



NONINVAGINATION VS. INVAGINATION OF APPENDICULAR STUMP: A RETROSPECTIVE STUDY

General Surgery

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ABSTRACT

Appendicitis is the most common abdominal surgical emergency. The standard treatment of acute appendicitis is appendectomy which can be performed by either open or laparoscopic approach. While during laparoscopic approach the stump is mostly not invaginated, in open method management of stump remains debatable- simple ligation or ligation and invagination of the stump.

Aim of the study was to compare results of simple ligation alone or ligation and invagination of the appendicular stump during appendectomy.

Materials And Methods: Altogether 74 patients were included in this study and divided into two groups. Group I ligation and invagination of the stump with purse string suture and Group II simple ligation of the stump. The two methods were compared with respect to operative time, intraoperative and post-operative complications.

Results: There was no significant difference in either the rate of post-operative complication and post-operative hospital stay between the two groups. The average operative time was shorter in group without invagination.

Conclusion: simple ligation of appendicular stump is a safe, simpler good technique associated with shorter operative time.

KEYWORDS

appendicitis, appendectomy, stump, ligation, invagination

INTRODUCTION

Acute appendicitis is the most common acute surgical emergency in developed world; if left untreated, it has the potential for severe complications, including sepsis, perforation with peritonitis and may even cause death. It is most common during the second decade of life though it may occur at any age from infancy to 90 years. It affects approximately 6-10% of the general population^{1,2}. By adulthood one in six people will have undergone removal of their appendix¹. Lifetime risk of appendectomy is 12% for men and 25% for women making it the most commonly performed operation in the world^{4,6}, with approximately 7% of all people undergoing appendectomy for acute appendicitis⁶.

Non-operative management of acute appendicitis with antibiotics alone cannot be recommended because of high rate of failure. Antibiotics treatment may be a useful temporizing measure, in environments with no surgical capabilities e.g. on ship¹.

Appendectomy remains the standard treatment of acute appendicitis, which is performed by both open and laparoscopic approaches⁷. Open appendectomy is still the most common approach because it is quick and cost effective. The length of the appendix varies from 2-20cm and the average length is 9 cm in adults³. Acute appendicitis most commonly results from luminal obstruction by a faecolith, hyperplastic lymphoid tissue, parasitic infestation, or tumour, with subsequent localised venous ischaemia resulting in mucosal disruption followed by invasive bacterial infection; viral ulceration may also be the cause of mucosal ulceration in certain patients⁸. Infection limited to the appendix itself results in localized inflammation and simple, or suppurative, appendicitis⁸.

Out of all clinical and laboratory-based scoring system devised to assist diagnosis, the Alvarado (MANTRELS) score is the most widely used⁹. A score of 7 or more is strongly predictive of acute appendicitis⁹. In patients with an equivocal score^{5,6}, abdominal ultrasound or contrast-enhanced CT examination further reduces the rate of negative appendectomy⁹. Abdominal ultrasound examination is more useful in children and thin adults, particularly if gynaecological pathology is suspected, with a diagnostic accuracy in excess of 90%⁹.

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, carbolisation of the stump prior to invagination was included as an added safeguard method against infection⁷. After ligation or transfixation of the appendix, some surgeon invaginate the stump by means of a purse string suture or a Z-stitch with 2-0 chromic catgut or vicryl suture or doubly invaginate the stump³. Thus the technique to deal with the stump varies widely amongst surgeons.

On the other hand those who do only simple ligation, found it simpler, less time-consuming and without interfering with anatomy of the caecal wall¹. Many surgeons believe invagination of the appendiceal stump is unnecessary⁹.

This study was therefore undertaken in our unit to compare the two methods of dealing with appendicular stump and necessity of stump invagination during appendectomy.

MATERIALS AND METHODS

This retrospective study was conducted in our surgery unit of Tezpur Medical College, Assam from January 2017 to December 2019.

Altogether 74 patients were included during the above period for this study. All appendicitis patients either acute or recurrent were included and patients diagnosed with perforated appendix and appendicular lump or abscess were excluded. They were alternately divided into Group I and Group II.

Group I: ligation with invagination of appendix stump-37 cases.

Group II: simple ligation – 37 cases.

The diagnosis of acute appendicitis was made based on the Alvarado (MANTRELS) score and abdominal ultrasonography. Recurrent appendicitis patients were diagnosed from history and abdominal ultrasound. A detailed history, thorough physical examination and blood investigations were carried out to make the diagnosis. Patients with features suggestive acute appendicitis were scored using the Alvarado score (MANTRELS) score. Those who scored 7-10 were considered as having acute appendicitis and those who scored 5-6 with abdominal ultrasonography show inflamed appendix were considered as recurrent appendicitis.

All patients were operated through a standard grid iron skin incision; the appendicular stump was ligated with silk 1-0 free tie and transfixed with silk 2-0 on round body needle.

In Group I after ligation and transfixation, invagination of the stump was done by purse-string suture with 2-0 vicryl on a round body needle applied 1.5-2 cm away from the base of the appendix while in Group II only simple ligation and transfixation of appendicular stump was done. All operations were carried out by Associate Professor, Assistant Professor and Registrars.

Operative time was recorded from skin incision to last skin suture and any intraoperative problems like caecal wall oedema, caecal wall puncture, serosal tear etc. were recorded. None of the patients required drain to be put in abdominal cavity. Abdomen was closed in layers with vicryl 2-0 and skin with ethilon 2-0 or 3-0.



Fig.1 appendix crushed, ligated and 'Z' suture Inserted prior to invagination.



Fig.2 appendicular stump invaginated on tying 'Z' suture.

All patients were given antibiotics ceftriaxone and metronidazole intravenously for 2 days and PPI, analgesics, antacids and IV fluids till bowel sounds returned when these medicines were switched to oral route. Oral fluids were started when bowel sound returned about 12-24 hours after operation. Operative wound was examined on 4th post-operative day for any sign of infection which was recorded. Stitches were removed on 9th or 10th post-operative day and patients were followed for at least 6 months

RESULTS:

All the 74 patients included in the study underwent appendicectomy. Each group had 37 patients. Group I patients underwent ligation and inversion of the stump while Group II patients underwent simple ligation of the stump. Out of total 74 patients 43 were males (58.1%) and 31 (41.9) were females. The age of patients ranged from 16-57 years, the highest incidence being in the age group 16-30 years. The two groups were similar in respect to age, sex, clinical features, position of caecum and treatment. Right iliac fossa pain was the most common presenting symptom in all the patients and tenderness in the right iliac fossa was the most common sign elicited (95%). The most common position recorded in this study was retrocaecal (56%). The average operating time was 54 minutes (44-64 mins) in group I while it was 40 minutes (32-48 mins) in group II. Table I shows various characteristics of patients.

Table I

Patient characteristics	Group I	Group II
Mean age in years	26.5±6.3	27.4±5.7
M:F		
male	20	23
female	17	14
Mean operating time	54±10(minutes)	40±8(minutes)
Mean length of stay(days)	4±2	3±2

Post-operative wound infection was noticed in 3 patients in Group I and in 2 patients in Group II which was not of much significance. Post-operative wound infection increased the duration of hospital stay in both the groups by an average of 6 days.

The post-operative course of the patients in both the groups was similar. The difference between the post-operative complications like ileus and wound infection was not of any significance in either of the groups (table 2).

Table 2

Post-operative complications	Group I	Group II
Wound infections	3	2
Vomiting	2	1
Paralytic ileus in hours(24-48 hours)	3	2
>48 hours	nil	nil
Peritonitis	nil	nil
Residual abdominal abscess	nil	nil
Intestinal obstruction	nil	nil
Others	Nil	nil

No case of post-operative peritonitis, residual abdominal abscess and intestinal obstruction due to adhesions was noticed in both groups during the post-operative period and follow up. The most common complaint of the patients was persistent dull aching pain at the site of operation.

DISCUSSION:

Appendicitis is one of the most common surgical emergencies, which is common in the second and third decade of life⁵. Invagination of appendicular stump during appendicectomy has traditionally been

practised by many surgeons in many centres despite lack of evidence from randomized clinical trials to justify its benefit¹⁰⁻¹⁴, while some surgeons do simple ligation alone of the appendix stump. This study was aimed to evaluate two methods of dealing with the stump.

The reason given for this invagination of appendicular stump are safety against slipping of ligature from the stump or blow out of appendicular stump, less chance of peritonitis from slippage of pathogens from the stump, less incidence of post-operative wound infection, better healing of gut by formation of granulation tissue and collagen from the serosal layer of caecum¹, on the other hand, who do simple ligation only found it simpler, less time consuming and leaving intact the anatomy of caecal wall¹⁴, with no difference in the incidence of post-operative wound infection or paralytic ileus. However, there are reports of more residual abscesses over the wall of caecum due to invagination of the stump, besides the deformation (filling defect) may lead to the suspicion of a neoplasm^{10,12}. Simple ligation of appendicular stump has been reported to obviate these misinterpretation¹¹. With purse string sutures, there are more chances of intraoperative complications like caecal wall puncture and serosal tear and invagination may rarely form lead point of ileo-caecal intussusception. Our study showed no advantages of invagination of the appendix stump over simple ligation in conformity with other randomized clinical studies¹⁰⁻¹⁵.

In present study no significant differences were observed in the rate of post-operative complications and post-operative hospital stay between the two groups which is in agreement with other trials^{10,14}. The mean operating time was significantly shorter in the group without invagination, a finding consistent with that reported by others^{10,13,16}. As in other studies^{11,12} no case of post-operative peritonitis, residual abscess and intestinal obstruction due to adhesions was noticed in both groups during the post-operative period and follow up. The only problem reported was prolonged dull aching pain over the operation site, which was equal in both the groups.

CONCLUSION:

This study showed that simple ligation of the appendix stump is an equally safe, simpler method with shorter operating time with no difference in the outcome in comparison with invagination of te stump with purse-string sutures. Simple ligation of the appendix stump is therefore recommended as standard procedure in open appendicectomy.

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