



ROLE OF ANTISEPTIC SOLUTION (PYODINE) TO PREVENT INFECTION DURING MESH PLACEMENT

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Abstract: Surgical site infections (SSIs) are a significant complication in postoperative care, leading to increased morbidity and healthcare costs. Antiseptic solutions for preoperative skin preparation are crucial in minimising SSIs. Chlorhexidine-alcohol and povidone-iodine solutions are commonly used, but their comparative efficacy in preventing SSIs, especially in mesh replacement surgeries, needs further investigation. **Objective:** This study aimed to determine the occurrence of surgical site infection (SSI) in wounds after applying povidone-iodine and chlorhexidine-alcohol solutions during mesh replacement surgeries. **Methods:** This randomised controlled trial was conducted at Kulsoom Bai Valika Hospital, Karachi, from August 1, 2023, to January 31, 2024. Following ethical approval from the institutional review board, 240 patients aged 20-65 undergoing elective surgery were included through non-probability consecutive sampling. Patients allergic to the study solutions or who refused to participate were excluded. Participants were randomly assigned to Group A (chlorhexidine-alcohol, n=120) and Group B (povidone-iodine, n=120). Post-surgery, Group A wounds were scrubbed with chlorhexidine-alcohol and Group B with povidone-iodine. Patients were monitored daily until discharge. Statistical analysis was performed using chi-square tests to compare the incidence of SSIs between the groups. **Results:** The mean age of participants was 41.32±1.6 years in Group A and 41.62±1.5 years in Group B. Within a 30-day follow-up, SSIs were observed in 23% of Group A and 40% of Group B (p<0.0001). Superficial incisional infections were 16% in Group A and 28% in Group B (p<0.0001). Deep incisional infections were 6% in Group A and 13% in Group B (p=0.004). **Conclusion:** The use of chlorhexidine-alcohol for antisepsis in mesh replacement surgeries significantly reduced the incidence of surgical site infections compared to povidone-iodine-alcohol. This suggests that chlorhexidine-alcohol is a more effective antiseptic solution for preventing SSIs in such procedures.

Keywords: Chlorhexidine, Mesh Replacement, Povidone-Iodine, Surgical Site Infection, Wound Infection

Introduction

The issue of surgical site infection has garnered increasing attention. Not only does it have a correlation with slower recovery and more extended hospital stays, but it also hurts the patient's mental well-being and poses a risk to society (1). The precise definition of postoperative surgical site infection remains ambiguous. However, it is generally agreed upon that SSI occurs within 30 days following a surgical procedure and encompasses both superficial and deep wound infections (2). Various strategies can be employed to mitigate the occurrence of postoperative surgical site infections, including rigorous hand antiseptic practices, administration of preoperative antibiotics, and adherence to stringent aseptic surgical procedures. The World Health Organisation (WHO), Institute for Health and Care Excellence (NICE), and Centres for Disease Control (CDC), the National, have recently revised the guidelines for preventing postoperative surgical site infections (3). They emphasise that preoperative skin antiseptic is crucial in reducing the risk of such infections. Povidone-iodine, also known as polyvinyl-pyrrolidone-iodine complex (PVP-I), was created approximately four decades ago. It is utilised to cleanse surfaces and hands, as well as for the prevention and treatment of wound infections (4). When PVP-I comes into contact with tissues, it gradually releases free iodine.

This iodine then oxidises the fatty acids found in the cell walls of bacteria, and it also enters the cell membranes to disrupt and denature nucleic acids and proteins (5). Povidone-iodine is the predominant preoperative skin antiseptic utilised in clinical settings. Nevertheless, current research indicates that chlorhexidine yields superior outcomes to povidone-iodine as a preoperative skin antiseptic. Clinicians have a perplexing dilemma when selecting preoperative skin disinfectants. Two meta-analyses indicate chlorhexidine is more advantageous than iodine-based preoperative skin antisepsis (6, 7). Noorani et al. discovered six trials with 5031 patients, in which they saw a notable advantage of using chlorhexidine (p = 0.019) (7). Lee et al. discovered nine randomised studies involving 3614 patients and observed a substantial benefit of using Chlorhexidine (6). Additional examinations by Lee and colleagues identified four distinct randomised controlled trials that included positive skin cultures as the primary metric for measuring infection (8, 9). Chlorhexidine has shown positive outcomes in many surgeries, including foot, ankle, and shoulder procedures and hysterectomies, indicating its adaptability. The study conducted by Darouiche et al. is noteworthy. It was a prospective, blinded, randomised, controlled trial that compared the effectiveness of chlorhexidine-alcohol scrub to PVI scrub and paint in

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adults who underwent clean-contaminated general surgery procedures (10). The study's primary outcome was the occurrence of SSI within 30 days after the surgery. The investigators discovered that chlorhexidine provided significantly greater protection against surgical site infections (SSI) in the 849 evaluated patients, as indicated by a p-value of 0.008. This finding was consistent in both the intention-to-treat and per-protocol analyses. The chlorhexidine group experienced a considerably longer time to SSI, and no meaningful differences were seen (10). The objective of this research will be to determine the occurrence of surgical site infection in the wound after applying povidone and chlorhexidine solution during the mesh replacement.

Methodology

After the ethical approval from the institutional review board, this randomised control trial was conducted at Kulsoom Bai Valika Hospital Karachi from 01/Aug/23 to 31/Jan/24. Through non-probability consecutive sampling, 240 patients between the age range of 20-65 years, of either gender, undergoing any elective surgery belonging to ASA grade I and II were included in the present study. Patients allergic to the drug components and who refused to participate were excluded from the present study. The patients were randomly allocated to two study groups: Group A- chlorhexidine group (n=120) and Group B- Povidone-iodine group (n=120). After the surgical procedure, the wounds of the patient in group A were scrubbed with a Chlorhexidine-alcohol combination (2% chlorhexidine gluconate with 70% isopropyl alcohol), and patients in group B were cleaned with an iodine-alcohol

combination (8.3% povidone-iodine with 72.5% isopropyl alcohol). Patients were monitored daily until they were released from the hospital. Subsequently, they were contacted by telephone during the 30 days following the surgery to evaluate if they exhibited any indications of surgical-site infection and to query if they had sought medical attention from a physician's office or emergency room for wound issues. Infection at the surgical site, superficially or deeply, within 30 days following surgery was the primary outcome. The predetermined secondary outcomes included skin separation, seroma, hematoma, and cellulitis. SPSS version 21 was used to analyse the data statistically. Categorical variables were presented as frequency and percentage, and continuous variables as Mean± S. D.

Results

Table 1 shows the clinical and demographic parameters of study participants in both groups. The mean age of the participants in both study groups was 41.32±11.6 and 41.62±11.5 years. Within the 30-day follow-up period after the surgery, SSI was observed in 23% of participants in group A and 40% in group B (p<0.0001). Superficial incisional was observed in 16% of participants in group A and 28% in group B (p<0.0001). Deep incision was observed in 6% of participants in group A and 13% in group B (p=0.004). As a secondary outcome, skin separation was observed in 25% of participants in group A and 39% of participants in group B (p<0.0001). Seroma was observed in 20% of participants in group A and 38% in group B (p<0.0001). Hematoma was observed in 10% of participants in group A and 20% in group B (p=0.004).

Table 1: Clinical and demographic parameters of study participants

Parameters	Group A (n=120)	Group B (n=120)	P-value
Age (years)	41.32±11.6	41.62±11.5	0.753
Gender			<0.0001
Male	51 (42%)	63 (52%)	
Female	69 (57%)	57 (47%)	
Primary outcome			
Surgical site infection SSI	28 (23%)	48 (40%)	<0.0001
Superficial incisional	20 (16%)	34 (28%)	<0.0001
Deep incisional	8 (6%)	16 (13%)	0.004
Secondary outcomes			
Skin separation	30 (25%)	47 (39%)	<0.0001
Seroma	24 (20%)	46 (38%)	<0.0001
Hematoma	12 (10%)	20 (16%)	0.004
Cellulitis	9 (7%)	18 (15%)	0.002
Adverse skin reactions			
Pruritus at the operative site	7 (6%)	14 (12%)	0.008
Erythema at operative site	6 (5%)	12 (10%)	0.014
Allergic skin reaction	10 (8%)	5 (4%)	0.025

Discussion

Our randomised, controlled experiment revealed a notable decrease in the likelihood of surgical-site infection following surgeries when chlorhexidine-alcohol was employed for mesh replacement, as opposed to iodine-alcohol. Furthermore, individuals who were allocated to get chlorhexidine-alcohol were notably less prone than those

assigned to iodine-alcohol to require physician office visits due to wound problems. The frequency of secondary outcomes was also reduced in the chlorhexidine-alcohol group, and adverse skin reactions were significantly reduced in the chlorhexidine-alcohol group. Similar to our result, a study conducted by Tuuli et al. (2016) observed a lower incidence of SSI in the patients who received

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chlorhexidine-alcohol during mesh replacement after the surgery as compared to those who received Povidine ($p=0.017$) (11). However, another study conducted by Menderes in 2012 does not find a statistically significant difference in the occurrence of SSI in both study groups (12). Multiple trials conducted on patients undergoing general surgical procedures have demonstrated the better effectiveness of chlorhexidine-alcohol compared to povidone-iodine in preventing surgical-site infections. In a multicenter, randomised trial, adults undergoing clean-contaminated surgery were compared using two different agents: chlorhexidine-alcohol and povidone-iodine. Clean-contaminated surgery refers to specific types of operations (colorectal, gastroesophageal, small intestinal, gynecologic, biliary, thoracic, or urologic) performed under controlled conditions without significant spillage or unusual contamination. The results of the trial showed that chlorhexidine-alcohol had a significantly lower risk of SSI compared to povidone-iodine (9.5% vs. 16.1%) ($P=0.004$) (10). Chlorhexidine-alcohol was more effective in preventing superficial and deep incisional infections but not organ or space infections. A subsequent meta-analysis, incorporating this experiment along with five others, demonstrated a markedly reduced incidence of surgical-site infection when using chlorhexidine-based antiseptics instead of iodine-based antiseptics. Sixteen While the data indicated that chlorhexidine-based antiseptics were superior, it was uncertain if this superiority was due to chlorhexidine alone, alcohol alone, or the combination of both. Additionally, it was unclear if these findings would apply to caesarean birth (6). This study had a few limitations as well. This study has several limitations: it was conducted at a single centre, which may limit generalizability, and while the sample size was adequate, a larger cohort could provide more robust data. The follow-up period was limited to 30 days post-surgery, and exclusion criteria may introduce selection bias. Additionally, the lack of blinding could lead to performance or detection bias, outcomes were not differentiated by the type or complexity of surgeries, variability in antiseptic application techniques, and compliance was not controlled.

Conclusion

Overall, this study demonstrated that employing chlorhexidine-alcohol during mesh replacement after surgeries resulted in a notably reduced likelihood of surgical-site infection compared to the use of Povidine-alcohol.

Declarations

Data Availability statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate.

It is approved by the department concerned. (IRBEC-DRPK-23, 1-12-23 dated)

Consent for publication

Approved

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Conflict of interest

The authors declared an absence of conflict of interest.

Authors Contribution

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Concept & Design of Study

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