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Preoperative Skin Preparation with Chlorhexidine Alcohol and Povidone Iodine: A Comparative Study

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Abstract
Background: *Surgical Site Infections are the third most commonly reported nosocomial infections all over the world[1]. Patient's skin is a major source of pathogens that cause Surgical Site Infection. Povidone-Iodine (5%) is being used for preoperative skin preparation in surgeries since 1955 and is preferred universally. But it fails to control surgical site infection which is a major post operative complication.. Chlorhexidine alcohol has been widely used as an oral antiseptic solution and its efficacy has been recently made it as an antiseptic and disinfectant[2]. This study compares the efficacy of Chlorhexidine-Gluconate (2.5%v/v) & Isopropyl Alcohol (63%) to Povidone-Iodine (5%) in preventing surgical site infections in elective midline laparotomy surgeries.*
Aim of Study: *To compare the efficacy of chlorhexidine alcohol versus povidone iodine for pre-operative skin preparation in preventing surgical site infection in elective midline laparotomies.*
Materials and Methods: *A total of 200 patients were taken for this study. 100 patients underwent draping with chlorhexidine alcohol (Group A) who were compared with 100 patients who underwent draping with povidone iodine (Group B). Variables used in this study are wound infection and ASEPSIS score.*
Results: *In the povidone-iodine group 14 (14%) patients had wound infection and in the chlorhexidine alcohol group 10(10%) patients had wound infection. Even though SSI is lower in chlorhexidine group, the difference was not statistically significant (p value 0.384).*
Conclusion: *There is no significant difference between chlorhexidine alcohol and povidone iodine in preventing surgical site infection in elective midline laparotomy surgeries.*
Keywords: *Chlorhexidine Alcohol, Povidone Iodine, ASEPSIS score.*

Introduction

Despite many advances in the surgical techniques in the past few years, postoperative wound sepsis still remains a major problem. Although, only occasionally a cause of mortality, it is a frequent cause of increased morbidity leading to prolonged hospitalisation of the patient. Surgical Site Infections are the third most commonly reported

nosocomial infections all over the world[1]. Despite the advances made in preoperative asepsis, patients subjected to operations naturally have to face the risk of complications due to infections. Povidone-Iodine (5%) is been used for preoperative skin preparation in surgeries since 1955 and is preferred universally. But even then a surgical site infection is a major complication it fails to control completely. Chlorhexidine alcohol has been widely used as oral antiseptic solution in mouth washes. Its increased efficacy has been recently made it as an antiseptic and disinfectant[2]. This study compares the efficacy of Chlorhexidine-Gluconate (2.5%v/v) &Isopropyl Alcohol (63%) to Povidone-Iodine (5%) in preventing surgical site infections in elective midline laparotomy surgeries.

Patient's skin is a major source of pathogens that cause Surgical Site Infection. It is an established fact that the normal skin of healthy human beings harbors a rich bacterial flora[7]. Normally considered non-pathogenic, these organisms may be a potential source of infection of the surgical wound, making skin preparation at the time of the procedure critical[8]. There are several kinds of antiseptics available for preoperative skin preparation, however povidone iodine and chlorhexidine alcohol are commonly used in clinical practice. The present study was undertaken to compare and evaluate the efficacy of chlorhexidine alcohol versus povidone iodine in elective midline laparotomy surgeries for prevention of surgical site infections.

Aim of Study

To compare the efficacy of chlorhexidine alcohol versus povidone iodine for pre-operative skin preparation in preventing surgical site infection in elective midline laparotomies.

Materials and Methods

This is a Comparative study conducted in Dept. of Surgery in a tertiary care center Kerala over a period of 1 ½ year starting from Jan 2016 with a sample size of 200. All those patients are admitted to General surgical wards in Department of Surgery and are posted for elective midline laparotomy surgeries between Jan 2016 to June 2017.

Inclusion Criteria

- Patient older than 18yrs.
- Patients undergoing elective midline laparotomy.
- Duration of surgery 30 min to 4 h.

Exclusion Criteria

- Patients undergoing emergency surgery.
- Immuno compromised patients (HIV).
- Patients on long term steroids.
- Patients with focus of infection somewhere on the body.
- Patients undergoing chemotherapy or radiotherapy.
- Diabetic patients with poor glycemic control (HbA1c>9).
- Patients with history of allergy to study agents.

The patients are divided into two groups by computer randomization that is Group A (chlorhexidine alcohol group) and Group B (povidone iodine group). All cases are elective surgeries done under is General Anaesthesia. All patients received one dose of parenteral antibiotics 1 hour prior to applying incision and a course of parenteral antibiotic post operatively. All cases are opened using a vertical midline laparotomy incision. For all patients, rectus was closed in the midline using No.1 loop PDS thus apposing the wound edges. Then the wound was closed by skin staples.

The agents used for the study are 2.5% v/v chlorhexidine in 63% v/v isopropyl alcohol and povidone iodine 5%. The antiseptics agents will be applied to the skin by sterile gauze under aseptic precaution. The antiseptics were left on the skin for three to four minutes. Post operatively the same agent which was used for draping will be applied to the sutured surgical wound by sterile gauze.The surgical wounds will be examined daily until the patient is discharged from the hospital and patients will be followed up weekly for a

period of 30 days. In this study ASEPSIS scoring system will be used for assessment of surgical site wound infection.

The data is collected and results are analysed using SPSS version 18.0. Quantitative variables were expressed as the mean ± standard deviation. Comparison of means was done by student't' test, values without mean was compared by Pearson chi square test.

Observation and Discussions

In this study we compared the effects of Chlorhexidine-Gluconate (2.5%v/v) &Isopropyl Alcohol (63%) to Povidone-Iodine (5%) in preventing surgical site infections in elective midline laparotomy surgeries. Surgical site infection in chlorhexidine group (10%) was found to be lower than the povidone iodine group (14%) which is in accordance with the study conducted by Rabih O Darouiche et al[8] where the incidence of surgical site infection was 9.5% in chlorhexidine alcohol group 16.1% in betadine group. In another study conducted by Geetha Danasekaran et al[83] surgical site infection in chlorhexidine alcohol group was 3.3% and in povidone iodine group it was 23.33%. No significant statistical difference of the risk factors between the two groups of the sample patients such as age, operative time, wound classification or underlying host factors. Staphylococcus aureus (6% in chlorhexidine alcohol group and 12% povidone iodine group) was the commonest organisms isolated. After the application of antiseptic agents, there was reduction of bacterial colonisation in both the groups. These findings were similar to the results of a study done in Thailand. The study reported that wound infection decreased from 3.2% to 2% after chlorhexidine skin preparation and the organisms found in the culture specimen included *Staphylococcus epidermidis*, *Staphylococcus aureus*, Streptococcus species and Enterococcus species. In this study, among the patients who has SSIs, the microbiological examination revealed *E.coli* as the organism (3.33%) present in chlorhexidine-alcohol group. In povidone-iodine group of the patients had infection due to *Staphylococcus aureus* (16.66%) followed by *E. coli* (6.6%). In the present study, majority (85%) of the patients in chlorhexidine alcohol had duration of hospital stay up to seven days and 11% patients required hospital stay between 8 to 14 days. In povidone iodine group, 79% patients had hospital stay up to seven days followed by 14% of patients between 8 to 14 days and 7% of patients more than 14 days suggesting prolonged length of hospital stay in povidone iodine group. The mean length of hospital stay in chlorhexidine alcohol group was 7.43±2.58 days, whereas in povidone iodine, it was 8.02± 3.17days. In the present study, postoperative day wound inspection findings revealed high rate of surgical site infection in povidone iodine group (14% versus 10%) but the difference is not statistically significant (p value 0.079).

Table 1: Type of elective surgery

Elective surgery	Chlorhexidine alcohol	Povidone-iodine	Total
Esophagogastric	11 (11%)	6 (6%)	17
Hepatobiliary	29 (29%)	21 (21%)	50
Small intestine	30 (30%)	47 (47%)	77
Colorectal	30 (30%)	26 (26%)	56
Total	100	100	200

Table 2: Diabetes

Diabetes	Chlorhexidine alcohol	Povidone-iodine	Total
Diabetic	8	6	14
Non diabetic	92	94	186
Total	100	100	200

Table 3: Smoking

Smoking	Chlorhexidine alcohol	Povidone-iodine	Total
Smokers	12	11	23
Non smokers	88	89	177
Total	100	100	200

Table 4: Surgical site infection

SSI	Chlorhexidine alcohol	Povidone-iodine	Total
Present	10	14	24
Absent	90	86	176
Total	100	100	200

Table 5: Types of surgical site infections

Type	Chlorhexidine alcohol	Povidone-iodine	Total
Superficial	9	13	22
Deep	1	1	2
No infection	90	86	176
Total	100	100.0	200

Table 6: Asepsis score

Score	Chlorhexidine alcohol	Povidone-iodine	Total
0-10	90	84	174
11-20	6	10	16
21-30	4	6	10
Total	100	100	200

Table 7: Type of organism

Type of organism	Chlorhexidine alcohol	Povidone-iodine	Total
Staphylococci	6	12	18
E coli	4	4	8
Sterile	90	84	174
Total	100	100.0	200

Table 8: Hospital stay

Hospital stay in days	Chlorhexidine alcohol	Povidone-iodine	Total
Up to 7	85	79	164
8-14	11	14	25
>14	4	7	11
Total	100	100	200

Conclusion

There is no significant difference between chlorhexidine alcohol and povidone-iodine in preventing surgical site infection in elective midline laparotomies.

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