



PREOPERATIVE SKIN PREPARATION WITH AQUEOUS POVIDONE-IODINE ALONE AND IN COMBINATION WITH ALCOHOLIC CHLORHEXIDINE IN INDIVIDUALS HAVING ELECTIVE SURGERY WAS EVALUATED CLINICALLY

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Abstract

Aim: In patients having elective surgery, the purpose of this study is to conduct a clinical assessment of preoperative skin preparation using aqueous povidone-iodine alone and in combination with alcoholic chlorhexidine.

Material and methods: Patients who were undergoing emergency surgery, patients who were immunocompromised and patients who were taking long-term steroids, as well as patients who had septicemia and had a focus of infection somewhere on the body that manifested clinically with fever and increased total and differential counts, were not allowed to participate in the study. The patients were all split up into two groups with the same number of people.

Results: The length of time that operations lasted ranged from fifty minutes to three hours and fifteen minutes; however, given that all of the procedures were clean and elective, the length of time that surgeries lasted had no impact on the number of patients that had positive culture swabs. There were seven patients in group one who had a positive culture, while there was only one patient in group two who had a positive culture. This difference is statistically significant. Seven patients in group 1 and one patient in group 2 had postoperative wound infections after their surgeries, respectively. It should be pointed out that only four of the seven patients with growth in group-1 had post-operative wound infections, while the other three were acquired on the ward. Likewise, the only illness that group 2 has is one that was acquired in the ward.

Conclusion: The results of this study demonstrate that povidone-iodine in combination with alcoholic chlorhexidine is more effective in pre-operative skin preparation than povidone-iodine used alone. As a result, this combination should be recommended as the antiseptic of choice for use in skin preparation prior to elective clean surgery. It is appropriate to follow this regimen in contaminated and emergency operations given that it was shown to be superior in reducing incision site colonization and postoperative wound infection.

Keywords: Skin, Aqueous povidone-iodine, Alcoholic chlorhexidine, Elective surgery

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1. Introduction

The skin is the major barrier that prevents microorganisms from entering the body. After a skin incision, it is possible for germs that are normally present on the skin to contaminate the exposed tissues and produce a surgical site infection (SSI). Even though there have been several developments in surgical procedures over the course of the last few years, post-operative wound infection continues to be a serious concern. SSIs are linked to lengthier hospitalisations in hospitals and critical care units, greater readmission to hospitals after patients have been discharged, and a death rate that is twice as high as normal. Post-operative wound infections may be caused by a number of different reasons, some of which are related to the patient, and others of which are related to the surgery itself [1]. Both preventing access to a wound and the infection that might result from that wound's presence are referred to as "asepsis" and "antisepsis," respectively. Moynihan [2] (1920) carried out his bacteriological experiment having any of the following purposes in mind: 1. the prevention of any organisms from entering the wound; 2. the elimination of any microorganisms that could enter the wound by the application of a bactericide to the surface of the wound. It has been shown that preoperative skin antisepsis may significantly cut down on the number of microorganisms present in the surgical site. The most usual method for preparing the skin for surgical procedures is to first wash the region to be worked on with an antiseptic soap solution, and then to paint the area with a sterile paint solution once it has been cleaned. It has been shown that degerming the skin with antiseptics for a duration of less than one minute is just as effective as scrubbing the skin for five minutes with a germicidal soap solution and then painting on antiseptics [3]. Chlorhexidine gluconate (CHX) and povidone-iodine are two antiseptics that are often used to treat skin infections (PVP-I). The 2017 CDC Guideline for the Prevention of SSIs recommends, with high-quality evidence, the use of intraoperative skin preparation with an alcohol-based antiseptic agent. However, due to a lack of conclusive randomized controlled trials (RCTs), no specific antiseptic agent is endorsed [4]. The recommendation to use an alcohol-based antiseptic agent is supported by the 2017 CDC Guideline for the Prevention of SSIs. CHX is recommended for usage by a variety of other organizations, including the Canadian Patient Safety Institute and the Health Protection Scotland [5,6]. The remanent impact against bacterial regrowth and the consequent extended action that may be ascribed to CHX are the basis for these recommendations [7,8]. In

addition, in contrast to iodophors, CHX does not lose its active state in the presence of organic fluids like blood or pus [9], while these substances cause iodophors to lose their activity. This research is being conducted to examine the effectiveness of using povidone-iodine by itself vs using it in conjunction with alcoholic chlorhexidine in combating bacterial flora on the skin of the operation site under the kinds of environmental conditions that are present in operating rooms.

2. Material and methods

This is observational research in which 120 individuals who had been admitted to the Department of General Surgery for elective clean surgery participated. Patients who were undergoing emergency surgery, patients who were immunocompromised and patients who were taking long-term steroids, as well as patients who had septicaemia and had a focus of infection somewhere on the body that manifested clinically with fever and increased total and differential counts, were not allowed to participate in the study. The patients were all split up into two groups with the same number of people.

Methodology

The cases were chosen at random, and the preoperative shaving of the patients' parts occurred at the same time and on the same evening for all of the patients. This ensured that there would be no bias in the results. In each of the groups, the preoperative skin preparation is performed using the antiseptic protocol that is specific to that group. The antiseptic regimen that is administered for Group-1 patients consists of three coatings of aqueous povidone-iodine IP 5% w/v. The antiseptic regimen that is utilised for Group-2 patients begins with a single coat of an agent that contains chlorhexidine gluconate 2.5% v/v in 70% propanol. This is then followed by two coats of aqueous povidone-iodine IP 5% w/v. Cefotaxime, 1 gramme intravenously administered after a test dosage, is the antibiotic that is administered before to surgery. It is done so one hour before the incision is made. In both of the groups, the site of the incision is promptly swabbed with sterile saline and subjected to culture and sensitivity testing. Knowing whether or not these strains were responsible for generating infections in the post-operative period was a significant consequence of this finding since it had crucial ramifications.

Statistical data

The SPSS Statistics V25.0 programme was used to conduct the statistical analysis. The findings were shown using frequency distributions and percentages. In order to determine whether or not

there was a significant difference, the Chi-square test and the Fischer exact test were used. Where P was less than 0.05, statistical significance was assumed.

3. Results

A total of 120 individuals who were scheduled to have clean elective surgery were split up into two groups for the purpose of this study (60 in each group). In group 1, the mean (standard deviation) age was 39.98 + 8.64 years, whereas in group 2, the mean (standard deviation) age was 39.01 + 7.79 years; this difference is not statistically significant. There were a total of 96 people, with 72 men and 48 females.

The length of time that operations lasted ranged from fifty minutes to three hours and fifteen minutes; however, given that all of the procedures were clean and elective, the length of time that surgeries lasted had no impact on the number of

patients that had positive culture swabs. There were seven patients in group one who had a positive culture, while there was only one patient in group two who had a positive culture. This difference is statistically significant. Table-4 provides a summary of the outcomes of the culture and antibiotic sensitivity tests conducted on the patients who had growth in both groups. After surgery, patients were monitored until the time of suture removal (typically between 5 and 12 days), with the goal of determining the percentage of patients who went on to develop wound infections. Seven patients in group 1 and one patient in group 2 had postoperative wound infections after their surgeries, respectively. It should be pointed out that only four of the seven patients with growth in group-1 had post-operative wound infections, while the other three were acquired on the ward. Likewise, the only illness that group 2 has is one that was acquired in the ward.

Table 1: Age distribution

Gender	N=120	%
Male	72	60
Female	48	40
Age		
Below 20	5	4.17
20-30	30	25
30-40	35	29.17
40-50	30	25
50-60	8	6.67
60-70	8	6.67
Above 70	4	3.33

Table 2: Nature of operations

Diagnosis of subjects	Group I		Group II		Total	
	N=60	%	N=60	%	N=120	%
Excision	18	30	20	3.33	38	31.67
Excision Biopsy	4	6.67	-		4	3.33
Hemithyroidectomy	1	1.67	-		1	0.83
Hernioplasty	22	36.67	26	43.33	48	40
Superficial Parotidectomy	1	1.67	1	1.67	2	1.67
Total Thyroidectomy	7	11.67	6	10	13	10.83
Trendelenburg Procedure	7	11.67	7	11.67	14	11.67

Table 3: Culture report

Culture	Group I		Group II		Total	
	N=60	%	N=60	%	N=120	%
Negative	53	83.33	59	98.33	112	93.33
Positive	7	11.67	1	1.67	8	6.67

Table 4: Sensitivity report

Antibiotics	Group I		Group II	
	<i>S. epidermidis</i>	<i>S. aureus</i>	<i>S. epidermidis</i>	<i>S. aureus</i>
Amoxicillin	Sensitive	Sensitive	Sensitive	Sensitive
Cefotaxime	Sensitive	Sensitive	Sensitive	Sensitive

Ciprofloxacin	Sensitive	Sensitive	Sensitive
Gentamycin	Sensitive	Sensitive	Sensitive
Amikacin	Sensitive	Sensitive	Sensitive

Table 5: Relationship between Microbiological report and post-operative wound infection rate

Microbiological report	Group I			Group II		
	No infection	Infection	Total	No infection	Infection	Total
No Growth	50	3	53	58	1	59
Growth	3	4	7	1	0	1
Total	53	7	60	59	1	60

4. Discussion

The first documented use of PVP-iodine in surgical procedures was in 1955. In recent years, chlorhexidine gluconate, an antiseptic and disinfectant with much improved efficacy, has been widely accessible in every region of the world. In this research, we examined the effectiveness of using povidone-iodine alone vs using it in conjunction with alcoholic chlorhexidine in elective clean procedures to avoid surgical site infections. This was done using a randomized controlled trial. The current study was conducted on 120 patients who were scheduled to undergo elective clean cases in the Department of General Surgery. The objectives of the study were to evaluate the efficacy of povidone-iodine alone and in combination with an antiseptic agent containing alcoholic chlorhexidine on preoperative skin preparation, as well as to compare the rate of postoperative wound infections between the two groups of patients. Even after skin disinfection, the colonization of the site of incision was observed in 11.67% of participants in group-1 and 1.67% of participants in group-2 in the current study. Comparatively, the respective values in Julia L et al. [10] studies were 35.3% and 4.7%, and in Ajay et al. [11] studies they were 20.8% and 3.3%. This demonstrates that the colonization rates of the sites of incision were greatly decreased when using a combination of povidone-iodine and an alcoholic solution of chlorhexidine as opposed to only using povidone-iodine alone. This was compared to using povidone-iodine alone. The incidence of postoperative wound infections in group-1 is 6.67 percent, while the rate in group-2 is zero percent, but the comparable values in studies conducted by Brown et al. [12] were 8.1 percent and 6.0 percent, Ajay et al. [11] studies were 13.3% and 0%. Studies conducted by Park et al. [13], Sistla et al. [14], and Paocharoen et al. [15] found that there was not a huge difference in the outcomes of their respective experiments. The findings of the current study indicate that a pre-operative skin preparation consisting of chlorhexidine gluconate 2.5% v/v in 70% propanol followed by aqueous povidone-iodine 5% w/v is more effective than aqueous povidone-

iodine used on its own. This was determined by comparing the two methods to each other.

5. Conclusion

The results of this study demonstrate that povidone-iodine in combination with alcoholic chlorhexidine is more effective in pre-operative skin preparation than povidone-iodine used alone. As a result, this combination should be recommended as the antiseptic of choice for use in skin preparation prior to elective clean surgery. It is appropriate to follow this regimen in contaminated and emergency operations given that it was shown to be superior in reducing incision site colonisation and postoperative wound infection.

6. References

1. Gottrup F. Prevention of surgical-wound infections *N Engl J Med* 2000;342(3):202-204.
2. Moynihan, Sir Berkeley GA. The ritual of a surgical operation. *British journal of surgery* 1920;8:27.
3. Richard Howard J. "Surgical infections." *Schwartz textbook of principles of surgery*, McGraw Hill Company, 7th international edition 1999, 132.
4. Berrios-Torres SI, Umscheid CA, Bratzler DW, Leas B, Stone EC, Kelz RR, *et al.* Centers for Disease Control and Prevention guideline for the prevention of surgical site infection, 2017. *JAMA Surg* 2017;152:784-791.
5. Canadian Patient Safety Institute. Safer healthcare now! Getting started kit: prevent surgical site infections. Available at: <http://www.patientsafetyinstitute.ca/en/toolsResources/Documents/Interventions/Surgical%20Site%20Infection/SSI%20Getting%20Started%20Kit.pdf>
6. Health Protection Scotland. Targeted literature review: what are the key infection prevention and control recommendations to inform a surgical site infection (SSI)

- prevention quality improvement tool? Available at: <http://www.hps.scot.nhs.uk/resourcedocument.aspx?id=2805>.
7. Leaper D, Burman-Roy S, Palanca A, Cullen K, Worster D, Gautam-Aitken E, *et al.* Prevention and treatment of surgical site infection: summary of NICE guidance. *BMJ* 2008;337:a1924.
 8. Anon. Prävention post-operativer Wundinfektionen. *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz* 2018;61:448-473.
 9. Lim KS, Kam PC. Chlorhexidine-pharmacology and clinical applications. *Anaesth Intensive Care* 2008;36:502-512.
 10. Julia Langgartner, Hans-Jorg Linde, Norbert Lehn, Reng Schol M, Erich J, Gluck T. Combined skin disinfection with Chlorhexidine/Propanol and aqueous povidone-iodine reduces bacterial colonization of central venous catheter. *Intensive care medicine* 2004;30(6):1081-88.
 11. Ajay Kumar Mareedu. Comparative study of Preoperative skin preparation with aqueous povidone iodine only versus povidone iodine in combination with chlorhexidine in clean elective surgeries. *IOSR journal of dental and medical sciences (IOSR-JDMS)*. 2018;17(5):01-06.
 12. Brown TR, Clarence Ehrlich E, Frederick Stehman B, Alan Golichowski M, James Madura A, Harold EE. "A clinical evaluation of chlorhexidine gluconate spray as compared with iodophor scrub for preoperative skin preparation". *Surgery, Gynecology and Obstetrics* 1984;158(4):363.
 13. Park HM, Han SS, *et al.* Randomized clinical trial of preoperative skin antisepsis with chlorhexidine gluconate or povidone-iodine. *BJS* 2017;104(2):e145-e150. Doi: 10.1002/bjs.10395. Epub 2106 Nov 23.
 14. Sistla SC, Prabhu G, Sadasivan J. Minimizing wound contamination in a 'clean' surgery: comparison of chlorhexidine-ethanol and povidone-iodine. *Chemotherapy* 2010;56(4):261-7.
 15. Veeraya Paocharoen. Comparison of surgical wound infection after preoperative skin preparation with 4% Chlorhexidine and povidone-iodine: a prospective randomized trial *J med assoc Thai*, 2009, 92.