Section: Research Paper

Clinical evaluation of preoperative skin preparation with aqueous povidone iodine alone and in combination with alcoholic chlorhexidine in patients undergoing elective surgery

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ABSTRACT

Aim: Preoperative skin preparation with aqueous povidone-iodine alone and in combination with alcoholic chlorhexidine in individuals having elective surgery was evaluated clinically.

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: A total of 140 individuals who were scheduled to have clean elective surgery were split up into two groups for the purpose of this study (70 in each group). In group 1, the mean (standard deviation) age was 38.98 ± 7.55 years, whereas in group 2, the mean (standard deviation) age was 38.99 ± 5.68 years; this difference is not statistically significant. There were a total of 100 people, with 85 men and 55 females.

There were 9 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 6 and 10 days), with the goal of determining the percentage of patients who went on to develop wound infections. 9 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 5 of the 9 patients with growth in group-1 had post-operative wound infections, while the other 4 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 colonisation and postoperative wound infection.

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

Introduction

In spite of the fact that the risk of surgery site infections (SSI) in clean orthopaedic operations is modest, ranging from 0.3% to 1.9%, the implications of these infections, particularly deep infections, are devastating for patients who are otherwise healthy. Hence, therapy to lessen the likelihood of such consequences is still very essential. The patient's own natural skin flora, not contamination from equipment or the air in the room, is the primary cause of surgical site infections (SSIs). An antiseptic preparation that is applied topically to the skin is one of the most important factors in alleviating the load of natural skin flora. [1] Even when subjected to very high levels of disinfection, human skin is incapable of becoming sterile because of its histologic structure, which includes glands and hair follicles in the deeper layers of the skin. As a result, eliminating bacterial colonisation continues to be the primary objective of surgical skin preparation. Since an antiseptic agent cannot sterilise tissue, the decrease of bacterial colonisation is proportional to the antiseptic agent's concentration as well as the amount of time bacteria are exposed to it. In order to achieve a minimum of tissue toxicity and a short exposure time with a maximum reduction of the normal skin flora, the concentration and exposure time have been determined as a compromise between the tissue toxicity and practicability of the various antiseptic agents. This was done in order to maximise the reduction of normal skin flora. [2,3]

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 randomised 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 organisations, 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.

Material and methods

This is an observational research in which 140 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 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.

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 V24.0 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.

Results

A total of 140 individuals who were scheduled to have clean elective surgery were split up into two groups for the purpose of this study (70 in each group). In group 1, the mean (standard deviation) age was 38.98 ± 7.55 years, whereas in group 2, the mean (standard deviation) age was 38.99 ± 5.68 years; this difference is not statistically significant. There were a total of 100 people, with 85 men and 55 females.

The length of time that operations lasted ranged from 55 minutes to 3.10 hours 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 9 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 6 and 10 days), with the goal of determining the percentage of patients who went on to develop wound infections. 9

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 5 of the 9 patients with growth in group-1 had post-operative wound infections, while the other 4 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=140	%
Male	85	60.71
Female	55	39.29
Age		
Below 20	7	5
20-30	34	24.28
30-40	40	28.57
40-50	34	24.28
50-60	10	7.14
60-70	10	7.14
Above 70	5	3.57

Table 2: Nature of operations

Diagnosis of subjects	**Group I**		**Group II**		**Total**	
	N=70	**%**	**N=70**	**%**	**N=140**	**%**
Excision	20	28.57	22	31.43	42	30
Excision Biopsy	5	7.14	-		5	3.57
Hemithyroidectomy	2	2.86	-		2	1.43
Hernioplasty	27	38.57	31	44.29	58	41.43
Superficial Parotidectomy	1	1.43	2	2.86	3	2.14
Total Thyroidectomy	7	10	7	10	14	10
Trendelenburg Procedure	8	11.43	8	11.43	16	11.43

Table 3: Culture report

Culture	**Group I**		**Group II**		**Total**	
	N=70	**%**	**N=70**	**%**	**N=140**	**%**
Negative	61	87.14	69	98.57	130	92.86
Positive	9	12.86	1	1.43	10	7.14

Table 4: Sensitivity report

Antibiotics	**Group I**		**Group II**
	S. *epidermidis*	**S. *aureus***	**S. *epidermidis***
Amoxicillin	Sensitive	Sensitive	Sensitive
Cefotaxime	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	57	4	61	68	1	69
Growth	4	5	9	1	0	1
Total	61	9	70	69	1	70

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 randomised controlled trial. The current study was conducted on 140 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 colonisation of the site of incision was observed in 12.86% of participants in group-1 and 1.43% 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 colonisation 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 7.14 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.

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.

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