laparoscopic appendectomy was 29.7±8.4 years, a difference which was found to be statistically non-significant (p- value 0.568).

The relatively young age of onset of the acute appendicitis as observed in the present study is consistent with the literature on the epidemiology of the subject.

Table 1. Distribution of study participants according to their demographic data (n=50)

Age groups (years)	Open appendectomy (n=25)	Laparoscopic appendectomy (n=25)	Total
14-20	3	4	7
20-30	9	8	17
30-40	9	6	15
40-50	4	6	10
50-60	0	1	1
			P-value
Mean±SD age	31.2±10.6	29.7±8.4	0.568
Sex			
Male (%)	13 (52)	7 (28)	0.083
Female (%)	12 (48)	18 (72)	

Table 2. Distribution of study participants according to their postoperative pain asmeasured by the Visual Analogue Scale (VAS) (n=50)

VAS grade	Open appendectomy (n=25)	Laparoscopic appendectomy (n=25)	Chi-square value	p-value
1	5 (20)	13 (52)	6.146	0.043*
2	13 (52)	8 (32)		
3	6 (24)	4 (16)		
4	1 (4)	0 (0)		
Total (%)	**25 (100)**	**25 (100)**		

*Statistically significant

Table 3. Distribution of study participants according to their incidence of postoperative vomiting (n=50)

Postoperative vomiting	Open appendectomy (n=25)	Laparoscopic appendectomy (n=25)	Chi-square value	p-value
Present (%)	8 (32)	7 (28)	0.095	0.758
Absent (%)	17 (68)	18 (72)		
Total (%)	**25 (100)**	**25 (100)**		

Table 4. Distribution of study participants according to the incidence ofpostoperative fever (n=50)

Postoperative fever	Open appendectomy (n=25)	Laparoscopic appendectomy (n=25)	Chi-square value	p-value
Present (%)	07 (28)	06 (24)	0.104	0.747
Absent (%)	18 (72)	19 (76)		
Total (%)	**25 (100)**	**25 (100)**		

Table 5. Distribution of study participants according to the incidence ofpostoperative wound infection (n=50)

Postoperative wound infection	Open appendectomy (n=25)	Laparoscopic appendectomy (n=25)	Chi-square value	p-value
Present (%)	06 (24)	1 (4)	4.092	0.043*
Absent (%)	19 (76)	24 (96)		
Total (%)	**25 (100)**	**25 (100)**		

*Statistically significant

Table 6. Distribution of study participants according to the incidence ofpostoperative paralytic ileus (n=50)

Postoperative paralytic ileus	Open appendectomy (n=25)	Laparoscopic appendectomy (n=25)	Chi-square value	p-value
Present (%)	3 (12)	0 (0)	4.351	0.037*
Absent (%)	22 (88)	25 (100)		
Total (%)	**25 (100)**	**25 (100)**		

*Statistically significant

Table 7. Distribution of study participants according to the participants' meantime to return of bowel sounds (completed hours) (n=50)

Time to return of bowel sounds	Open appendectomy (n=25)	Laparoscopic appendectomy (n=25)	t-value	p-value
Mean	20.2	6.3	22.851	<0.001*
SD	2.1	2.2		

*Statistically significant

Table 8. Distribution of study participants according to the post operativeurinary retention (n=50)

Post Operative urinary retention	Open appendectomy (n=25)	Laparoscopic appendectomy (n=25)	t-value	p-value
Present(%)	02(08)	0(0)	6.591	0.013*
Absent(%)	23(92)	25(100)		

*Statistically significant

consistent with the literature on the epidemiology of the subject. In their studies, both Naveen K et al. and Babu KS et al. reported that the incidence of acute appendicitis in India was most common in the younger age groups, with most patients being aged between 15 and 30 years.[8,9]In the present study, it was seen that the condition was most prevalent among women, with the sex ratio being 1:1.5 in the open appendectomy group and 1:2.7 in thelaparoscopic study group. Jamy et al., Markides et al., and Wei et al. all reported similar sex distribution in their respective studies on the topic.[10-12] Due to the random allocation of the study participants, as was expected, the difference between the two study groups with respect to the sex distribution was found to be statistically non-significant too (p-value 0.083).

Although all of the operations were successful, with patients making full recoveries, it was observed that the postoperative pain was significantly lesser in the laparoscopic appendectomy group as compared to the open appendectomy group. In the present study none of the patients in laparoscopic group experienced the severe pain in postoperative period and most of the patients having mild post operative pain and in open appendectomy group only one patient had severe pain in postoperative period and most experiencing mild to moderate pain. One of the major advantages of laparoscopic appendectomy is the procedure's excellent postoperative pain outcomes. Masoomi et al., Wei et al., and Ohtani et al., reported that the postoperative pain perception was significantly lower among the patients undergoing laparoscopic appendectomy as compared to those undergoing open appendectomy.[12-14] The findings of the present study provide evidence in favor of this assertion, and establishes the advantage of the laparoscopic procedure further. The reason for less pain in the laparoscopic group might have been due to less handling of the tissues, no forceful retraction of the wound margins and miniscule incisions.[15-17] A statistically comparable proportion of patients experienced nausea and vomiting in the postoperative period in the study groups (32% of the open appendectomy group and28% of the laparoscopic appendectomy group). Findings similar to these have been reported by Wei et al. and Ohtani et al. in their research.[12,14] Incidence of fever in the postoperative period was also comparable between the study groups, with the difference being statistically non-significant (p-value 0.747). Mhoberg et al., in their studies have shown that small number of patients in each group having mild postoperative fever.[18] However, when postoperative wound infection was considered, it was present in 6(24%) of the patients of the open appendectomy group but only 1 (4%) of the patients undergoing laparoscopic appendectomy, and the difference between the two studygroups was found to be

statistically significant (p-value 0.043). Out of 6 patients in open appendectomy group 4 patients had only mild erythema at the suture site and only 2 patients had mild pus discharge which prolonged their hospital stay and was managedby regular dressing and giving a extended course of iv antibiotics in post operative period and. In laparoscopic group only one had post operative wound infection which may be explained by the extraction of infected appendix in Endo bag, so the inflamed appendix is never in direct contact with the wound, however in one patient contamination of port site due to leakage from endo bag may be the reason for port site wound infection. The lower rate also may be partly due to less invasive nature of laparoscopy. More tissue handling and increased surgical trauma during open surgery may increase the risk of wound infection. Rahman et al., reported that wound site infection is significantly higher in open group (p=0.019)[19.] Wei et al., in their study showed that the incidence of wound infection for laparoscopic appendectomy was significantly less than for open group (Z = 5.55; p=0.00001).[12] McCall et al., in his meta-analysis found that wound infection was more common after open appendectomy than laparoscopic group.[20] Similar result was reported in study conducted by Hansen et al.[21] Similarly in our study there was no incidence of any intrabdominal abscess formation post operatively in our study. This may be attributed to pre operatively antibiotics that were given and no residual fluid left in the pelvic cavity as thorough suctioning was done intraoperatively and in laparoscopic group appendix was extracted in endo bag which reduces the chances of spillage. Postoperative intrabdominal abscess is the most serious complication which is responsible for significant morbidity. Most studies have shown its increased incidence specially treatment of gangrenous and perforated appendix. Talha et al., Wei et al., reported in their studies no significant difference in both the groups in respect to intrabdominal abscess formation.[22,12] Similarly significant difference was observed between the two study groups with respect to the incidence of paralytic ileus, whose incidence was significantly high in the open appendectomy group 3(12%), while none of the patients undergoing laparoscopic appendectomy developed the condition (p-value 0.037). Furthermore, it was also observed that laparoscopic appendectomy was associated with a much faster return of bowel sounds. By virtue of the minimally invasive nature of the surgery, laparoscopic appendectomies have been associated with a significantly lower incidence of wound infection and paralytic ileus, as well as a faster return of bowel sounds in the postoperative period.[13,23-25] The present study's observations also provided further evidence in this regard. In our study two patients in open appendectomy group had post operative urinary retention which was statistically significant (p value=0.013). Attwood et al., noted that urinary retention in two patients in open appendectomy group and none laparoscopic group, so that's why they opined that post laparoscopic surgery patients is more comfortable than open group of cases. Spinal anesthesia can result on urinary retention in patients undergoing open appendectomy.[26] In our study no patient had any trocar site bleeding as despite done many laparoscopic procedures by our team still meticulous care was taken as, mostly the patients were asked to pass urine immediately before surgery thus to avoid any bladder injury while inserting the first supraumbilical port by open method (Hasson technique) and other two ports were inserted under direct vision. Linos et al., have reported injury to the inferior epigastric artery in two patients, one required open laparotomy and other developed a localized abdominal wall hematoma which was followed up clinically and resolved in within 3 weeks. In another patient, insertion of suprapubic trocar resulted inbladder injury which was repaired by extending suprapubic incision and repairing bladder wall and closing anterior abdominal wall in two layers.[27]

Conclusion:

It is concluded that the laparoscopic appendectomy is a better alternative to open appendectomy in terms postoperative symptoms like post operative pain, wound infection, paralytic ileus, returnof bowel sounds.

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