

© 2016 Bahar Seifi, Faezeh Sahbaei, Mohamad Zare Zare, Azam Abdoli, and Mohammad Heidari

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/4.0/>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ORIGINAL PAPER

Mater Sociomed. 2016 Oct; 28(5): 348-352

A COMPARATIVE STUDY BETWEEN POVIDONE-
IODINE AND MANUGEL 85 ON SURGICAL SCRUBBahar Seifi¹, Faezeh Sahbaei², Mohamad Zare Zare¹, Azam Abdoli², and Mohammad Heidari³¹Department of Nursing, Tehran Medical Sciences Branch, Islamic Azad University, Tehran, Iran²Department of Midwifery, Tehran Medical Sciences Branch, Islamic Azad University, Tehran, Iran³Department of Nursing, School of Nursing and Midwifery, Shahrekord University of Medical Sciences, Shahrekord, Iran

Corresponding author: Bahar Seifi, Department of Nursing, Tehran Medical Sciences Branch, Islamic Azad University, Tehran, Iran. Mobile: +98-9125389804, E-mail: Seifi_b@yahoo.com

ABSTRACT

Background: Direct transmission through skin contact is one of ways for disease transmission. Medical staffs have contact with many patients, so their hand can be a factor for the transmission of disease. Surgical scrub is a process that leads to destruction immigrant and stable microbus of hands and arms through friction washing by use of antiseptic solution prior to surgery. The aim of this study was to compare the effectiveness of disinfection of Povidone-Iodine and Manugel 85 in surgical scrub.**Methods:** This study was a clinical trial that done before and after Surgical scrub. 33 person of surgical team in hospital were surveyed during. Four samples were done for every person: first before surgical scrub with Povidone-Iodine solution, second immediately after surgical scrub, then after one week third test done before surgical scrub with Manugel 85, and fourth one immediately after surgical scrub. Paired t-test was used for statistical analysis and SPSS analysis. **Results:** Data analysis showed that the effect of Povidone-Iodine and Manugel 85, separately, before and after surgical scrub on number of colonies is significant. But the effect of these two solutions on behalf of number of colonies was not significant. The 100% grown cultures before surgical scrub with Povidone-Iodine solution and 90.91% before surgical scrub with Manugel 85 were staphylococcus.**Conclusion:** The disinfection effect of Povidone-Iodine and Manuge l85 on surgical scrub is the same.**Key words:** Surgical Scrubbing, Povidone-Iodine, Manugel 85.

1. INTRODUCTION

Nowadays, it is specified that skin contact is one of the disease transmission methods. Since medical staffs have direct contact with various patients, their hands can be transmitted pathogens (1). Infection of surgical wound includes infection as a result of bacterial contamination during and after surgical operation which is appeared 5-10 days after surgery. 300,000 cases of infection of surgical area in United States of America indicated that the most common infection among surgical patients. Surgical infection area causes prolongation of hospitalization time at hospital, the issue of which costs 1 billion for the United States of America annually. Mortality rate pertinent to the infection of surgical area stands at 3% (2). Nevertheless, surgical scrub is the oldest strategy for reducing infection of surgical area and is of the most important measures in medicine. As an effective move to alleviate infections as a result of surgical operation, washing hand for surgery was recommended as of 19th century (3).

Broadly speaking, washing hand should be taken into

serious consideration for surgical operation in particular. There are usually two microorganism types on skin: First group is related to "transient" or "temporary" microorganism which is appeared as a result of direct contract of hand with contaminated materials, all of which can be removed completely by washing hand with soap and disinfectants. The second group of microorganism is "Permanent" and "Stable" which is available under skin, hair follicles, sebaceous glands and sweat glands. This microorganism types have high adhesion to body skin and show high resistant against washing (4). Surgical scrub is a process that is lead to the reduced number of immigrant and viable microbes on skin of hand and arm through scrub-based washing using antiseptic solution before surgical operations (5). Unlike simple washing of hand, surgical scrub focuses on eradicating and eliminating skin viable and permanent microbes (6). Type of disinfectant materials used in scrub is one of important factors in effectiveness and efficacy of scrub. Antiseptic solutions, which are used for scrubbing, are different, the most important of which are as follows: Chlorhexidine,

hexachlorophene, Povidone-Iodine tricloxano alcohol (7). Most alcohol-based hand disinfectants (sanitizers) include ethanol, isopropanol or combination of the two products. Effects of scrubbing hand with disinfectants showed that alcohols reduce bacterial number of hands effectively (6). Successful control of infection requires proper preventive measures, so that surgical scrub of hands accurately is one of the most effective methods in preventing transmission of infection (7, 8). Nowadays not only nosocomial or hospital infections will cause prolongation of hospitalization time in hospitals, but also these infections burden hefty and huge costs in countries. Given the above issue, hospital infections are recommended to be alleviated to a great extent. Therefore, selecting top antiseptic solutions pertinent to environment, financial conditions and facilities governing organization and hospital and having thorough information on side advantages and benefits of disinfectants will help managers and directors select top solution in equal conditions according to saving in water consumption.

2. MATERIALS AND METHODS

This study is a clinical trial (before and after) which is conducted with the aim of determining disinfectant effect of “Povidone-Iodine and “Manugel 85” in surgical scrub. The aforementioned scrub solution is independent variable while degree of contamination of hands of surgical team is dependent variable of this study. Samples were selected from expert surgical team based in Iran, comprised of eight surgeons, 10 nurses and 15 technicians in operating room. Totally, 33 individuals comprised of surgical team were selected. Inclusion criteria to the study include patients not suffering from skin disease or cut or wound in hand skin and/or have not allergy to the tested materials. Moreover, nails should be cut with no surgical operation done at least 18 hours before conducting surgical scrub study. The exclusion criteria included having skin allergy to the tested disinfectants during the study. These 33 members of surgical team were selected in reported hospital, so that each member was responsible for observing his or her experience on the test directly. To do this, members of the team embarked on scrubbing their hands in operating room according to the washing instruction and for this purpose, they used two types of solutions Povidone-Iodine and “Manugel 85” for scrubbing their hands separately. The data were collected via sampling. Data collection tool includes questionnaire of samples’ demographic specifications and sheet for registering laboratory results which microbiological culture has been reported in laboratory. All members participated in the study used disinfectant / antiseptic solution (Povidone-Iodine or Manugel 85) in two turns and then, they were evaluated. Samples were identical in terms of quantity and type of colony before surgical scrub with Povidone-Iodine and Manugel 85. (P. Value= 0.00)

Culture was conducted in two turns by researcher at the time of using each of antiseptic solutions i.e. Iodine and Manugel 85, from samples by immersing four fingers of their dominant hand in plate of culture environment of blood agar, approved by laboratory, in a way that ending joint of finger should have contacted with the culture environment. 1st culture was conducted before scrubbing immediately,

while second culture was made after scrubbing and 3rd culture was conducted one hour after scrubbing. In the end, cultures were sent to the laboratory for analysis. It should be noted that culture environments were stored for a period of 48 hours in incubator at 37 °C and then, their microbial colonies and type were studied in terms of quantity. SPSS software and t-test was used for statistical analysis.

3. RESULTS

Women constituted 85 percent (85%) of subject of study, i.e. 24.2 percent surgeons, nine persons (27.3%) hold bachelor’s degree and 15 persons (45.5%) were technicians in operating room and one person (3%) was practitioner nurse. The average age of samples stood at 36-40 years. The average number of colonies before and after scrubbing with Povidone-Iodine stood at 55 and 2 colonies respectively.

The test showed significant difference with each of substances before and after scrubbing. Also, reduced number of colonies stood at 96.58%. The average number of colonies before and after scrubbing with Manugel 85 stood at 50 and 1 colonies respectively. Then they are matched (0.600). Also, the reduced number of colonies stood at 96.58 percent. The comparison of these results indicate that average number of colonies before and after scrubbing each of the duo solutions were similar to each other (Table 1).

Comparing reduced number of colonies developed in surgical scrub with Povidone-Iodine and Manugel 85, statistical test showed that any significant difference was not observed. (P=0.083)

solutions	Before	After	P value
Povidone-Iodine	55	2	00.0
Manugel 85	50	1	00.0
	P value=0.600		

Table 1. Comparison of average number of colonies before & after scrubbing

Before scrubbing with Povidone-Iodine solution in 100% of grown cultures, staphylococci was appeared in a way that this rate hit 9.09 percent after scrubbing with Povidone-Iodine solution. (Table2). It shows that hands of all subjects of the study contaminated with staphylococci. The difference between type of colonies of staphylococci, streptococci and E-coli was significant before and after scrubbing with iodine solution.

Kinds of Colonies	Before %	After %	P Value
Staphylococcus	100	9.09	0.000
Streptococcus	60.61	6.06	0.000
E-coli	27.27	0	0.000
Others	18.18	0	0.012

Table 2. Distribution kinds of colonies before and after Povidone-Iodine scrubbing

Before scrubbing surgery with Manugel 85, 90.91 percent of cultures enjoyed staphylococci, the rate of which stood at 9.09% after scrubbing with Manugel 85. The said issue shows that hands of more members of surgical team had contaminated with staphylococci. Statistical analysis showed that there is not significant difference between

colony type of E-coli in before and after scrubbing with Manugel 85. These results are meant that effect of Manugel 85 on staphylococci, streptococci and other types of colonies was more than E-coli.

Kinds of Colonies	Before	After	P value
	%	%	
Staphylococcus	90.91	9.09	0.000
Streptococcus	27.27	0	0.002
E-coli	9.09	0	0.083
Others	45.46	0	0.000

Table 3. Distribution kinds of colonies before and after Manugel 85 scrubbing Statistical

Analysis did not show any difference between the numbers of colony of hands of surgical team members before scrubbing between iodine and Manugel 85. Also, most contamination in hands of surgical team members before scrubbing with both solutions was found in staphylococci and these results showed that samples matched with iodine and Manugel 85 in terms of quantity and type of colony before and after surgical scrubbing. After scrubbing with iodine solution, number of grown colonies reduced 96.58 percent. In the same direction, number of grown colonies reduced 99.09 percent after scrubbing with Manugel 85 (Table 4).

kinds of disinfections	percent
Povidon Iodine	96.58
Manugel 85	99.09
T-test	P value=0.083

Table 4. Reduction of number of grown Colonies

In this case, statistical analysis did not show any difference with each other as well (P=0.083). This shows the same effect of Povidone-Iodine and Manugel 85 on the number of colonies. The results showed that effect of Povidone-Iodine solution is high on staphylococci, streptococci and E-coli and effect of Manugel 85 on staphylococci and streptococci is significant. It should be noted that effect of Manugel 85 on E-coli was insignificant which shows that the sameness of effect of Povidone-Iodine and Manugel 85 solution on staphylococci colony which included the most contamination of hands of surgical team members. Therefore, with due observance to the aforementioned results, antiseptic and disinfectant effect of Povidone-Iodine and Manugel 85 was identical in reduction of contamination of surgical team members.

4. DISCUSSION

As it is specified from result of the present study, disinfection effect of Povidone-Iodine and Manugel 85 percent was identical. In a study which was conducted by Ghods and Irajian entitled "Effect of Alcohol in Surgical Scrub", they compared effect of Povidone-Iodine and combination of Povidone-Iodine and alcohol 70%. Researchers explained that surgical scrub has not any difference in efficacy of scrub with Povidone-Iodine solution (7.5%) and/or with combination of Povidone-Iodine and alcohol 70% which corresponds with the results of this study (7). But the results obtained in this study differed from the results of a study conducted by Kah Weng L, et al. (2012) in Austria, claiming that alcohol-based solution (avant-grade) has more efficacy to the Povidone-Iodine solution in reducing colonies of fingers of

surgical team members (9). The average number of grown colonies was found 55 colonies before surgical scrubbing with Povidone-Iodine solution, the number of which hit two colonies after surgical scrubbing with Povidone-Iodine solution. Reduced percentage of colonies after surgical scrub showed 96.58 percent with Povidone-Iodine solution. Also, statistical analysis showed significant difference between number of colonies before and after surgical scrub with Povidone-Iodine solution (P=0.000).

In a study conducted by Ghorbani, et al. average colony at hand of surgical team members showed significant difference before and after scrubbing with Povidone-Iodine solution (8). In a study conducted by Ghods and Irajian, the average colony at hands of surgical team members showed significant difference before and after scrubbing with Povidone-Iodine solution. In addition, significant difference was observed between average colonies before scrubbing and immediately after scrubbing with Povidone-Iodine solution (5 minute scrubs) (7). Based on which, results of comparison test before and after scrubbing conform to the results of this study. In another study conducted by Sharifi and Samadi Aydenlo, it showed that 40 percent of cultures were found "positive" before scrubbing with Povidone-Iodine, the rate of which hit 20 percent after scrubbing and was not significant statistically (1). The reduced colonies did not match with the results of the study. It should be noted that difference between colonies of staphylococci, streptococci and E-coli was significant with Povidone-Iodine solution before and after scrubbing. (P= 0.000) These results showed that effect of Povidone-Iodine on staphylococci, streptococci and E-coli was high. In a study conducted by Ghods and Irajian in 2007, maximum percentage of colonies of staphylococci stood at 69.4 percent (7). In another study conducted by Yuldashkhan, et al. 63 percent of surgical team members enjoyed positive warm Cocci colony before scrubbing with "Povidone-Iodine 63" solution, the figure of which hit 6.6 percent after scrubbing with Povidone-Iodine (4) and match with the results of this study. In a study conducted by Ghorbani, et al. entro bactero aeroinva has formed the maximum percentage of colony before scrubbing with Povidone-Iodine solution which does not match with the results of this study. After scrubbing with manugel, colonies reduced as much as 99.09 percent Also, paired t-test showed significant difference with the number of colonies before and after surgical scrubs with Manugel 85. (P= 0.000) , the average colony at hands of surgical team members showed significant difference before and after scrubbing with alcohol-based solution (Ethanol 70%) (8), the results of which are consistent with the results of this study. In another study conducted by Sharifi and Aydenlo, 33.3 percent of hands of surgical team members turned "positive" before scrubbing with decosept solution, the rate of which hit 3.2 percent after scrubbing (1). And paired t-test was significant which is consistent with the results of test statistically. Kah Weng L& et al. founded the average colonies stood at zero percent immediately after surgical scrubbing with Avant-grade alcohol-based solution (ethyl alcohol 61% along with chlor hexidine gloconut 1%) (9) that is consistent with the results of this study.

It should be noted that 90.91 percent of culture enjoyed staphylococci before surgical scrubbing with "Manugel

85", the rate of which hit 9.09 percent after scrubbing. The statistical analysis showed that there is not significant difference between types of colony of E-coli before and after scrubbing with "Manugel 85" but there is significant difference between colonies of staphylococci, streptococci and other types before and after scrubbing with Manugel 85. Ghorbani, et al. conducted entrobacteroaeroinva constituted maximum percentage of colonies before scrubbing with Decosept solution (8) the result of which are not consistent with the results of this study. Yuldashkhan et al. found 77 percent of hands of surgical team members had warm "positive" Coccids before scrubbing with Decosept solution, there ate of which reduced up to nine percent (9%) after scrubbing (4) the results of which are consistent with the result of this study. With regard to the objective of determining "Comparative Effect of Povidone-Iodine and Manugel 85 in Surgical Scrubs", 100 percent cultures before surgical scrubs with Povidone-Iodine solution and 90.91 percent "Manugel 85" enjoyed staphylococci. There was not any significant difference between these two groups. (P= 0.083) but there was significant difference between colonies of streptococci (P= 0.000), E-coli (P=0.000) and other types of colonies (P=0.000).

The results showed that samples were matched to each other before scrubbing with Povidone-Iodine and "Manugel 85" in terms of number of staphylococci colony. Comparing the number of colonies after surgical scrubs between Povidone-Iodine and "Manugel 85" show that the average number of colonies did not any significant difference after surgical scrub with Povidone-Iodine solution and "Manugel 85" (P= 0.083), the issue of which indicate the effect of Povidone-Iodine and "Manugel 85" on the reduced number of colonies of surgical team hands. Sharifi and Aydenlo showed 3.2 percent hands after scribing with Decosept and 20 percent of hands of surgical team after scrubbing with Povidone-Iodine solution turned "positive" (1), the result of which is not consistent with the results of this study. Comparing the number of colonies grown on hands of surgical team members showed 96.58 percent decrease in Povidone-Iodine solution and also 99.09 percent in Manugel 85. In the same direction, any significant was not observed statistically between reduced number of colonies grown at hands of surgical team members after being scrubbed with Manugel 85 and Povidine Iodine solution. (P= 0.083), showing relatively equal effect of Povidone-Iodine and Manugel 85 on the number of colonies. Also 50 percent (50%) of positive cultivations scrub were decreased in surgical scrub with Povidone-Iodine, the rate of which decreased 90 percent in surgical scrub with Decosept solution (1). Given the above issue, the obtained results are consistent with the result of this study in terms of considerable decline in surgical scrub with Decosept solution but it is not consistent with the percentage of decrease in surgical scrub with Povidone-Iodine.

Kah Weng L& et al. conducted that alcohol-based avantgarde solution (ethyl alcohol 61% along with Chlorhexidine Gluconate 1%) has more effectiveness than Povidone-Iodine solution in terms of reduced colonies in hands of surgical team members (9), the result of which has not consistent with the results of this study. Also Gupta& et al. in U.S. investigated effect of alcohol-based solution (without rinsing) and alcohol-based solutions (with rinsing) were studied in

comparison with Povidone-Iodine solution. These researchers stated that alcohol-based solution (without rinsing) was found more effective than alcohol - based solutions (with rinsing and Povidone-Iodine) (10), the result of which are not consistent with the result of this study. Kac & et al. compared three surgical scrubs with Povidone-Iodine solution (4%) and Sterillium in 1.5 and three minutes respectively and concluded that effect of surgical scrub with Sterillium solutions in 1.5 and three minutes is equal but there is a significant statistical difference between Povidone-Iodine and Sterillium solutions in 1.5 and three-minute periods (11), the results of which are not consistent with the result of this study.

With regard to the effectiveness of ethanol, Suchomel et al. conducted antibacterial ethanol effect in surgical scrub with concentrations of 75%, 85% and 95% in three minutes and compared it with Europe reference method using E-Propanol 60% for a period of three minutes of scrubbing. The result showed that effect of ethanol 75% and 95% was less than that of reference sample (E-propanol 60%) significantly but ethanol 85% did not show any significant reduction to the reference sampler in 3 to 5 minutes scrubbing timers). They proposed surgical scrub with ethanol, provided that ethanol should have a concentration between 75 and 85 percent for a period of three-minute scrubbing (12, 13). The Manugel 85, which contains 82% Ethanol, was used in this study, the result of which is consistent with the results conducted by them.

5. CONCLUSION

The most pollution in hands of surgical team before scrubbing with Povidone-Iodine and Manugel 85 were related to staphylococci. Before surgical scrubbing, samples were matched with Povidone-Iodine and Manugel 85 in terms of number and type of colony. After scrubbing with Povidone-Iodine and Manugel 85, a considerable decline was observed in the colonies grown but did not show any statistical difference. (P=0.083) The said issue indicates the sameness of effect of Povidone-Iodine and Manugel 85 on the number of colonies. Effect of Povidone-Iodine solution is high on staphylococci, streptococci and E-coli but Manugel 85 affects significantly on "staphylococci" and "streptococci". Effect of Manugel 85 on "E-coli" was insignificant. With due observance to the aforementioned results, disinfectant effect of "Povidone-Iodine" and "Manugel 85 in surgical scrub is identical and the hypothesis of the study entitled "Effect of "Povidone-Iodine" Solution and "Manugel 85" in Surgical Scrub Differs from Each Other" is rejected. In a nutshell, both "Povidone-Iodine" and "Manugel 85" solutions showed the same disinfectant effect on surgical scrub.

Then the substitution of "Manugel 85" to surgical scrub in areas which suffering from water shortage problem is recommended .As the study showed that 100% type of pollutant colony was "staphylococci", it recommended that surgical team to wash their hands repeatedly to presenting sanitary healthcare to patients.

- **Author's contribution:** All authors contributed in all phases of preparing this article. Final proof reading was made by first author.

• **Conflict of interest: none declared.**

REFERENCES

1. Sharifi N, Samadi Aydenlo N. Comparison of antiseptic effect of Decosept and Povidin Iodine on hand skin normal flora. *Journal of Urmia Nursing and Midwifery Faculty*. 2008 Oct 15; 6(3): 121-6.
2. Awad SS. Adherence to surgical care improvement project measures and post-operative surgical site infections. *Surgical infections*. 2012 Aug 1; 13(4): 234-7.
3. Widmer AF, Rotter M, Voss A, Nthumba P, Allegranzi B, Boyce J, Pittet D. Surgical hand preparation: state-of-the-art. *Journal of Hospital Infection*. 2010 Feb 28; 74(2): 112-22.
4. Yuldashkhan M, Bolurchifard F, Amiri Z. Comparing two antiseptic solutions for scrubbing. *Journal of Shahid Beheshti School of Nursing & Midwifery*. 2008; 18(60).
5. Potter PA, Perry AG, Stockert P, Hall A. *Fundamentals of nursing*. Elsevier Health Sciences; 2013 Dec 27.
6. Carpenito-Moyet LJ. *Nursing care plans & documentation: nursing diagnoses and collaborative problems*. Lippincott Williams & Wilkins; 2009.
7. Ghods AA, Irajian GR. Survey the effect of alcohol on surgical scrub.
8. Ghorbani A, Soltani Z, Molapoor A, Shafikhani M. Comparison efficiency of surgical handscrub with betadin and surgical hand rub on hands' microbial burden. *Iranian Journal of Medical Microbiology*. 2009 Dec 15; 3(2): 55-60.
9. AvMed D, Foo TL, Low W, Naidu G. Surgical Hand Antisepsis—A Pilot Study comparing Povidone-Iodine Hand Scrub and Alcohol-based Chlorhexidine Gluconate Hand Rub. *Ann Acad Med Singapore*. 2012; 41: 12-6.
10. Gupta C, Czubytyj AM, Briski LE, Malani AK. Comparison of two alcohol-based surgical scrub solutions with an iodine-based scrub brush for presurgical antiseptic effectiveness in a community hospital. *Journal of Hospital Infection*. 2007 Jan 31; 65(1): 65-71.
11. Kac G, Masmejean E, Gueneret M, Rodi A, Peyrard S, Podglajen I. Bactericidal efficacy of a 1.5 min surgical hand-rubbing protocol under in-use conditions. *Journal of Hospital Infection*. 2009 Jun 30; 72(2): 135-9.
12. Suchomel M, Rotter M. Ethanol in pre-surgical hand rubs: concentration and duration of application for achieving European Norm EN 12791. *Journal of Hospital Infection*. 2011 Mar 31; 77(3): 263-6.
13. Suchomel M, Koller W, Kundi M, Rotter ML. Surgical hand rub: influence of duration of application on the immediate and 3-hours effects of n-propanol and isopropanol. *American journal of infection control*. 2009 May 31; 37(4): 289-93.