

EFFECT OF POVIDONE-IODINE IRRIGATION ON POST APPENDECTOMY WOUND INFECTION: RANDOMIZED CONTROL TRIAL

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ABSTRACT

Objective: Despite the use of prophylactic antibiotics and sterilization techniques, rate of post appendectomy wound infection is high. The usefulness of povidone-iodine on intact skin is well-established but its use as prophylactic irrigation solution on open surgical wounds is limitedly addressed. This study compare the frequency of superficial surgical site infection after appendectomy, with and without peroperative irrigation of subcutaneous tissue with 1% povidone-iodine solution.

Methods: A Total of 166 patients operated for acute appendicitis with open appendectomy at Civil Hospital Karachi were included in the study. They were randomly allocated into two groups. In the treatment group, the subcutaneous tissue was irrigated with 1% diluted povidone-iodine solution before skin closure while no irrigation was done in the control group. All patients were followed for surgical site infection according to Southampton wound grading system for 30 days after surgery.

Results: The mean age of patients was 25.96 ± 9.9 years with a male to female ratio of 2:1. Wound healed normally with no signs of inflammation in 107 (64.5%) out of 166 patients. Mild bruising was present in 34(20.5%), erythema with tenderness or heat in 11(6.6%) and serous/ haemoserous discharge in 6(3.6%) patients with no significant difference between the groups. Purulent discharge was significantly reduced in the treatment group (p -value<0.05). The overall infection rate was 10.8% and 19.3% in the treatment and control group respectively ($p=0.129$).

Conclusion: The irrigation of the subcutaneous tissue with 1% diluted povidone-iodine solution after appendectomy, though not affect the overall infection rate but significantly reduced the formation of pus within the infected wound cavity.

Keywords: wound infection, post appendectomy, povidone-iodine, irrigation

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INTRODUCTION

Surgical site infection is a common complication after appendectomy^{1,2}. Despite the use of prophylactic antibiotics and sterilization techniques rates of post appendectomy wound infection are high reaching up to 18 to 20%^{3,4}.

Povidone-iodine is a widely used antiseptic solution. It consists of polyvinyl pyrrolidone with water, iodide and 1% available iodine. It has a bactericidal activity against a broad spectrum of micro organisms⁵ Effect starts with in 30 seconds of application and lasts for up to 14 hours⁵. The usefulness of povidone-iodine on intact skin is well-established^{5,6} but its use as a prophylac-

tic irrigation solution against surgical site infection (SSI) is limitedly addressed^{7,8}. This is due to concerns about its safety in open wounds⁹. Studies show that its anti bacterial action increases with degree of dilution. Such that 0.1-1% solutions are more rapidly bactericidal than full strength 10% solution⁵. At this strength it is neither cytotoxic nor impairs healing and has been Food and Drug Administration (FDA) approved for short term treatment of superficial and acute wounds^{5,9,10,11}.

Since appendectomy is usually performed by junior surgeons¹, wound infection is not only a source of discomfort for the patients but also discouraging for the young surgeons. This also increases the post operative hospital stay and operative cost of the procedure^{2,11}.

The study was conducted to compare the frequency of superficial surgical site infections after appendectomy in patients irrigated with 1% povidone-iodine and those who are not irrigated with it before skin closure. If this simple procedure resulted in decrease wound infection, this simple and inexpensive remedy can be used to prevent both the patient and junior surgeons of the stress of surgical site infection.

METHODOLOGY

This randomized controlled trial was conducted in the surgical units of Civil Hospital, Karachi, a 1600 bed tertiary care teaching hospital, from January to December 2011 after approval of Research Training and Monitoring Cell (RTMC) of College of Physicians and Surgeons Pakistan (CPSP). A total of 166 patients above 12 years of age, who underwent open appendectomy in emergency were included in the study. Patients with increased risk of wound infection (having perforated appendix, appendicular abscess, or with co-morbidities like diabetes mellitus, immune suppression) were excluded. Informed consent was taken from all patients for participation in the study. Patients were assigned randomly into two groups, A (the study group) and B (the control group) using Random allocation software version 1.0.0.

All patients were operated for open appendectomy via grid iron incision. At induction, one gram of second generation cephalosporin intravenously given for prophylaxis against infection. In the study group A, before skin closure, the subcutaneous tissue was irrigated with 4-5 cc of 1% diluted povidone-iodine solution. The solution was sprayed into the subcutaneous wound with the help of a 5cc syringe, kept there for 2-3 minutes and was then aspirated. However, in the control group B, no irrigation was done. Skin was closed by continuous sub cuticle sutures in both groups and then

aseptically dressed. Additional two doses of one gram of second generation cephalosporin were given intravenously for infection prophylaxis. All operations were performed by postgraduate students under supervision of a consultant surgeon in the emergency operation theatre of the hospital. Patients were examined for surgical site infection at their first follow up visit after one week in the out patient clinic. The surgical wound was classified according to Southampton wound grading system¹². A Performa was used to document findings. It included demographic information, patient's group (study or control) and surgical wound examination findings at the follow up visit in the out patient clinic till 30 days post operative.

Data was analysed with SPSS version 17. Chi square test was applied between proportion for significant difference. Significance was taken as $p < 0.05$.

RESULTS

Total 166 patient [110 (66.3%) male and 56(33.7%) female] were included in the study. Mean \pm SD age of patients was 25.96 ± 9.9 years.

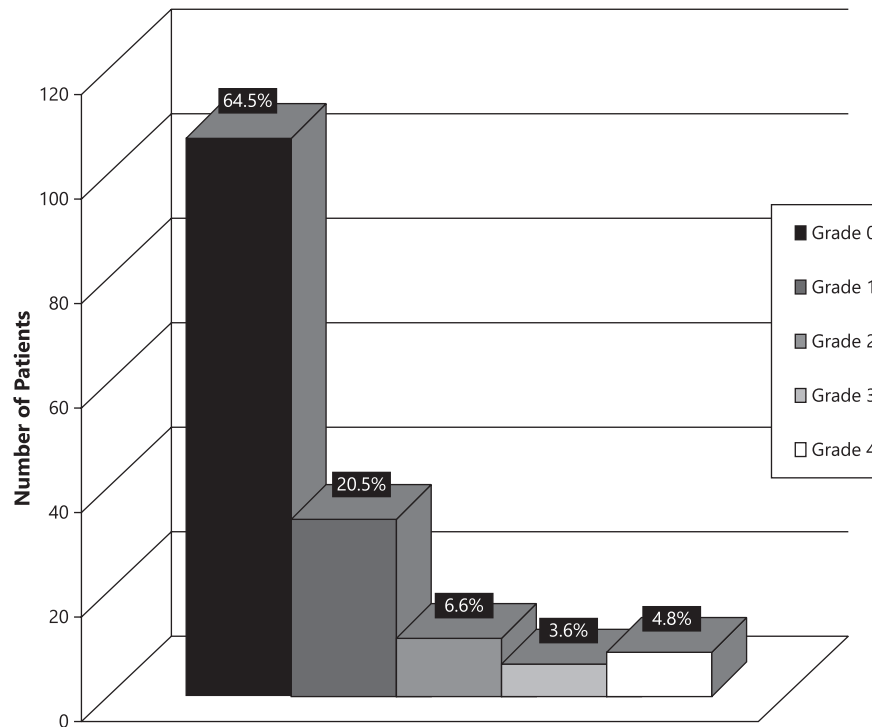
The surgical wound in both groups were examined 30 days post-operative and graded into five grades (0-4) in accordance with Southampton wound grading system, as shown in Figure 1. The frequency of patients in each Southampton grade was compared between two groups, as shown in Table 1. A significantly higher number of patients ($p < 0.05$) in control group B (seven patients) developed purulent discharge from wound site as compared to study group A (one patient).

Southampton grade 2 and above was considered as surgical site infection. It was present in overall 25 (15.1%) patients. Nine (10.8%) patients from group A and 16 (19.3%) patients from group B. The difference of surgical wound infection in the two groups was statistically insignificant ($p=0.129$).

Table 1: Comparison of wound infection between case and control group after appendectomy

Southampton Wound grade	Total patients n = 166	Group A Povidone irrigation n = 83	Group B No irrigation n = 83	P-Value
	n (%)	n (%)	n (%)	
Grade 0: Normal healing	107 (64.5)	60 (72.3)	47 (56.6)	0.035*
Grade 1: Normal healing + mild bruising	34 (20.5)	14 (16.9)	20 (24.1)	0.249
Grade 2: Erythema/tenderness/heat	11 (6.6)	06 (7.2)	05 (06)	0.755
Grade 3: Serous discharge	06 (3.6)	02 (2.4)	04 (4.8)	0.406
Grade 4: Purulent discharge	08 (4.8)	01 (1.2)	07 (8.4)	0.030*

*significant findings.

Figure 1: Southampton wound grading of wound after patient of appendicectomy

DISCUSSION

This study showed that although wound infection rate is not significantly reduced after peroperative irrigation of povidone-iodine; severity of infection was significantly less after irrigation of povidone-iodine. The overall frequency of wound infection in our study was 15.1% which is comparable to a wide range of post appendicectomy wound infection of 2.1 to 20% from both local and international literature^{3,4,13,14}. In a study from Lahore, Shah demonstrated superficial infection rate of 13.1% in open appendicectomy patients¹⁵. Mughal et al showed infection rate of 18% among paediatric population³. However there are studies with low infection rates. Ahmed et al reported wound infection rate of 5% from Lahore¹⁶. Chaudry et al showed infection rate of 6.4%¹⁷. One of the reasons for this varied presentation of wound infection after appendicectomy is the inconsistent or non standardized definitions of wound infection. In most of the local studies mentioned above the definition or criteria to label the wound as infected was not clearly mentioned^{3,4,13,17}. Since these studies compared laparoscopic with open appendicectomy, infection rates of the two groups can be compared but not with other studies^{4,18}. In our study we classified surgical wound according to Southampton wound grading system. This is the recommended classification of wound infection along with ASEPSIS score and CDC classification of surgical site infection and has been used by various authors worldwide^{1,18}.

Purulent discharge from the surgical wound is the hallmark of ongoing infective process. This purulent discharge (pus) occurs due to the persistent production of inflammatory mediators, metabolic wastes and toxins by the microbial pathogens and along with virulence of the micro organism is a predictor of continued proliferation and growth of the micro organism⁵. Antiseptics are agents that destroy or inhibit the growth of micro organisms in or on living tissue hence limiting the formation of pus with in the wound cavity^{5,9}. In our study the irrigation of subcutaneous tissue with povidone-iodine significantly reduced the formation of pus from the surgical wound (p -value=0.030). Sindelar and Mason also showed that local irrigation of abdominal and urological wound with 10% povidone-iodine solution significantly lowered the formation of pus. The infection rate was 2.9% in the treatment group and 15.1% in the control group ($p < 0.001$). The treatment group (povidone-iodine) did not experience any interference with wound healing or adverse reactions¹⁹. Hiramatsu and colleagues in their study also demonstrated the beneficial effect of povidone-iodine application on subcutaneous tissue. They randomly allocated 59 patients into two groups. In the treatment group povidone-iodine gel was administered to the subcutaneous tissue and the skin was closed. While in the control group no intervention was done. Wound infection occurred in 18 patients, 5 (16%) in treatment group and 13 (46%) in the control group ($p < 0.05$)²⁰. Various other authors in their studies show the effectiveness of povidone-iodine

application for infection prophylaxis in abdominal, gynaecological and ophthalmologic procedures²¹⁻²⁴.

LIMITATIONS

The diagnosis of surgical site infection was based on Southampton wound assessment scale which was observer dependent and though observed by a single resident had some degree of observer bias. No intervention was performed in the control group but irrigation with saline could be a possible solution for that.

CONCLUSION

This study shows that the irrigation of the subcutaneous tissue with 1% diluted povidone-iodine solution after appendectomy significantly reduced the formation of pus within the infected wound cavity.

FUTURE RECOMMENDATIONS

We suggest further randomized controlled trials for the assessment of effectiveness of povidone-iodine irrigation, enrolling patients with complicated appendicitis, with more contamination of the surgical wound. Secondly saline irrigation can be used as a control as it minimizes the bacterial load without any bactericidal activity. Also there is a need of longer follow up for one month. Culture of the infected fluid or pus may be taken for the confirmation of infection.

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CONTRIBUTORS

MI conceived the idea, did data collection and wrote the final draft. MJ helped in data collection and intellectual contribution. AQ helped in data analysis and intellectual contribution. SI helped in data entry and analysis and intellectual contribution. All authors contributed significantly to the final manuscript.