WOUND INFECTION INCIDENCE WITH GANGRENOUS OR PERFORATED APPENDICITIS BETWEEN PRIMARY CLOSURE AND DELAYED PRIMARY CLOSURE

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ABSTRACT:

Background: Acute appendicitis is a common indication for emergency abdominal surgery. Surgical incisions after appendicectomy for complicated (perforated/gangrenous) acute appendicitis are often managed with delayed primary closure (DPC) rather than primary closure (PC). Delayed primary wound closure remains controversial.

Objective: To compare the difference in the rate of surgical wound infection, length of hospital stay and patients convenience between primary closure and delayed primary closure after complicated (perforated/gangrenous) acute appendicitis.

Materials and Methods: This comparative study was conducted at the Hayatabad Medical Complex, Peshawar from Feb 2010 to Feb 2012, dealing with complicated appendicitis were reviewed to assess the results of Primary closure (PC) in comparison with Delayed primary closure (DPC) of wound after complicated appendicitis. The rate of incision (wound) infection, hospital stay and patient's satisfaction, in groups of patients managed by PC and DPC were compared. A total of 110 patients with complicated appendicitis were divided into two equal groups, (Group A) with 55 patients underwent primary closure and (Group B) with 55 patients underwent delayed primary closure.

Results: The mean age of the patients in Group A was 37.72±13.28 years and 35.3±14.1years in Group B patients (p=0.3602). There were 38 (69%) males and 17 (31%) females in Group A, and 31 (56.3%) males and 24 (43.6%) females in Group B (p=0.1187) (Table 1).Wounds infections were observed in 16 cases (14.5%), including 11 cases (20%) in Group A and 5 cases (9.0%) in Group B (p=0.05235).Total length of hospital stay was (3.45±0.42) and (5.30±0.21) in Group A and Group B respectively (p=0.0000001). Regarding patients satisfaction and pain score, patients convenience was (68±36.59) and (36±81.43) in Group A and Group B respectively (p=0.009046).Three patients (5.4%)in Group A and one patient (1.8%)in Group B had pelvic abscesses.

Conclusion: Primary wound closure in complicated appendicitis is convenient and satisfying for the patients, and also reduces the overall cost of treatment with no added risk of surgical wound infection.

Keywords: Wound infection, primary closure (PC), delayed primary closure (DPC).

INTRODUCTION

Appendicectomy is still one of the most commonly performed emergency surgical procedures worldwide. An appendicectomy with an open right lower quadrant incision is the gold standard of treatment for acute appendicitis. Infection of the operative incision is the most common cause of morbidity after appendectomy for complicated (gangrenous or perforated) acute appendicitis[1],and it may result in increased patient pain, longer hospital stay, poor cosmesis and overall higher costs of treatment.

In patients with non-perforated appendicitis, the incidence of wound infection is less than 5%[2], but in perforated appendicitis it increases to 15% to 20% and is highest with diffuse peritonitis[3]. Two routinely used methods of wound management after an appendicectomy are delayed primary closure (DPC), which involves packing an open wound for 4-5 days followed by wound closure, and primary closure[1]. Traditionally, in an effort to decrease the risk of operative site infection after complicated appendicitis, such incisions have not been managed with primary closure (PC), but rather the skin and subcutaneous tissue edges have been left open then closed later by delayed PC or have been allowed to heal by secondary intention[1]. Open wound management has previously been considered as the standard of care for many cases of acute appendicitis, particularly case of perforated appendicitis[4]. These methods have been developed in response to the high rate of wound infections, up to 58% seen in these cases.

However, no single large randomized trial proved the benefits of DPC in reducing the wound infection rate in patients following an appendicectomy. By contrasts, many studies in the 1980s and 1990s have reported low rates of infection using primary closure (PC), suggesting

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that such management might be safely and successfully used[5]. Recent studies recommend primary wound closure in cases of gangrenous or perforated appendicitis[6]. Chatwiriya,et al[7], Mcgreal, et al[8], have shown that gangrenous or perforated appendicitis most often can be primarily closed. Thus one of the most important reasons for the controversy in a primary or delayed closure[9], is post-surgical wound infection[4]. Recent studies tend to recommend that perforated appendicitis most often can be closed primarily without an increase in the wound infection rate as compared to DPC[1].

MATERIALS AND METHODS

After getting permission from Local hospital ethical and research committee, this comparative study was conducted at the Hayatabad Medical Complex, Peshawar from Feb 2010 to Feb 2012,to assess the results of Primary closure in comparison with Delayed wound closure after complicated appendicitis. The rate of incision (wound) infection, hospital stay and patient's satisfaction, in groups of patients managed by PC and DC were compared. A total of 110 patients with complicated appendicitis were divided into two equal groups, (Group A) with 55 patients underwent primary closure and (Group B) with 55 patients underwent delayed primary closure. Inclusion criteria were patients of both gender and older than 15 years undergoing appendicectomy through grid iron or Lanz incision and having per-operative findings of complicated appendicitis (perforated/gangrenous). Patients having per-operative findings of normal appendix, simple appendicitis (mildly inflamed, non-perforated), appendicular mass, or any other pathology with or without appendicitis and patients having incidental appendicectomies were excluded from the study.

The diagnosis of acute appendicitis made on the basis of history of right iliac fossa pain, nausea and vomiting and on clinical examination showing rebound tenderness and with supporting evidence of leucocytosis greater than 10,000. The purpose and benefits of study was explained to the patients, the patients were well informed about risks and benefits of both the techniques of wound closure and a written and informed consent was taken. After ascertaining complete history, thorough clinical examination was done and a complete set of routine investigations sent. All the surgeries were done by the same surgeon under general anaesthesia through standardized techniques. Patients were assessed on 2nd, 5th and 7th postoperative day for wound infection in ward as well as in outpatient department to conclude the safety and pain were assessed for efficacy.

All patients received single intravenous 1.5 gram cefuroxime and metronidazole infusion before the skin incision, and appendicectomy was performed in the conventional manner by grid iron and lanz incisions in all patients. In 5 patients the incision was converted into Rutherford Morrison. Care was taken to avoid contamination of the peritoneal cavity. Appendicular stump was not invaginated in any of the cases. After peritoneal cavity washed with normal saline, drains were put in cases where indicated and peritoneum was closed with continuous chromic 2/0. Muscles were approximated with interrupted 2/0 chromic and External oblique aponeurosis was closed by continuous suture using vicryl-0. Before skin closure, the wound was irrigated copiously with warm normal saline and gloves were changed before subcutaneous tissues and skin closure. Scarpa's fascia was closed with interrupted chromic 2/0 and skin with interrupted prolene 2/0. In group (A)patients the skin wasprimarily closed and the first dressing was changed at the time of discharged and stitches were removed on 10th postoperative day except in patients who reported with soakage of dressing, localize pain or any wound discharge. While in group (B) patients, wounds were left open, daily dressing was changed and in the case of any infection it was changed twice daily when required, till the closure of the wound. Wounds closure was done on 5th post-operative day in DPC (Group B) patients, or once the infection was settled in infected wound cases in both groups. Post-operatively all patients received intravenous cefuroxime 1.5 gram twice daily and metronidazole infusion thrice daily till discharge.

All patients in both groups were evaluated for any signs and symptoms of wound infection (pain ,induration, erythema and frank pus at the wound site) for at least one month following surgery. Total duration of hospital stay was also noted in both groups. Patient´s convenience regarding the management was recorded, with special emphasis on pain score at the time of change of dressing and satisfaction at the time of discharge using the visual analogue score (VAS) in all patients. Patients asked to indicate a point on 100 mm line, one end of the line(100mm) represent no pain and the other represent worst pain (0mm) .Complete absence of pain was considered as symptomatic pain relief.

The data was analysed using SPSS version 10.Thep-value of <0.05 was considered significant.

RESULTS

The mean age of the patients in Group A was 37.7 ± 13.28 years, and 35.3 ± 14.1 in Group B patients, ($p=0.3602$) (Table 1). There were 38 (69%) males and 17 (30.9%) females in Group A, and 31 (56.3%) males and 24 (43.6%) females in Group B, ($p=0.1187$) (Table 1). The duration of symptoms in both groups is also not statistically significant ($p=.5596$) (Table 1). Four patients (7.2%) in group A and one patient (1.8%) in group B had diabetes mellitus, though all of them had well controlled blood sugar level before surgery and in the post-operative period. Two patients (3.6%) in the group B had chronic hepatitis B infection with normal

TABLE: 1 Demographics, duration of symptoms of patients (n=110)

S No	Variables	Group A (n=55)	Group B (n=55)	P-value
1.	Age	37.7±13.28 (years)	35.3±14.1(years)	0.3602
2.	Male	38 (69%)	31 (56.3%)	0.1187
3.	Female	17 (31%)	24 (43.6%)	
4.	Duration of symptoms	2.03±9.23	2.76±0.6	0.5596

Table: 2 Outcome and comparison between two Groups (n=110)

S No	Variables	Group A (PC)	Group B (DPC)	P-value
1.	SWI	11 (20%)	5 (9%)	0.05235
2.	LOS (days)	3.45±0.42	5.30±o.21	0.0000001
3.	Convenience (mm)	68±36.59	36±81.43	0.009046

SWI: Surgical wound infection, LOS : length of stay

Table: 3 Comparison of different studies with current study

Study	Interventions	SWI/PC (%)	SWI/DPC (%)
Rucinski 2000[1]	PC (n=1724) DPC (n=808)	91/1724 (4.7%)	42/808 (4.6%)
Chatwiriyacharoen 2002[7]	PC (n=22) DPC (n=22)	2/22 (9.1%)	6/22 (27.3%)
Cohn 20011[4]	PC (n=8) DPC (n=9)	4/8 (50%)	5/9 (55.6%)
McGreal 2002[8]	PC (n=26) DPC (n=34)	2/26 (7.7%)	8/34 (23.5%)
Khizar1[2]	PC (n=50) DPC (n=50)	5/50 (10%)	4/50 (8%)
Chiang1[3]	PC (n=36) DPC (n=34)	14/36 (38.9%)	1/34 (2.9%)
Current study	PC (n=55) DPC (n=55)	11/55 (20%)	5/55 (09%)

SWI : surgical wound infection

liver function tests and coagulation profile. The operation techniques were the same in both groups.

There were 16 patients (14.5%) who developed wound infection that required opening and irrigation of wound. Of them 11 patients (20%) in Group A and 5 patients (9.0%) in Group B had wound infection, which is not statistically significant (p=0.05235), as shown in (Table 2). Three patients (5.4%) in Group A and one patient (1.8%) in Group B had pelvic abscesses. Total length of hospital stay was 3.45±0.42 and 5.30±o.21 in Group A and Group B respectively, (p=0.0000001) (Table 2). Regarding patients satisfaction and pain score, patients convenience was 68±36.59 and 36±81.43 in Group A and Group B respectively(p=0.009046) as shown in (Table 2).

DISCUSSION

As with simple appendicitis, the outcome of future debates about gangrenous and perforated appendicitis will rest on potential differences in post-operative factors such as analgesia requirement, length of hospital stay, return to regular activity and complication rates[10]. Complications of perforated appendicitis continue to represent a significant post-operative problem. Early diagnosis of acute appendicitis and operation prior to perforation remains the best form of prevention of complications. Although morbidity and mortality have decreased to a greater extent due to advances in the perioperative care, yet keeping in view the incidence of acute appendicitis, this low rate of surgical wound infection still accounts for significant morbidity and consumes a major part of health budgets[11].

The mean age of the patients in Group A was 37.7±13.28 years, and 35.3±14.1 in Group B patients (p=0.3602). There were 38 (69%) males and 17 (30.9%) females in Group A, and 31 (56.3%) males and 24 (43.6%) females in Group B,(p=0.1187) as in (Table 1). Mean duration of symptoms was 2.03±9.23 and 2.76±0.6 in group A and group B respectively,(p=0.5596) (Table 1).

There were 16 patients (14.5%) who developed wound infections that required opening and irrigation of wounds. Of them 11 patients (20%) in Group A and 5 patients (9.0%) in Group B had wound infections, which is again not statistically significant between two groups (p=0.05235) (Table 2).Two patients (3.6%) with wound infection in Group A needed re-admission and intravenous antibiotics due to copious pus discharge with systemic signs and symptoms. In his study by RusinskiJ,et al[1], showed the overall mean rate of incision infection was (4.65%); it was (4.7%) and (4.6%) in the PC and DPC groups, respectively. In another study Khan KI, et al, showed (10%) and (8%) wound infection rates in PC and DPC Groups respectively with no statistical

difference (p-value >0.699)[12]. In contrast Chiang and colleagues[13],showed wound infection rate of (38.9%) and (2.9%) in the PC and DPC groups respectively which is statistically significant ($p < 0.001$), concluded that the DPC after complicated appendicectomy reduces the incidence of wound infection. Comparison of our current wound infection results with other authors studies are listed in (Table 3).

Three patients (5.4%) in Group A and one patient (1.8%) in Group B had pelvic abscesses, presented with high grade fever and chills, abdominal pain and two had associated diarrhoea, all were re-admitted and were put on intravenous antibiotics and drained per rectally. Four patients (7.2%) in group A and one patient (1.8%) in group B had diabetes mellitus, though all of them had well controlled blood sugar level before surgery and in the post-operative period. Two patients (3.6%) in the group B had chronic hepatitis B infection with normal liver function tests and coagulation profile.

Total length of hospital stay was 3.45 ± 0.42 and 5.30 ± 0.21 in Group A and Group B respectively, which is statistically significant between two groups ($p=0.0000001$). In his study by Khan KI, et al[12], showed total length of hospital stay of 2.30 ± 0.51 and 3.94 ± 0.84 days in PC and DPC groups respectively that was statistically significant ($p < 0.05$). In another study by Chiang and colleagues[13], total duration of hospital stay was (8.4 ± 0.9) days and (6.3 ± 0.7) days in PC versus DPC groups respectively showing statistically significant difference ($p < 0.038$).Regarding patients satisfaction and pain score, patients convenience was 68 ± 36.59 and 36 ± 81.43 in Group A and Group B respectively, which is statistically significant ($p=0.009046$), as compared to (76 ± 24.85) and (23.70 ± 10.54) in PC and DPC groups in their study by Khan KI and his colleagues[12], which is also statistically significant ($p < 0.05$).

The difference of length of stay between both the groups was significant and we took this as the indirect predictor of the cost of overall treatment. This became very important once the incidence of appendicitis was taken into consideration. Approximately 400,000 appendicectomies are done annually in Pakistan[15]. Out of which 20-30% fall in the category of complicated appendicitis[16], resulting in an average of 100000appendicectomies being performed for complicated appendicitis. So the patient hospital year which can be saved by following primary closure (PC) in all such cases can reach up to 160,000 per year.

CONCLUSION

Primary wound closure in complicated appendicitis is convenient and satisfying for the patients, and also reduces the overall cost of treatment with no added risk of Surgical Wound Infection.

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