Evaluation of the Clinico-Demographic and Early Postoperative Outcomes of Laparoscopic Appendectomy

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Abstract

Introduction: Acute appendicitis is the most common cause of acute abdomen that requires emergency surgery. The life time incidence of acute appendicitis ranges between 7 and 9%. An appendectomy, either open (OA) or laparoscopic (LA), is a frequently performed surgical procedure for the treatment of acute appendicitis.

This study aims to evaluate the clinico-demographic and early post-operative outcomes of laparoscopic appendectomy in terms of Length of Hospital stay (LOH), surgical site infections (SSI) and Post-operative pain.

Methodology: This study was done in Department of Surgery Western Regional Hospital, Pokhara Academy of Health Sciences after Institutional scientific and ethical clearance. It is a prospective hospital based cross sectional study conducted from March 2021 to March 2022 and included 105 patients. All cases were followed up for one month.

LA was performed through a three ports technique. The clinical and demographic parameters and the early postoperative outcomes of the LA were evaluated. Statistical analysis were done using SPSS 25.

Result: A total of 105 cases were operated of which 54 were males and 51 were female with majority of patients of the age group 11-20 years. The average length of hospital stay was 2.30 ± 0.93 days, superficial surgical site/port site infection was 2.9% and no intra-abdominal abscess was noted.

Conclusion: Laparoscopic appendectomy is safe and effective in terms of reduction of the length of hospital stay (LOH), surgical site infections (SSI) and post-operative pain.

Keywords: Acute Appendicitis; Appendectomy, Laparoscopy; Length of hospital stay; Surgical site infections

Introduction

Acute appendicitis is one of the most common causes of acute abdomen presenting to the emergency department. The cardinal symptoms of appendicitis are migratory abdominal pain (initially periumbilical then to right lower quadrant) with or without anorexia, nausea, vomiting or fever. Appendectomy is the preferred treatment for acute appendicitis, which is also the most commonly performed operation in general surgical emergencies.[1] For over a century ,Open appendectomy (OA), as described by Mc Burney in 1894, remained the gold standard for the treatment of acute appendicitis.[2]recovery time from operation to discharge and reintervention for infective complications. Analysis was by intention to treat. Results: The rate of LA in Lothian increased from 29.9 to 39.4 per cent (P < 0.001 In 1983, laparoscopic appendectomy (LA) was first described by Semm, a German surgeon, since then, this approach has gained popularity over open appendectomy.[3]

The life time risk of acute appendicitis ranges between 7 and 9%.[1] Acute appendicitis is diagnosed clinically using the modified Alvarado score and other radiological tools as adjunct and appendectomies are performed by the surgeon. This study evaluates the outcomes of the LA in terms of length of hospital stay, postoperative pain and SSI.

Mc Burney's open appendectomy usually performed is well tolerated. Over the past two decades the management of the acute appendicitis has been influenced by the introduction of laparoscopic appendectomy which has shown short hospital stay, faster recovery and earlier return to full activity, decreased postoperative pain, improved wound healing and lower wound infection rate[4]particularly for complicated

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appendicitis, remains unclear. Our objectives were to assess 30-day outcomes after LA versus OA for acute appendicitis and complicated appendicitis, determine the incidence of specific outcomes after appendectomy, and examine factors influencing the utilization and duration of the operative approach with multi-institutional clinical data. Methods: Using the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP. Though laparoscopic appendectomy offers number of advantages, the incidence of intra-abdominal abscess (IAA) seems to be higher in case of complicated appendicitis.[4]particularly for complicated appendicitis, remains unclear. Our objectives were to assess 30-day outcomes after LA versus OA for acute appendicitis and complicated appendicitis, determine the incidence of specific outcomes after appendectomy, and examine factors influencing the utilization and duration of the operative approach with multi-institutional clinical data. Methods: Using the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP Because of the inconclusive results, consensus has not been established whether the OA or LA should be the preferred surgical approach for acute appendicitis. In the era of minimal invasive surgery, laparoscopic surgery is gaining popularity and surgeons are slowly shifting towards it. Laparoscopic surgery seems to increase the quality of life post-operatively with fewer complications, early return to work and better cosmesis.

Western Regional Hospital (WRH) is providing the standard quality of care to patient with acute appendicitis. This study aims to depict the clinical, demographic and early post-operative outcomes of laparoscopic appendectomy. The studies have shown that there are no significant differences in post-operative complications in management of uncomplicated and complicated appendicitis so this study provides the outcomes of laparoscopic appendectomy performed in our center.[5, 6, 7]

Methods

This is a prospective hospital based study conducted at Western Regional Hospital, Pokhara from March 2021 to March 2022 after ethical clearance from institutional review committee. One hundred and five patients were included in the study. All the patients diagnosed with appendicitis who underwent laparoscopic appendectomy were included in the study and appendectomy with bowel resection with/without anastomosis or stoma creation, drain placement ,midline laparotomy, patients with comorbidities like diabetes, immunocompromised states, conversion of LA to OA, mentally retarded, pregnant, patients who opted for OA and unfit for general anesthesia were excluded in our study.

Acute appendicitis was diagnosed with the history of right lower quadrant pain or periumbilical pain migrating to the right lower quadrant associated with nausea and/or vomiting, fever of more than 38°C and/or leukocytosis above 10,000 cells per mL in laboratory finding, right lower quadrant guarding, and tenderness on physical examination and radiological evidence of acute appendicitis either ultrasonography and/or computed tomography.

The graphical outline of the study design is followed as given in the figure 1.

Graphical outline of study design and procedure

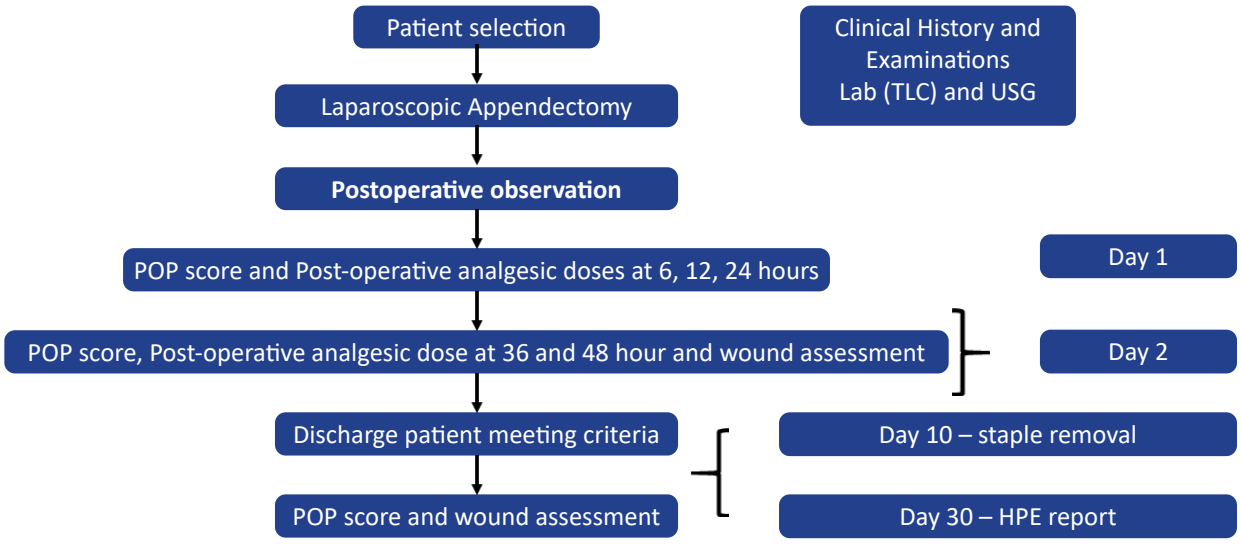

Fig 1: Graphical outline of study

Procedure:

Prior to the surgery, all the patients received a standard regimen of intravenous antibiotics (injection Ceftriaxone 1gm (50mg/kg/day) and injection ornidazole 15 mg/kg/day) during the admission and during the time of induction of anaesthesia and povidone iodine 10% was used for painting the surgical field. In laparoscopic appendectomy (LA) after general anaesthesia (GA), catheterization was done and pneumoperitoneum created by continuous insufflation of carbondioxide up to pressure of 12-15 mm of Hg via Hasson's technique. Following gas insufflation,

a 10 mm laparoscope and two additional trocars, a 5 mm trocar in the suprapubic area and a third 10/5 mm trocar in the right lower or left lower abdominal quadrant were introduced under vision. The appendicular artery was coagulated with ligasure or electrocautery and base of the appendix was ligated with endoloop. The specimen was extracted through 10mm port without using retrieval bag and the umbilical port was closed with the polyglactin 910 and skin stapled.

Post-operative course:

Analgesic, injection ketorolac, paracetamol were given 8 hourly based on weight and topped up to opiates (pethidine or tramadol) according to the pain perception and if not tolerated by patient, as per the WHO analgesic ladder pattern. Clear liquid diet was given and advanced to regular diet after the liquid diet was tolerated and flatus passed. Patients were discharged when they tolerated a regular diet, pain controlled on oral analgesics (ketorolac) and were afebrile for 24 hours. Similarly intravenous antibiotics (ceftriaxone/ornidazole) were continued during the hospital stay and switched to oral antibiotics during discharge.

Post operatively the patient was followed for surgical site infections(SSI), length of hospital stay(LOH) and pain perception using Visual analogue scale(VAS)/Numerical rating scale(NRS) and doses of analgesics used in 6th hour, 12th hour ,24th hour and 2nd, 10th and 30th days were noted. For VAS/NRS a chart was used and patients were inquired about the intensity of the pain and graded as given in the chart in figure 2. Patients were followed up in 10th and 30th day in out-patient department (OPD) or in phone.

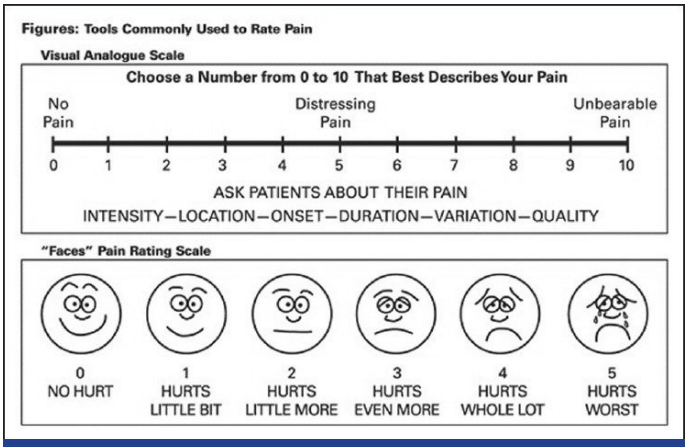

Fig 2: Visual Analogue Scale/Numerical Rating

Statistical analyses was done after collecting required data in preformed proforma. For the statistical analysis Statistical Package for Social Sciences (SPSS) version 25 was used. All the patients were enrolled into the study after they provided the informed written consent. The study was conducted after ethical clearance was given by Institutional Review Committee (IRC) of Pokhara Academy of Health Sciences (PoAHS).

Results

In the study one hundred and five patients underwent laparoscopic appendectomy. There were 54 male and 51 female with age range of (8-68) years. Majority of patients belonged to age group 11-20 years as shown in Table 1.

Table 1: Demographic characteristics between two groups (Age category/sex)

Age group (in years)	Sex		Total
	Male	Female	
≤10	4	6	10
11-20	23	24	47
21-30	19	14	33
31-40	5	5	10
41-50	2	2	4
≥51	1	0	1
Total	54(**51.4%**)	51(**48.6%**)	105

The clinical characteristics of the patients was as shown in the Table 2.

Table 2: Characteristics (Age//Duration of symptoms/WBC)

Parameters	Mean	Range
Age	21.82yr	8 - 60yr
Duration of symptoms	1.61days	1 - 4 days
TLC	12445.21	5700 – 21500

Intraoperatively 82(78.1%) had inflamed appendix and perforation/abscess in 4(3.8%) given in Table 3. Overall 82 uncomplicated and 23 complicated appendicitis were operated and early post-operative outcomes were analyzed.

Table 3: Per-operative findings

Per-operative findings	Number(Percentage)
Inflamed	82(78%)
Phlegmnous	10(9.5%)
Gangrenous	9(8.6%)
Perforated/Abscess	4(3.8%)

In the early post-operative outcomes, the mean length of stay was 2.30 ± 0.93 days with minimum and maximum LOH of 1 and 7 days respectively. One of the patient developed portal pyemia and managed accordingly and discharged after 7 days. Similarly, 3(2.9%) cases had port site infection/Superficial SSI managed with dressing. Out of three cases with SSI one had acutely inflamed appendix, second had appendicular abscess and third had gangrenous appendix intraoperatively. Post-operative pain scores (VAS) were as given in the Table 4.

Table 4: Early post-operative outcomes following Laparoscopic appendectomy

Postoperative parameters	Results
LOH	2.30 ± 0.931days
Port Site infection (Superficial SSI)	3(2.9%)
Pain Score at Day1 (VAS1)	4.95 ± 1.13
Pain Score at Day 2(VAS2)	3.47 ± 1.2
Pain Score at Day 10(VAS10)	1.44 ± 0.6
Pain Score at Day 30(VAS30)	0.0095 ± 0.97

Discussion

Laparoscopic appendectomy is gradually becoming the preferred operative procedure for acute appendicitis. The rate of LA between 1998 and 2008 increased from 20.6% to 70.8%. LA has become the preferred approach to treat acute appendicitis since 2005 in United States.[8] In our setting the trend is gradually shifting towards the laparoscopic approach, however the literature on increased incidence of Intra-abdominal abscess is worrisome for the surgeon and the patient.

The major advantage of the laparoscopic appendectomy is the decreased length of hospital stay, early return to the work and better cosmesis. The average length of hospital stay (LOH) was 2.30 ± 0.93 days. This reduced LOH was comparable to the other studies conducted.[9,10,11,12,13,14,15]

The wound infection in our study was noted in 3 (2.9%). The lesser incidence of the surgical site infection (SSI)/port site infection was similar in other studies[16,17,18,19,20,4,13,21] which reduced the patient's discomfort, pain and improved quality of life post operatively.

The finding of this study and other in the literature demonstrated lower wound infection rate in the LA in both uncomplicated and complicated appendicitis which might be due to smaller incision in LA and delivery of the appendix through trocar or with in plastic bag without coming in contact with the abdominal layers and skin.

The intra-abdominal abscess (IAA) occurring after LA was the setback for the surgeon for the selection of the procedure for the appendectomy. This dreadful complication in the literature were higher in the laparoscopic surgery.[17,4]particularly for complicated appendicitis, remains unclear. Our objectives were to assess 30-day outcomes after LA versus OA for acute appendicitis and complicated appendicitis, determine the incidence of specific outcomes after appendectomy, and examine factors influencing the utilization and duration of the operative approach with multi-institutional clinical data. Methods: Using the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP, [22] There were none IAA in our study.

The use of minimally invasive surgery in the management of surgical emergencies is growing. However, in 2002 LA was challenged by a systematic review[23] which showed an increased incidence of IAA nearly threefold compared with OA.

Possible hypothesis for this difference were the spread of the infected contents throughout the abdominal cavity during insufflation with carbon dioxide while creating pneumoperitoneum[22,24], carbon dioxide may increase the growth of anaerobic microorganism[25], increased surgical time, aggressive handling of the infected appendix (causing contamination in peritoneal cavity).[26] Based on the findings and review of the literature, the risk of occurrence of IAA following the LA should not take aback the surgeon from opting to laparoscopic appendectomy in a patient with complicated or uncomplicated appendicitis. The benefit of LA outweighs the risk of development of IAA[17,11,] and adequate suctioning of infected area and exploration of entire abdominal cavity are advised.

In the study, the post-operative pain was calculated using Visual Analogue Scale (VAS)/ Numerical Rating Scale (NRS) which was given the value form **0** (no pain at all) to **10** (severe pain). The average pain score Day1, Day2, Day10 and Day30 were 4.95 ± 1.13, 3.47 ± 1.22 NS 1.44 ± 0.6 and 0.0095 ± 0.97 respectively. The pain in 10th and 30th day were minimal to none according to VAS/NRS score. The pain score of our study were comparable with the other studies[28, 13]

Conclusion

Laparoscopic appendectomy is safe and effective in terms of reduction of the length of hospital stay (LOH), surgical site infections (SSI) and post-operative pain.

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