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SURGICAL SITE INFECTION;

POVIDONE-IODINE PROPHYLAXIS AND SURGICAL SITE INFECTION IN APPENDECTOMY.

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ABSTRACT… Objectives: Efficacy of postoperative Povidone-Iodine prophylaxis and surgical site infection in appendectomy surgery. **Study Design:** Randomized clinical trial. **Place and Duration:** Department of Surgery, Liaquat University Hospital Jamshoro/Hyderabad from March 2016 to November 2017. **Subjects and Methods:** Diagnosed cases of acute appendicitis with classical clinical presentation were included in the study protocol. 60 patients were those, who were applied 1% povidone-iodine solution (cases) to wound post operatively versus 60 patients (control) were those in whom wound not irrigated with Povidone- Iodine. Ethical approval and consent were taken. Data was noted in a proforma and analyzed on SPSS 22.0 ($P \leq 0.05$). **Results:** Age (mean ± SD) in control and cases was observed as 25.5 ± 8.5 and 24.5 ± 9.5 years respectively ($P=0.76$). Male and female were noted as 43 (%) and 17 (%) & 45 (%) and 15 (%) in control and cases respectively ($P > 0.05$). Wound healing score by Southampton classification of wound healing shows lesser frequency of surgical site infection in cases compared to controls ($P < 0.05$). Grade 4 pus discharging wound infection was noted in 2 (3.33%) control versus 3 (5.0%) in cases ($P=0.021$). **Conclusion:** It is concluded that the 1% Povidone- Iodine solution is effective in preventing the post appendectomy surgical site infection.

Key words: Appendectomy, Povidone-Iodine, Surgical Site Infection.

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INTRODUCTION

Appendectomy is one of the most common surgical procedures of emergency nature, while the surgical site infection (SSI) is the beauty of any surgical procedure. Appendectomy is a contamined surgical procedure hence the post operative infective complications are common.[1,2] However, the surgical site infection has declined due to the improved surgical instrumentation, sterilization procedures and antibiotic prophylaxis. In appendectomy, the reported frequency of surgical site infection varies from 1 - 20% despite antibiotic prophylaxis.[3,4] 1% Povidone- Iodine (1% PI) is one of the antiseptic that is widely used in surgical wards for post operative infection prevention. 1% PI is prepared by dissolving 1% iodine, iodide and pyrrolidone polyvinyl in water. 1% PI exerts effective bactericidal activity against the bacterial pathogens. Antibacterial effect of 1% PI begins within 30 seconds and lasts for more than 14 hours.[4,5] Efficacy of 1% PI is an established fact against bacterial infection in skin wounds.[5,6] But studies on its use as prophylactic agent post appendectomy infections are limited.[7,8] One concern against its use is in open wound cavities.[9] Concentrated PI increases its bactericidal activity. For example 0.1-1% dilute PI is more bactericidal than 10% diluted PI solutions.[4,5]

It is reported that the PI does not exert cell cytotoxicity nor delays the wound healing even at high concentrations. Food and Drug Administration (FDA) approves its use as bactericidal agent for acute superficial wounds infections.[9-11] Hence, PI is ideal for contaminated surgical procedures such as the appendectomy[1] for prevention of surgical site infection (SSI). The surgical site infections increase hospital stay, increase morbidity and economical expense, looses patients confidence that discourages the

surgeons. Post operative morbidity, hospital stay and expenses are major problems for patients.[11,12] If we see appendectomy from patient point of view, it is most commonly surgical procedure performed for the youngsters and increases morbidity by surgical site infection increases the economical burden and decreases the earning of poor population. Hence the surgical site infection of post appendectomy is of social concern also. This needs simple procedures to be evaluated for better post surgical outcome in terms of surgical site infection. The present study was planned to analyze the efficacy of 1% Povidone-iodine solution against the post appendectomy wound infections at our tertiary care hospital. It was hypothesized that there is no difference in frequency of surgical site infection in those irrigated with 1% Povidone- Iodine compared to those in whom wound not irrigated with it before skin closure.

SUBJECTS AND METHODS

Surgical wards of Liaquat University Hospital Jamshoro/Hyderabad are the busiest units. Both elective and emergency surgical procedures are conducted day and night. Liaquat University Hospital is a tertiary care hospital that caters thousands patients annually. The present randomized clinical trial was conducted at the Department of Surgery, Liaquat University Hospital Jamshoro/Hyderabad from March 2016 to November 2017.

Acute appendicitis cases were randomized into 2 groups. Controls (n=60) were acute appendicitis in whom 1% Povidone- Iodine was not applied to wounds. While cases (n=60) were those acute appendicitis in whom 1% Povidone- Iodine was applied to wounds. Acute appendicitis was diagnosed clinically. Young patients with classical presentation of pain in right iliac fossa; nausea, vomiting, fever and increased total white cell counts were included. Post appendectomy wound was irrigated with 1% Povidone-Iodine in cases. Inclusion criteria were volunteer cases of acute appendicitis of age 12- 30 years were included. Perforated acute appendicitis, peritonitis, appendicular abscess, appendicular lump, diabetes mellitus, inflammatory bowel disease, malnourished etc were excluded. Patients received one gram of antibiotic prophylaxis intravenously. Surgical procedures were performed by a senior consultant surgeon under general anesthesia. A grid- iron incision was used in the right iliac fossa for the open surgical procedure of appendectomy. In cases, the wound was irrigated with 1% Povidone-Iodine solution before skin closure. Subcutaneous wound tissue was applied 1% Povidone-Iodine; approximately 5 ml was applied by disposable syringe (BD, USA). 2 -3 minutes were elapsed for suturing of skin. Controls did not got this protocol of 1% Povidone-Iodine application. Continuous sub-cuticular surgical sutures were used for skin wound closure. Gauze piece was soaked with 1% PI and was kept onto the wound and tethered with paper plaster. Patients received two grams of cephalosporin antibiotic intravenously post operatively in both groups.

Southampton wound grading was used for surgical site infection wound.[12] Wound site was examined for the surgical site infection (SSI) at the discharge of patients. This examination for SSI followed during follow up visits in the outpatient department upto 30 post operative day. The study protocol was approved by the ethical review committee for ethical issues. All the ethical issues were in accordance to the Helsinki`s declaration for conducting human research. Volunteers were offered consent form to sign before surgical procedure. It was voluntarily signed by patients or legal heirs. Consent was must to sign for study protocol. A pre- structured proforma was designed by authors for data collection. Biodata, findings of clinical examination, surgical antibiotic prophylaxis, discharge, surgical site infection on follow up visits were noted in a proforma. All ethical issues were pre-decided and followed strictly. Confidentiality of patient's data, surgical procedure and findings, post operative care and surgical site infection were maintained strictly in accordance to the "Helsinki`s declaration". SPSS 22.0 (Statistical Package for Social Science) Inc. Chicago, IL, USA was used for the analysis of continuous and categorical variables. Continuous variables analysis was done by Student t-test while categorical variables by Chi- square test.

Statistical significance was 95% confidence interval (P≤0.05).

RESULTS

Age (mean ± SD) in control and cases was observed as 25.5 ± 8.5 and 24.5 ± 9.5 years respectively (P=0.76). Body weight was 59.5±10.5 and 58.5±11.5 kg in control and cases respectively (P=0.89). Blood glucose was noted as 157.5±13.5 and 168.5±16.75 mg/dl in control and cases respectively (P=0.041). Age, body weight, blood glucose and systemic blood pressure are shown in Table-I. Figure-1 shows the gender distribution; male and female were noted as 43 (%) and 17 (%) & 45 (%) and 15 (%) in control and cases respectively (P >0.05). Southampton classification of wound healing is summarized in Table-II and Figure-2. Grade 0, 1, 2, 3 and 4 were noted in 39 (65%) versus 41 (68.33%) (P=0.0001), 8 (13.33%) versus 8 (13.33%) (P=0.91), 6 (10.0%) versus 8 (13.33%) (P=0.031), 5 (8.33%) versus 2 (3.33%) (P=0.001) and 2 (3.33%) versus 1 (1.66%) (P=0.021) in control and cases. Grade 4 pus discharging wound infection was noted in 2 (3.33%) control versus 3 (5.0%) in cases. The difference was statistically significant (P=0.021). Southampton wound grading is depicted in Figure-2.

DISCUSSION

In present randomized clinical trial, the efficacy of 1% Povidone- iodine against surgical site infection (SSI) was noted in post- appendectomy patients. Age (mean ± SD) in control and cases was observed as 25.5 ± 8.5 and 24.5 ± 9.5 years respectively (P=0.76).

	Control	Cases	P-Value
Age (years)	25.5 ± 8.5	24.5±9.5	0.76
Body weight (kg)	59.5±10.5	58.5±11.5	0.89
Blood Glucose (mg/dl)	157.5±13.5	168.5±16.75	0.041
Systolic B.P (mmHg)	119.5±5.04	120.0±10.8	0.06
Diastolic B.P (mmHg)	71.5±8.05	72.5±10.5	0.53

Table-I. Demographic features of control and cases (n=120)

	Control	Cases	P-Value
	No. (%)	No. (%)	
Grade 0- (healing normal)	39 (65%)	41 (68.33%)	0.0001
Grade 1- (Mild bruising)	8 (13.33%)	8 (13.33%)	0.91
Grade 2- (Erythema)	6 (10.0%)	8 (13.33%)	0.031
Grade 3- (Serous discharge)	5 (8.33%)	2 (3.33%)	0.041
Grade 4- (Pus discharge)	2 (3.33%)	1 (1.66%)	0.021

Table-II. Wound grading in control and cases (n=120)

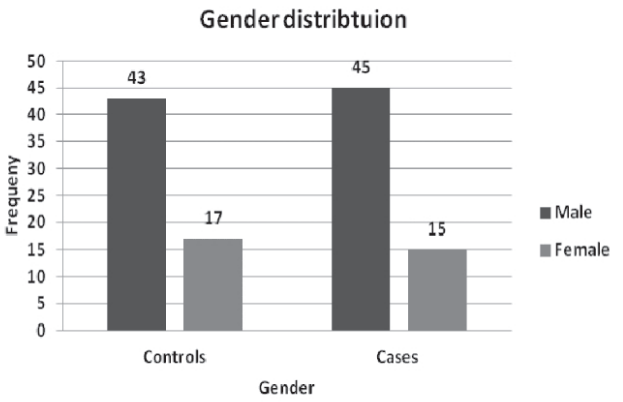

Figure-1. Bar graph showing gender distribution of study subejcts

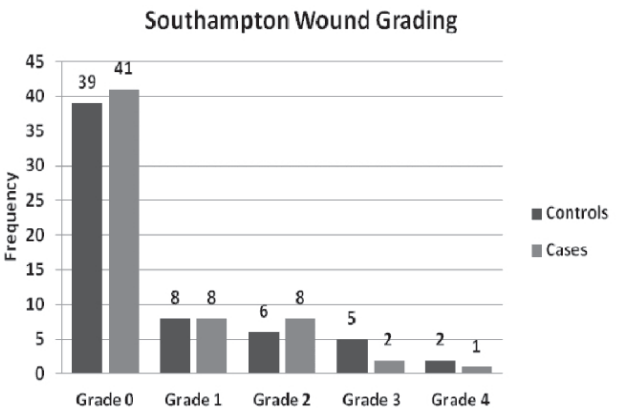

Figure-2. Southampton wound grading of study subejcts

These findings are supported by previous studies[11,12] as they have reported similar young age subjects. In present study, the male and female were noted as 43 (%) and 17 (%) & 45 (%) and 15 (%) in control and cases respectively (P >0.05). Male dominancy was noted, this is supported by previous studies[11-13] as they have reported predominantly male subjects. Blood glucose was performed to exclude an incidental case of diabetes mellitus as this delays the wound healing and predisposes to the surgical site wound infections. Southampton classification of wound healing is summarized in Table-II and Figure-2. In present study, normal wound healing (Soutampton grade 0) was noted in 39 (65%) versus 41 (68.33%) of control and cases respectively that was significant (P=0.0001) and lesser severity of infection those applied 1% Povidone- Iodine to the wounds. Grade 0, 1, 2, 3 and 4 were noted in 39 (65%) versus 41 (68.33%) (P=0.0001), 8 (13.33%) versus 6 (10.0%) (P=0.003), 6 (10.0%) versus 8 (13.33%) (P=0.031), 5 (8.33%) versus 3 (5.0%) (P=0.041) and 2 (3.33%) versus 3 (5.0%) (P=0.021) in control and cases. Grade 4 pus discharging wound infection in control and cases were observed in 2 (3.33%) and 1 (1.66%) respectively (P=0.021). Southampton wound grading is depicted in Figure-2. Southampton wound grades 1-4 were noted in 35.0% versus 31.6% in cases (P < 0.05), the differences were statistically significant. In present study, the grade 4 pus discharging wound infection was noted in 3.33% in control compared to 1.66% in cases (P= 0.87). These findings are supported by previous studies.[13-14] They reported wound infection range of 2.1 - 20% in post- appendectomy subjects. But a recent study[12] has reported very high frequency of post appendectomy wound infection of 15.1%. This is in contradistinction to the present and previous studies.[3,13,14]

Another study reported surgical site infection in 13.1% in open appendectomy cases.[15] This frequency of 13.1% is contrary to low rate of 3.33% in control and 1.66% in cases of present study. Some of studies[16,17] had reported post appendectomy surgical site infection in 5% and 6.4% respectively. These findings are supportive to observations of the present study. A previous study[3] reported 18% post appendectomy surgical site infection in pediatric population, and is contradictory to present study. The controversial results of post appendectomy surgical site infection can be explained by the different sample size, different age groups, different immune status, and nutritional deficiency, postgraduate versus consultant surgery and post operative care that differs from country to country. In our surgical wards, the post operative care is highly vigilant that is evident from low frequency of post appendectomy surgical site infection.

Few of previous studies[3,13,14] have not mentioned standard criteria of wound infection this might be the reason of different SSI frequency. Comparison of laparoscopic and open appendectomy has different frequency of surgical site infection as has been cited.[18] We used Southampton wound grading system that is a standardized grading system, hence this bias is excluded. Our findings of wound grading are concordant to the previous studies.[17,18] Purulent discharge is a hallmark of post appendectomy surgical site infection. Pus discharging surgical site infection in controls was noted in 3.33% compared to 1.66% in cases (P= 0.87). This is consistent to a previous studies.[5,13,14] A previous study[5] reported that the pus discharge is a sign of persistent bacterial proliferation at the wound site.[5,9] In present study, 1% Povidone-Iodine inhibited the surgical site bacterial growth and halted the process of SSI and prevented the pus formation similar to the previous studies.[5,9] Another previous study[19] reported the Povidone-Iodine is effective against the surgical site infection, they reported frequency of 15.1% SSI in control compared to 2.9% SSI in cases. We noted frequency of 1.66% SSI in Povidone- Iodine cases that is in agreement with previous studies.[19-21]

We conclude that the Povidone- Iodine prophylaxis is effective in preventing post appendectomy surgical site infection. Small sample size is one of the limitations of present study. However, prospective study design, use of Southampton wound grading and collection of data in a systemic way adds to the strength of the study. The present study is of clinical significance as 1% Povidone-Iodine was found effective against the surgical

site infection in post appendectomy patients. As the 1% Povidone- Iodine is simple, cost effective and inexpensive remedy hence it will save the morbidity in young post appendectomy patients.

CONCLUSION

It is concluded that the 1% Povidone- Iodine solution is effective in preventing the post appendectomy surgical site infection. This helps reducing the morbidity of surgical site infection. Large sample size future studies are highly recommended for preventing wound infection simply by Povidone- iodine application which is inexpensive, cost effective and easy to apply.

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Don't worry about **getting** old,
worry about **thinking** old.

"Unknown"

AUTHORSHIP AND CONTRIBUTION DECLARATION

Sr. #	Author-s Full Name	Contribution to the paper	Author=s Signature
1	Abdul Salam Memon	Concept of study, literature review, study ptotocol, consent. athical approval, data collection, data analysis, manuscript writing.	
2	Aijaz Ahmed Shaikh	Performa, literature review, study protpcol, consent ethical approval, data collection, manuscript writing.	
3	Riaz Ahmed Memon	Data analysis. data collection, maintaining confidentially of patient data, data analysis.	
4	Afzal Junejo	Data compilation, Result, study protocol, Discussion, data analysis, manuscript wiritng, proof reading.