ORIGINAL ARTICLE

Techniques of Wound Closure in Appendicular Surgery: A Prospective Comparative Study at AllamaIqbal Memorial Teaching Hospital

ANSAR LATIF[1], AHSAN JAMIL[2], ANILA ANSAR[3], *SANHA SARWAR[4], MOHSANAH SARWAR[5]*

ABSTRACT

Aim: Toassess techniques of wound closure in relation to indications of surgery for appendiceacal pathologies at emergency department of a tertiary care hospital.
Study Design: Prospective comparative analysis.
Place and duration of study: General Surgery Department, AllamaIqbal Memorial Teaching Hospital, Sialkot. from January 2014 to February 2017.
Methods: Patients reporting in the emergency and trauma center and undergoing surgery for appendicecal pathologies were serially included, All those refusing surgery or managed on conservative lines were excluded. Known diabetics were excluded similarly patients having abdominal scars in infraumbilical region for pelvic pathologies were excluded. Surgery was done by minimum of Senior Registrar level expertise. Operative findings/ pathologies and operative procedures were recorded.Two groups were made depending upon the closure technique: Group I with " Primary closure"and Group II with "Delayed Primary closure". Postoperatively patients were managed in the wards.Poatoperative 3 months follow up in outpatients' department was required for inclusion in the study and assessment of outcome. Data was entered and analysis done by SPSS v 22.
Results: Of the 1923 appendicectomies done in this period; 1072 patients fulfilled the inclusion criteria. Mainly the patients lost to follow up. There were 903 patients for which the surgery was carried and Primary closure was done while 169 patients' wound were kept open for delayed primary closure at a second session. Infective complications were main complication requiring intervention for the wound or re-exploration in the Primary closure group while disfiguring and ugly scarring remained the main morbidity in the Group II /Delayed Primary group.
Conclusion: Delayed Primary closure for different pathologies in appendicectomy is a safe approach associated with prolonged admission and adverse scar outcome while the primary closure is the most practiced approach which is associated with better patients satisfaction but morbidity rate being low can be grave and at times mortality is encountered.
Keywords: Acute appendicitis, appendicular abscess, perforated appendix, oshner-sherren regime.

INTRODUCTION

Surgery for Appendiceal pathologies is main part of the ofGeneral surgical workload in emergency settings. It is the most frequent cause of acute abdominal presentations in young people; that is infrequent in infants and middle age and its incidence rises with age[1]. The surgical treatment i.e.,appendicectomy forms main bulk of surgery in emergency settings. Depending upon operative findings technique of wound closure is tailored to minimize morbidity in these patients. Infection, cosmesis, disfigurement and neuralgic pain are the problems faced in postoperative period. Associated factors like cost burden, hospital stay, infections, being away from place of duty leads to patient anxiety[2,3]. Encountering appendicular perforations, abscesses and even appendicular masses can cause unexpected course of operative time, extended surgical procedures and hospitalization. Infective morbidity in acute appendicitis which are non complicated is reported as <10% and in complicatedcases as15–20%; maximum after settled peritonitis i.e. 35%. Uncomplicated appendicectomy merits skin to be closed primarily. Gross wound soiling will lead to keep the wound unstitched for delayed primary closure. Primary closures can be done by subcuticularcontinuous andinterrupted stitches. Complicated appendicitis wounds are usually left for delayed primary closure after a couple of days . Primary closure over placing a nelaton catheter is opted in certain cases[4,5]. To reduce the

[1]Associate Professor Surgery, AllamaIqbal Teaching Hospital, Sialkot
[2]PGR Surgery, AllamaIqbal Memorial Teaching Hospital, Sialkot
[3]Associate Prof., Gynae. &Obs, Sialkot Medical College, Sialkot
[4]MO Psychiatry, AllamaIqbal Memorial Teaching Hospital, Sialkot.
[5]PGR Medicine, Combined Military Hospital, Sialkot.
Correspondence to DrAnsarLatif. Email: ansarlatif2013@gmail.com, Cell: 923217103994.

incidence of reopening the skin incision, wound is managed by open technique in patients with perforated appendicitis considering the high rate of infective complications. The wound is kept clean covered with surgical gauze and daily dressing is carried. Closure of wound is done a couple of days later when incision is clean and free of infection (delayed primary closure). This technique decreases the chance of infective complications and also lowers the risk of wound failute i.e. wound dehiscence, so the hospital stay and complications are less. The cosmetic outcome is no doubt poor as compared to primary closure. Latest studies recommend that Primary closure may be done for perforated appendicitis with the broad spectrum antibiotic regimes[6,7]. Primary wound closure is superior option in comparison to delayed primary closure infavour of cosmetic result and patient compliance. The highly debated issue for adopting between primary versus delayed primary closure after complicated appendicitis remains the infective complications[8,9]. Recent medical research shows that infection rates in the two groups are (8% and 2.7% respectively) in primary closure group and delayed primary closure[10].

The aim of this study was to analyze the spectrum of techniques for wound closure and its complications for appendicular surgeries in our hospital.

PATIENTS AND METHODS

This prospective study was planned inGeneral surgery Department ofAllamaIqbal Memorial Teaching Hospital Sialkot from January 2014 to February 2017. A total of 1923 patients which were admitted for Appendicular surgeries in our Hospital.Patients having diagnosis of acute appendicitis male and females; 10–65 yearsage were included. Thosewith a known metabolic disorders like diabetes mellitus, previous abdominal surgery, history of medication with steroids and having HIV/AIDS were not included in the study. Patients having abdominal scars in infraumbilical area for pelvic pathologies were excluded. Surgery was done by minimum of Senior Registrar level expertise. Operative findings/ pathologies and operative procedures were recorded. Two groups were made depending upon the closure technique: Group I " Primary closure" and Group II "Delayed Primary closure". Postoperatively patients were managed in the wards. Minimum of three months of follow up was must for inclusion in the study and assessment of outcome. All patients presenting with provisional diagnosis of acute appendicitis were admitted in surgical department from emergency ward. Provisionally diagnosed as acute appendicitis on history of pain in right iliac region, anorexia and vomiting: physical signs like tenderness in right iliac fossa and laboratory investigation;white cell count ≥10000 cm3 /dl) .Thedetail in the proforma was entered after explaining to the patients and obtaining written informed consent. The exclusion criteria were strictly followed to control confounding factors. Elective appendicectomies were excluded from the study. The data of all patients was recorded on a pre-designed Performa and after surgery following the patient for at least three month. All the surgeries were done under general anaesthesia by the same surgeon through a standardized technique The Grid Iron incision and muscle-splitting method was used. Care was taken to avoid contamination of the subcutaneous tissue and adjacent peritoneal cavity during the procedure. Appendectomy was performed and stump was ligated with vicryl 2/0. Muscles were approximated with interrupted 2/0 chromic. External oblique was closed by continuous suture using chromic 2/0. The wound was washed with saline and then skin was closed. Scarpa's fascia and skin were closed with interrupted sutures. In patients with perforated appendicitis, peritoneal lavage after appendectomy was routinely performed with warm saline until the return of clear effluent. Nelatan catheter was placed in the pelvis and paracolic gutter through a separate wound in the abdominal wall. The skin was repaired primarily, or left open and packed with Povidine-soaked gauze. Dressing was not changed till the removal of the stitches i.e. 7th post-operative day except in patients who reported with localized pain, soakage of dressing or any discharge from the wound. . In patients undergoing DPC, daily dressing was changed and in case of the presence of infection it was changed twice daily when required, till the closure of the wound. Wound was closed after refreshing the edges after 3-5 days or once the infection was settled in cases of infected wounds. Injectable antibiotics, including 1.2 gram of Ampicillin + Clavulinic acid twice daily, Gentamicin thrice daily and Metronidazole thrice daily, were given to each patient starting from the time of admission till discharge. Patients' convenience was recorded regarding the management. The data was analyzed by SPSS v 22.

RESULTS

General demographic data of the patients included in study is shown in Table I. Details of surgical incisions madein both the groups indifferent patients depending upon the clinical situation are shown in Table II. Drains were placed in 113(%) patients with Primary closure and 47(%) patients who were for

delayed primary closure Complications in the two groups were recorded as Table III.

Table 1: General demographic data.

Total appendicectomies done in the hospital	1923	
Patients excluded/ lost to follow up	851	
Total patients included in Study	1072	100%
Age	65 years	Mean age 41.23 years
Sex distribution	Male:Female	632:440 (1.45: 1)
Group I(Primary closure)	903	(84.23%)
Group II (delayed primary closure)	169	(15.76%)

Table II: Types of incisions

	Group I(Primary closure) n=903(100%)	**Group (delayed primary closure) n=169(100%)**
Grid Iron Incision	563(62.34%)	83(49.11%)
Rutherford Morison's Incision	205(22.70%)	59(34.91%)
Lanz Incision	162(17.95%)	27(15.97%)
Right Paramedian Incision	24(2.65%)	-
Midline Incision	9(0.99%)	-

Table III: Morbidity data

	Group I(Primary closure) – n=903(100%)	**Group II (delayed primary closure) n=169(100%)**
Wound infections	71(7.86%)	11(6.50%)
Deep wound infections/ pelvic abscess	6(0.66%)	1(0.59%)
Re exploration	3(0.33%)	-
Enterocutaneous fistula	2(0.22%)	1(0.59%)
Disfigurement of scar	7(0.77%)	5(2.95%)
Hypertrophic scar/ keloids	6(0.66%)	4(2.36%)
mortality	1(0.11%)	-
Hospital stay	3 days (±1.3)	3 days (±1.9)
Cost / expenditures	PkR 15000 (±3000)	PkR 25000 (± 6000)

DISCUSSION

Male to female ratio in our study was 632:440(1.45:1), while it was 26(32.9%) male and 53 (67.1%) female in group I Primary closure while delayed primary closure groupII had 30 (38%) male and 49 (62%) female in studies by Cohn SM[11]. Mean ages with us are 31.23 years, in the primary closure group it was 26.67±7.32 years while in the delayed primary group were 28.15±6.88 years.

Comparing the rate of infective complications; our study shows71:11(%%) , while these morbidities remained (38.9% vs. 2.9%) in study by Chiang RA[12] in primary closure compared to delayed primary closure; 50% vs 0% in study by Cohn SM[11]; and 42.5% vs 2.7% in study by Duttaroy DD[13].

Good antimicrobial drugs have reduced morbidity due toInfective complications in cases of perforated appendicitis and primary closure as similar to that of delayed primary closure likeseptic wounds1.7-1 1 per cent, intra-abdominal abscess formation as1.7-6per cent) with primary wound closure in children forperforated gangrenous appendicitis.

Intraoperative peritoneal lavage is much debated before primary closure, as there are more infective complications in children who have primary closure without peritoneal irrigation ascompared to those who had it. Primary wound closure is cheap cost wise and time saving for nursing and medical personnel.

Chatwiriya et al[14]and McGreal et al[15] concluded that complicated i.e.,gangrenous or perforated appendicitis often can be closed to lower morbidity.

Delayed Primary closure ismore acceptable in perforated appendicitis as compared to primary closure (93.6% vs. 60.7%). The contamination while surgery for perforatedAppendicitis is by rough handling andspilling of pus into the surgical wound. Primary closing technique creates a hidden space for infection so there isincreased incidence of type I superficial wound infection (39.1%).So the strategy should be delayed primary closure when there is obvious spillage of pus.

In the primary closure group I, infective morbidity was 39.1% while it remained 6.3% in the delayed closure group II[16]. There was much difference between the two techniques of closure as regards wound infection (*p* valve less than 0.000). In our study, the results showed that delayed primary closure is more suitable for wound management even after perforated appendicitis.

Pelvic abscesses were diagnosed in 6 (0.66%) patients in Primary closure group for which 3(0.33%) patients required re-exploration: and 1(0.59%) in Delayed Primary closure Group.We diagnosed 2 (0.22%) in Group I and 1(0.59%) in Group II; cases of Enterocutaneous fistula due to poor surgical technique and managed accordingly[17].Ugly scarring and disfigurement of scars 7(0.77%) in Group I and 5(2.95%) in Group II. Hospital stay 3 days(± 1.3) and

4 days (1.9%)and expendituresPkR 15000 (± 3000) and PkR 25000 (± 6000) in Primary closure and Delayed Primary closure group. The cost of overall treatment comes down with Primary Closure without any additional risk of morbidity/mortality[18].

CONCLUSION

Secondary closure after surgery for complicated cases of appendicitis is safe but results in adverse scar outcome and lengthy hospitalization while Primary closure also being safe in some cases of perforated appendix having better patients' acceptance and low complications can lead to grave consequences and at times mortality.The operating team must weigh the chance of infective complications against the problems in taking care of an open wound.

Conflict of Interests: No funding received from any one for the study, nothing to be disclosed

REFERENCES

1. Kusachi S, Kashimura N, Konishi T, Shimizu J,Kusunoki M, Oka M, et al. Length of stay and costfor surgical site infection after abdominal and cardiac surgery in Japanese hospitals: multi-centersurveillance. Surg Infect (Larchmt) 2012;13(4):257 -65.
2. Andersson AE, Bergh I, Karlsson J, Nilsson K. Patients' experiences of acquiring a deep surgicalsite infection: an interview study. Am J Infect Control 2010;38(9):711-7.
3. Mangram AJ, HoranTC, Pearson ML, Silver LC, Jarvis WR. Guideline for Prevention of SurgicalSite Infection, 1999.Am J Infect control 1999;27
4. McGreevy JM, Finlayson SR, Alvarado R, Laycock WS, Birkmeyer CM, Birkmeyer JD. Laparoscopy may be lowering the threshold to operate on patients with suspected appendicitis. *SurgEndosc*. 2002; **16:**1046 – 1049.
5. Adrian B. Wound healing. In: Brunicardi FC, Andersen DK, Billiar TR, Dunn DL, Hunter JG, Pollock RE eds. *Schwartz's Principles of Surgery*. 8th ed. New York: McGraw-Hill Companies; 2005: 234 – 238.
6. Bernard M, Jaffe H, David H, Berger. The Appendix. In: Brunicardi FC, Andersen DK, Billiar TR, Dunn DL, Hunter JG, Pollock RE. eds. *Schwartz's Principles of Surgery*. 8th ed. New York: McGraw-Hill Companies; 2005: 1131.
7. Henry MC, Moss RL. Primary versus delayed wound closure in complicated appendicitis: an international systematic review and meta-analysis. *PediatrSurg Int*.2005; **21:** 625 – 630.
8. Rosai J, Ackerman LV. *Rosai and Ackerman's Surgical Pathology*. 9th ed. Edinburgh: New York: Mosby; 2004: 758.
9. Ball CG, Kortbeek JB, Kirkpatrick AW, Mitchell P. Laparoscopic appendectomy for complicated appendicitis: an evaluation of postoperative factors. *SurgEndosc*. 2004; **18:** 969 – 973.
10. Rucinski J, Fabian T, Panagopoulos G, Schein M, Wise L. Gangrenous and perforated appendicitis: a metaanalytic study of 2532 patients indicates that the incision should be closed primarily. *Surgery.* 2000; **127:** 136 – 141.
11. Cohn SM, Giannotti G, Ong AW, Varela JE, Shatz DV, McKenney MG, et al. Prospective randomized trial of two wound management strategies for dirty abdominal wounds. *Ann Surg.* 2001; **233:** 409 – 413.
12. Chiang RA, Chen SL, Tsai YC, Bair MJ. Comparison of primary wound closure versus open wound management in perforated appendicitis. *J Formos Med Assoc*. 2006; **105:** 791 – 795.
13. Chatwiriya CW. Surgical wound infection post surgery in perforated appendicitis in children. *J Med Assoc Thai*. 2002; **85:** 572 – 576.
14. McGreal GT, Joy A, Manning B, Kelly JL, O'Donnell JA, Kirwan WW, et al. Antiseptic wick: does it reduce the incidence of wound infection following appendectomy? *World J Surg.* 2002; **26:** 631 – 634.
15. Hedrick TL, Sawyer RG, Hennessy SA, Turrentine FE, Friel CM. Can We Define Surgical Site Infection Accurately in Colorectal Surgery? Surgical Infect 2014;15(4):372-6.
16. Haridas M, Malangoni MA. Predictive factors for surgical site infection in general surgery. Surgery 2008;144(4):496-503.
17. Greisman HC. Wound management and medical organization in the Civil War. The Surgical clinics of North America. 1984;64(4):625-38.
18. Fukuda H, Morikane K, Kuroki M, Kawai S, Hayashi K, Ieiri Y, et al. Impact of surgical site infections after open and laparoscopic colon and rectal surgeries on postoperative resource consumption. Infection 2012;40(6)**:**649-59.