

Post-Operative Complications of Stump Ligation Alone Versus Stump Ligation with Invagination in Appendicectomy

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Citation

Q MINHAS, K SIDDIQUE, S MIRZA, A MALIK. *Post-Operative Complications of Stump Ligation Alone Versus Stump Ligation with Invagination in Appendicectomy*. The Internet Journal of Surgery. 2009 Volume 22 Number 2.

Abstract

Objective: To compare the postoperative complications after stump ligation alone and stump ligation with invagination in appendicectomy. **Methods:** This is a quasi-experimental study on 60 patients of acute appendicitis who were selected from the emergency department by incorporating Alvarado score and were divided into two groups after informed consent. Thirty patients had appendicectomy with stump ligation alone (group I) and thirty patients had appendicectomy with stump ligation and then burial of stump (group II). All patients were followed for post-operative complications for 20 days after surgery. **Results:** The number of days being hospitalized after surgery in all the patients was 1.38 ± 0.49 days ($p < .001$); 6.67% patients in group I in contrast to 13.33% in group II had superficial surgical site infection ($p = 0.424$). Three patients (Group II) had paralytic ileus which was managed conservatively. No one got peritonitis, abdominal or pelvic abscess and fecal fistula.

Conclusion: Patients undergoing appendicectomy with stump ligation only have a lower number of post-operative hospitalization days as compared to those undergoing appendicectomy with ligation and burial of the stump. No difference was observed between the two surgical techniques in terms of postoperative complications.

Research conducted at: Surgical Unit II, Holy Family Hospital, Rawalpindi, Pakistan

INTRODUCTION

Acute appendicitis remains one of the most common surgical emergencies.^{1,2} The early signs and symptoms of appendicitis are often subtle, patients and physicians may downplay their importance. In addition, the symptoms can vary depending upon the location of the appendix.^{1,2}

The goal of therapy is early diagnosis and prompt operative intervention. The operative approach in patients with suspected appendicitis depends upon the confidence in the diagnosis, history of prior surgery, and the patient's age, gender and clinical findings.^{1,2,3} Reginald Fitz reported the role of surgical removal of inflamed appendix for the first time in 1736 as the only curative treatment³. In 1889, Charles McBurney described the importance of early appendicectomy in his presentation before the New York Society of Surgeons.³

The technique of appendicectomy may vary from surgeon to surgeon or from center to center, starting from skin incision

to the ligation and invagination of the appendicular stump and so on. After ligation or transfixation of the appendiceal stump some surgeons invaginate the stump by means of a purse-string stitch or a Z-stitch or doubly invaginate the stump. Simple ligation without invagination was probably introduced by Kronlein in 1884³. This method was used by some surgeons but others have criticized it as leading to increased incidence of wound infection and peritoneal adhesions. Theoretically, every surgeon has its own justifications and advantages of selecting the operating procedure.³

Most of the appendicectomies are performed by postgraduate trainees while performing duties in the emergency departments of the tertiary care hospitals in Pakistan. This is the most frequently asked question from them whether they should only do ligation or ligation with invagination of the appendicular stump at the time of appendicectomy. Studies have been done in the West on this topic in the early 90s, but now the West has more advanced surgical equipment and is studying these techniques in a more sophisticated procedure of laparoscopic appendicectomy.⁴ In our country, we are still relying on

standard methods of open appendicectomy and unfortunately do not have any data.

A study done by Chaudhry et al. at Fauji Foundation Hospital, Rawalpindi, from 1999-2003 concluded that simple ligation of the appendix stump is a better and safe procedure during appendicectomy, though no significant difference was found regarding surgical site infection in the two groups.³ Another study by Shahid et al in 2003-2004 at PAC Hospital, Kamra, to compare the two procedures, followed the patients only for 7 days postoperatively and looked for postoperative wound infection, for fever and vomiting in the two groups but did not assess other postoperative complications, postoperative hospital stay and paralytic ileus.²

Which technique should be used while performing appendicectomy thus still remains controversial. Therefore, this study aims to compare the techniques of simple ligation without invagination and with invagination of the appendicular stump in terms of development of postoperative complications up to 20 days postoperatively.

PATIENTS AND METHODS

This quasi-experimental study was carried out in the Holy Family Hospital, Rawalpindi, for the duration of twelve months (September 2007-August 2008). After approval of the study by the ethical review committee of Holy Family Hospital, Rawalpindi, 60 patients of acute appendicitis were enrolled in the study in the emergency department based on non-probability convenient sampling, irrespective of age and gender, diagnosed by incorporating Alvarado score⁵. Unwilling patients, patients having history of onset of first symptom for more than 48hrs, complicated cases like perforated appendicitis, gangrenous appendicitis, and appendicular abscess and those with diabetes mellitus were excluded from the study.

Informed consent was taken from all the subjects and then they were divided into two treatment groups alternatively, no randomization was done (due to deficient resources).

Group I: Thirty patients were subjected to appendicectomy with simple ligation of appendicular stump.

Group II: Thirty patients underwent appendicectomy with ligation and invagination of appendicular stump.

Primary outcome which was looked for was hospital stay after surgery. Secondary outcomes were development of

post-operative complications including superficial surgical site infection (SSI), paralytic ileus, peritonitis, abdominal abscess, pelvic abscess and fecal fistula, for which each patient was followed up to 20 days by subsequent hospital visits after the discharge on day 5, 10, 15 and 20.

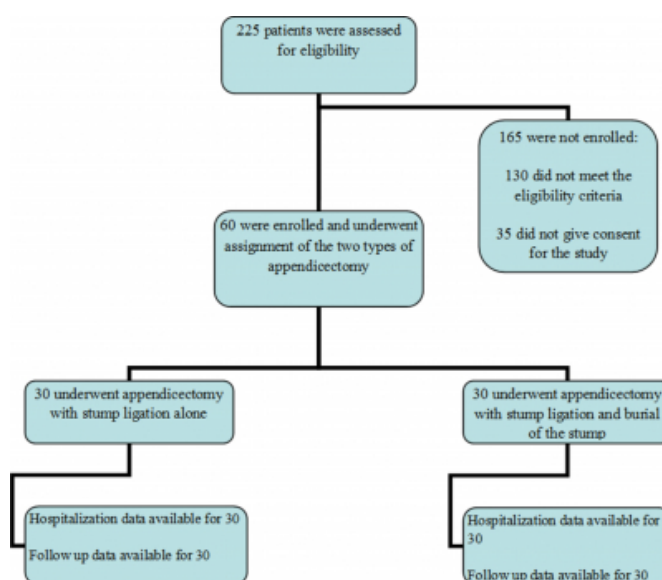
All outcomes were dealt as categorical variables and Pearson chi-square test or Fisher's exact test was applied to assess statistical significance. Data was analyzed in SPSS version 14.

RESULTS

A total of 225 patients were screened for eligibility (figure I).

Figure 1

Figure I: Eligibility, Assignment to Treatment Arms and Follow-Up.



One hundred thirty did not meet the eligibility criteria and 35 patients did not give consent for the study. Therefore, 60 patients were recruited for the study and were divided into two equal groups for treatment allocation. Hospitalization and follow-up data was available for all and there was no loss to follow-up. Baseline characteristics of the patients assigned to the two studies groups were alike. (Table I)

Figure 2

Table I: Baseline characteristics of the patients of acute appendicitis according to assigned study group

Characteristics	Stump Ligation Alone	Stump Ligation with Invagination of Stump
Age (yrs)	25±2	25±3
Male Sex No./Total No. (%)	17/30 (56.67%)	16/30 (53.34%)
BMI (kg/m ²)	22±3	22±2.5
Current Smokers No./Total No. (%)	10/30 (33.33%)	11/30 (36.67%)

PRIMARY OUTCOME:

Duration of postoperative hospitalization in all the patients was 1.38±0.49 days, which was found to be statistically significant between the two groups with p<0.001 (using Fisher's exact test).

OTHER OUTCOMES:

Three patients in group I (5% of total patients, 1% within the group) and 8 patients in group II (13.33% of total, 26.67% within the group) had postoperative nausea and vomiting. In Group I, out of 30 patients, 2 (3.3% of total patients, 6.67% within the group) got superficial surgical site infections while in Group-II, out of 30 patients, 4 (6.67% of the total patients, 13.33 % within the group) got superficial surgical site infections. Three patients (group II) had paralytic ileus which was managed conservatively. No one got peritonitis, abdominal or pelvic abscess and fecal fistula. Though there is apparent difference between these outcomes in the two groups, none was found to be of statistical significance. (Table II)

Figure 3

Table II: Post Operative Complications as Observed in Both the Treatment Arms.

Complications	Stump ligation alone	Stump ligation with invagination of the stump	Chi-square test
Post-op nausea and vomiting	3/30 (1%)	8/30 (26.67%)	0.095 (not significant)
Superficial surgical site infection	2/30 (6.7%)	4/30 (13.37%)	0.389 (not significant)
Paralytic ileus	0/30 (0%)	3/30 (1%)	0.076 (not significant)
Peritonitis	0/30 (0%)	0/30 (0%)	-
Abdominal abscess	0/30 (0%)	0/30 (0%)	-
Pelvic abscess	0/30 (0%)	0/30 (0%)	-
Fecal fistula	0/30 (0%)	0/30 (0%)	-

DISCUSSION

Acute appendicitis is one of the most common surgical conditions, and affects about 7% of the population in the

United States and in European countries⁵. In Asian and African countries, the incidence is probably lower because of the dietary habits of the inhabitants of these geographic areas. In the last few years, a decrease in frequency of appendicitis in Western countries has been reported which may be related to changes in dietary fiber intake. In fact, the higher incidence of appendicitis is believed to be related to poor fiber intake in such countries⁶. Persons of any age may be affected, with the highest incidence occurring during the second and third decades of life and in our study the mean age of patients was 26.25 yrs. Rare cases of neonatal and prenatal appendicitis have been reported⁵. Appendicitis occurs more frequently in males than in females, with a male-to-female ratio of 1.7:1⁵, which in this study was 1.2:1.

We selected patients of acute appendicitis from the Emergency Department of the Holy Family Hospital by incorporating Alvarado score. A study proved that the Alvarado Scoring System has an overall sensitivity of 53.8% and a specificity of 80%⁷. For males, the sensitivity was 56.4% and the specificity was 100%. For females, the sensitivity and specificity were 48% and 62.5% but further investigations may be required to confirm the diagnosis⁷. All the patients with score 7 or more should be surgically managed⁷.

Open appendicectomy is the standard curative treatment in Pakistan³. A traditional method of dealing with the appendix stump is to crush it, ligate it and then invaginate it. As described by Miles and Wilkie, carbonization of the stump prior to invagination was included as an added safeguard against infection³. It has since been shown that attempts to sterilize the appendix stump do not influence the incidence of postoperative wound infection. But whether or not it is necessary to invaginate the ligated stump is still undecided. To look for evidence in this matter, this study was planned.

Data apparently revealed that the patients in whom the stump was ligated and invaginated are more prone to get superficial surgical site infection (4/30 patients), but no statistical significance was revealed owing maybe to the small sample size of the study. Bull et al. showed the wound infection rate to be 18% without prophylactic use of antibiotics⁸. Many health care providers thought that the wound infection rate could have been reduced by the use of prophylactic antibiotics, particularly metronidazole in cases of appendicitis^{8,9}. Data of this study suggests that the method of treatment of the appendix stump does not affect the wound infection rate. The significant difference in Sinha's

retrospective series must be due to other factors possibly related to prophylactic use of antibiotics, variations in operative technique or postoperative management. This study results confirm those of Kingsley who found no significant difference in the wound infection rate, however the stump was treated³.

Paralytic ileus¹⁰ was the next postoperative complication observed in the patients. In Group II only, 3 patients (5%) developed this complication, it was managed conservatively and the patients recovered. In Group I no patients suffered from paralytic ileus.

No patient got abdominal abscess, pelvic abscess and fecal fistula. These study results proved that appendectomy (within 24hrs after arrival in hospital) for acute appendicitis (uncomplicated, with a history of 24hrs) has no relationship with abdominal abscess, pelvic abscess and fecal fistula. This is in accordance with the international research^{11,12}.

There have been several reports claiming benefits for the simplified method of appendectomy over the traditional method of embedding suture at the stump without contradictory opinions ever having been published. Nevertheless, most surgeons continue to carry out purse-string sutures in daily practices of open appendectomy as long as the stump situation permits^{2,3,4}. In cases where the caecum near the stump is friably swollen due to the spread of inflammation in advanced appendicitis, surgeons have often faced uncomfortable pulling of caecal stitches during embedding procedures, experiencing tearing or incomplete approximation of the pulled wall. To avoid this difficulty and shorten the procedure, surgeons have been performing simple ligations of the stump and observed the results. There was no advantage of one method over the other in recovery course and in view of the complication rates associated with stump inadequacy and adhesive ileus, even in cases of perforated appendicitis. When possible, stump ligation simplifies the appendectomy procedure without increased operative sequelae, even in cases of perforated appendicitis. So this procedure could be recommended instead of purse-string sutures, especially in cases of thick and friable caecal wall due to acutely disseminated appendiceal inflammation^{2,3,4}.

CONCLUSION

The evidence found is sufficient to demonstrate that, in relation to appendiceal stump handling either with simple stump ligation or invagination, there is significant difference between hospitalization rates (longer post-operative hospitalization in group II) but no difference in complication rates (postoperative nausea and vomiting, wound infection, peritonitis, abdominal and pelvic abscess, paralytic ileus or fecal fistula); nevertheless, the former is faster to perform and has a lower rate of paralytic ileus.

Although modern gastrointestinal surgery has abandoned the invagination of stapler closures (laparoscopic appendectomy), the traditional technique for appendectomy with appendix stump invagination is still in common use. Thus, the principal investigator recommends the simple ligation technique for conventional as well as for laparoscopic appendectomy because it is simpler and faster and it preserves the intact anatomy of the caecal wall.

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