

ORIGINAL RESEARCH

Moving on from conventional appendectomy involving simple ligation with stump burial to an easier and time saving simple ligation with transfixation of the appendiceal stump- A comparative study

¹Dr. Pritam Kundu, ²Dr. Sona Malhotra, ³Dr. Irfan Hussain Khan

¹⁻³Department of General Surgery, NIMS Hospital, Jaipur, Rajasthan, India

Corresponding author

Dr. Pritam Kundu

Department of General Surgery, NIMS Hospital, Jaipur, Rajasthan, India

Received: 24 September, 2023

Accepted: 29 October, 2023

ABSTRACT

Objective: To compare the feasibility, difficulties and post operative complications between appendectomy involving simple ligation with transfixation and conventional appendectomy involving simple ligation with stump burial in patients with clinical diagnosis of acute appendicitis. **Material and Methods:** This comparative study was conducted in General Surgery Unit II, NIMS Hospital, Jaipur, Rajasthan from June, 2022 to September, 2023 including 2 months follow-up in all cases. Forty cases who underwent appendectomy for uncomplicated acute appendicitis were divided into two groups. Group A included all patients undergone simple ligation with transfixation following appendectomy and Group B included all patients undergone stump closure with invagination following open appendectomy. Each group consisted of 20 cases. **Results:** The mean age was 35.8 years in group A and 36.5 years in group B. In this study wound infection was 10% in patients undergoing burial of stump following appendectomy and 5% in simple ligation ($p > 0.05$). Mean hospital stay was 3.65 days in those with stump burial following appendectomy while in simple ligation with transfixation, it was 3.6 days ($p > 0.05$). There was one case of paralytic ileus in Group B (5%) while in group A there was none ($p > 0.05$). In group B, 15% of patients suffered from fever while in simple ligation with transfixation, it was 10% (p value > 0.05). Extra time was spent on burial of stump following appendectomy with mean 3:45 minutes. **Conclusion:** Simple ligation with transfixation of the stump is easy and less time consuming. There is no significant difference in the frequency of wound infection and shorter hospital stay between simple ligation with transfixation and simple ligation with burial of stump after appendectomy.

Key Words: Appendicitis, Appendectomy, Stump Burial, Invagination, Ligation, Transfixation, Alvarado (MANTRELS) score, Appendix and Complications.

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution- Non Commercial- Share Alike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

INTRODUCTION

Acute appendicitis remains one of the commonest abdominal surgical emergencies. The incidence of appendicitis is most common in the second decade of life; mostly within the age group 20 -40 years. The length of appendix may vary in large, but the average length is 9 cm in adults. The causes of acute appendicitis are the luminal obstruction by fecolith, hyper-plastic lymphoid tissue, parasitic infestation, or tumor, localized venous ischemia resulting mucosal disruption, invasive bacterial infection and also viral infection may cause mucosal ulceration. Of all the scoring system, the most widely used is the Alvarado (MANTRELS) score. Score ≥ 7 is suggestive of acute appendicitis. Ultrasonography (whole abdomen)

and contrast enhanced CT scan of abdomen are also useful for diagnostic accuracy of $> 90\%$.

Appendectomy is one of the most common emergency abdominal surgery being performed worldwide; with approximately 7% of all people being operated for acute appendicitis. Though laparoscopic appendectomy is gaining popularity in well equipped theatres, open appendectomy dominates in number.

The technique of appendectomy may vary from surgeon to surgeon, or from centre to centre starting from skin incision to the ligation and burial of appendectomy stump and so on. Some surgeons prefer to bury the appendix stump using purse string or Z suture; some prefer not to bury the appendix stump following simple ligation with transfixation. In

laparoscopic appendectomy, the appendix stump is even simply coagulated.

Though sometimes notorious complications may occur following both in simple ligation (without appendix stump burial) and in burial of appendix stump, the later may complicate more often and pose difficulty to treat the appendiceal stump appendicitis (a rare complication). Hence, most studies prefer simple ligation withtransfixation without stump invagination. Stump appendicitis is an acute inflammation of the residual appendix and a rare complication after appendectomy. Simple ligation withtransfixation with failure to amputate the appendix close to its base may also result into stump appendicitis.

Stump invagination also causes deformity in the cecal wall that sometimes appears like a tumor during contrast study and colonoscopy.

Despite the evidences suggesting increased complications with appendiceal stump burial, it is sometimes necessary to perform to achieve adequate closure; for example in perforated base of appendix. Traditional method of ligation and inversion has the advantage that peritonealization and haemostasis are secured; still the risk of intra-luminal abscess of the caecum cannot be neglected. Thus, simple ligation withtransfixation with amputation of the appendix close to its base without burial of the appendiceal stump is the preferred step in appendectomy by the surgeons in recent times.

MATERIAL AND METHODS

This comparative study was conducted in General Surgery Unit II, NIMS Hospital, Jaipur, Rajasthan with 40 patients diagnosed with Acute Appendicitis from June, 2022 to September, 2023 including 2

months follow-up in all cases. All forty cases of acute appendicitis after proper formal consent were divided into two equal groups using simple randomization. Group A included all patients undergone simple ligation withtransfixation following appendectomy and Group B included all patients undergone stump closure with invagination following open appendectomy.

All patients above 14 years of age diagnosed with uncomplicated acute appendicitis were included in the study. The diagnosis was mainly made on clinical examination with routine laboratory investigations, ultrasonography or CECT of whole abdomen and confirmed during surgery. Patients diagnosed with perforated appendix, appendicitis with generalized peritonitis, appendicular abscess or mass formations with inflamed cecal wall were excluded from the study.

All the operated cases were followed during the 1st week, 1st month and 2nd months post operative period (starting from the date of discharge).

Post operative hospital stay, postoperative pain, fever, wound infection, paralytic ileus, intra-abdominal abscess formation, peritonitis and other rare complications like fecal fistula, portal pyaemia and appendiceal stump appendicitis were recorded in each proforma systematically. In the first follow up after a week from date of discharge, stitches were removed if wound is clean dry and healthy; detailed history, clinical examination and relevant investigations if required were done. All patients were further followed up after 1 month and 2 months post operative period.

After collecting data, all the statistical analysis was performed in SPSS of Microsoft excel software for windows and a P value of <0.05 was taken as significant.

RESULTS

Table 1.1

Patient Characteristics	Group A	Group B	P value
Gender			
Male	10	13	0.34
Female	10	7	
M:F	1	1.85	
Mean Age in years (SD)	35.8 (17.1)	36.5 (18.7)	0.062
Time on Stump inversion (Mean time)		03:45 minutes	-
Mean Operating time in minutes	00:59:00 (59 minutes)	01:13:00 (73 minutes)	-
Mean Hospital stay in days (Post Op)	3.6	3.65	0.56

Table 1.2

Post Op complications	Group A	Group B	P value
Pain	4.75	5	0.47
Fever	2	3	0.63
Infection	1	2	0.55
Paralytic ileus (24-48 hrs)	-	1	0.47
Intra Abdominal abscess	-	-	-
Peritonitis	-	-	-
Fecal fistula	-	-	-
Portal pyaemia	-	-	-

Stump Appendicitis	-	-	-
--------------------	---	---	---

A total of 50 patients with acute appendicitis scoring 5-9 by the Alvarado (MANTRELS) score were eligible for the study. Out of these, 10 patients were excluded from the study. In last 3 patients follow-up could not be done, 4 patients lost contact with, 2 patients due to perforated appendix and 1 patient refused to give consent. Hence, a total of 40 patients were randomly divided into two groups; Group A comprised of 20 patients who underwent simple ligation withtransfixation during open appendectomy and Group B comprised of 20 patients who underwent traditional stump inversion using purse string or Z suturing during open appendectomy. No randomized patients withdrew from the study. All 40 patients were included in the subsequent analysis. The two groups were similar with respect to age, sex, degree of appendiceal inflammation, anatomical location of appendix and antibiotic treatment.

The demographic characteristics between each group were compared (Table 1.1). There was dominance of male in the total sample size; where, in Group A male: female ratio was 1 (10 males and 10 females) and in Group B male: female ratio remained 1.85 (13 males and 7 females). The mean age of the samples in Group A was 35.8 (Range 15- 69 years) and that in Group B was 36.5 (Range 14-74years). The majority of patients in both groups were below 34years of age, i.e. 55% are between 14-34 years of age in both groups. The frequency of acute appendicitis was highest between 14-38 years of age comprising of 57.5%.

Overall wound infection post open appendectomy was 7.5% which were treated by opening the wound and draining the collected pus and by giving proper antibiotic coverage for 5 days according to culture and sensitivity. Wound infection noted in Group A was just 1 case (5%) and that in Group B were 2 cases (10%). Although the infection rate was high in Group B than Group A, it was not statistically much

significant. There was no case of intra-peritoneal infections in both groups.

Post operative pain score remained nearly same in both groups with average score of 4.75 in Group A and 5 in Group B.

Post operative fever developed in 12.5% patients collectively in both groups; with incidence more common in Group B than Group A and could be due to excessive tissue handling during stump inversion which could lead to pyrexia and inflammation. A total of 2 patients had mild fever in Group A and 3 patients had fever in Group B in the post operative period. Paralytic ileus (24-48 hours) noted in only one patient in group B post operatively.

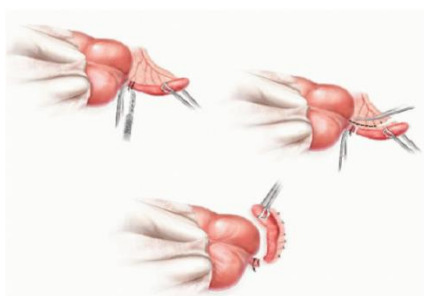
Post operative hospital stay is one of the important variables on which the outcome of the study highly depended. It reflected the morbidity, mortality, cost of the disease or, a procedure.

In our study, the mean hospital stay was 3.6 days in Group A and 3.65 days in Group B, with no significant statistical differences between the two groups.

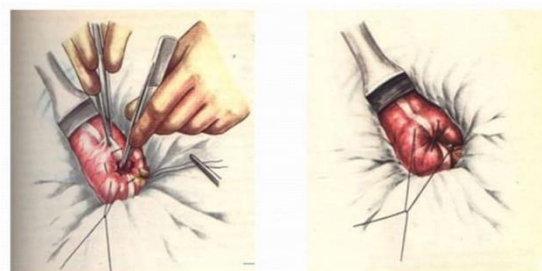
The mean operating time remained 59 minutes in Group A and 73 minutes in Group B, clearly explaining the extra time being consumed in doing the managing the stump inversion.

Another observation in the study was the mean time spent on stump invagination which was 3.45 minutes. In some cases it was difficult to invaginate due to fixed and improper exposure of cecum, which is why simple ligation withtransfixation is superior to stump invagination.

No case of major complications like peritonitis, residual abscess or intestinal obstructions, etc was noticed in both the groups during the post operative period and follow up. There was no mortality in the study.



Simple Ligation with transfixation



Simple ligation with stump burial

DISCUSSION

Acute appendicitis is the most common surgical emergency that is common in second and third decade of life. Invagination of appendicular stump during appendectomy has traditionally been practiced by many surgeons in many centres because of its safety against slipping of ligature from the stump or blow

out of appendicular stump, less chances of peritonitis from spillage of pathogens from remaining 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 cecum. On the other hand, who do simple ligation withtransfixation only found it simpler, less time

consuming and leaving intact the anatomy of caecal wall with no difference in the incidence of postoperative wound infection or paralytic ileus. However, there are reports of more residual abscesses over the wall of cecum due to invagination of stump, besides the deformation (filling defect) may lead to the suspicion of a neoplasm. Simple ligation with transfixation of the appendicular stump has been reported to obviate these misinterpretations. In agreement with other clinical studies our study showed no advantages of invagination of the appendix stump over simple ligation with transfixation.

Our study showed no statistically significant differences in the rate of postoperative complications and postoperative hospital stay between the two groups which is in consistent with other trials. In this study, the mean operating time was significantly shorter in the group without invagination, a finding consistent with that reported by others. Like in other studies no case of postoperative peritonitis, residual abscess and intestinal obstruction due to adhesions was noticed in both groups during the postoperative period and follow up. The most important observation was the extra time that was spent on stump invagination amongst the patients in Group B.

CONCLUSION

It is concluded that, we can omit, the step of appendicular stump invagination and instead perform simple ligation with transfixation of the appendix stump during open appendectomy which will shorten the operative time, with less incidence of wound infection, post operative ileus and other post operative complications. Simple ligation with transfixation also shortens the operative time. It produces no deformation of the caecal wall, as in invagination it may be mistaken for a caecal mass or it may act as a lead point for ileo-cecal intussusception. Simple ligation with transfixation of appendicular stump is therefore recommended as standard procedure in open appendectomy.

REFERENCES

1. Suvera MS, Kharadi AH, Asari US, Damor PB, Shah MT, Patel MB. Open appendectomy stump:

- invaginate or not to invaginate? *Int J Res Med Sci* 2013;1:248-51
2. Nadim Khan, Adil Bangash, Mushthaq M, Muzaffaruddin Sadiq, Imran M. Simple ligation versus ligation and burial of stump in appendectomy in patients with clinical diagnosis of acute appendicitis.
3. Bahaa Aldeen A. K. Al. Mujamaee. Non Burial of the Appendix Stump During Appendectomy a Safe Procedure.
4. Ellis BW. Acute appendicitis in Brian W Ellis and Simon Paterson-Brown, Hamilton Bailey's Emergency Surgery 13th edition, Hodder Arnold: 399-410.
5. Addis DG, Shaffer N, Fowler BS, Tauxe RV: The epidemiology of appendicitis and appendectomy in United States. *Am J Epid* 1990; 132: 910-925.
6. Bailey and Love's Short practice of surgery, 25th edition, Norman S. Williams, Christopher J. K. Bulstrode and P. Roman O'Connell 67: The Vermiform Appendix 1204-1218.
7. Engstrom L, Fenyo G. Appendectomy: assessment of stump invagination versus simple ligation: a prospective randomized trial. *Br J Surg* 1985; 72(12): 971-2.
8. Chaudhary IA, Samiullah, Mallhi AA, Afridi Z, Bano A. Is it necessary to invaginate the stump after appendectomy? *Pak J med Sci J* 2005; 21(1) : 58-60.
9. Jacobs PP, Koeys GF, Burynickx CM. Simple ligation superior to inversion of the appendicular stump; a prospective randomized study. *Ned Tijdschr Geneesk.* 1992; 136(21): 1020-3.
10. Mahzar R, Leem AM, Sarfraz A, Riaz U. Appendectomy; non-invagination vs. invagination of appendicular stump. *Ann King Edward Med Coll* 2006; 12(1): 58-60.
11. Lavonius MI, Liesjarvi S, Niskanen RO, Ristkari SK, Korkala O, Mokka RE. Simple ligation vs stump inversion in appendectomy. *Ann Chir Gynaecol*, 1996; 85(3): 222-4.
12. Das HP, Wilson SJ, Khan S, Parlade S, Uy A. Appendectomy stump : 'to bury or not to bury'. *Trop Doct.* 1989; 19(3): 108-9.
13. Naeem S, Khalid I, Appendectomy: Non-invagination vs. invagination of appendicular stump. *The professional* 2004; 11(2): 117-20.
14. Schwartz principle of surgery, 8th edition, F Charles Brunicaudi 29: The Appendix.
15. Yigit T, Mentose O, Eryilmaz M, Balkan M, Uzar AI, Kozak O. Stump resection result from incomplete operation. *Am Surg* 2007: 75-8.
16. Robello F, Bojalil J, Vargas RA, Torres L, Valle CY. Appendiceal stump appendicitis. *Cir* 2005; 73: 311-4.