RESEARCH

Comparison of The Effectiveness of Using Antiseptic Povidone Iodine 10% with Octenidine Hydrochloride 0.1% in Neuroaxial Block Action in Patients Who Will Undergo Surgery at Haji Adam Malik General Hospital Medan

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ABSTRACT

Background: Antiseptics or germicides are chemical compounds used to kill or inhibit the growth of microorganisms on living tissue such as the surface of the skin and mucous membranes.

Objective: To determine the comparative effectiveness of povidone iodine 10% antiseptic compared to octenidine hydrochloride 0.1% in neuraxial blockade in patients undergoing surgery at Haji Adam Malik General Hospital, Medan.

Methods: This study is an experimental study of the two-group pre-test - post-test study type. This design is a design that groups patients into certain groups that receive different treatments based on group division. There are two groups, with each group containing 10 samples.

Result: In group A (povidone iodine 10%), the average value of bacterial growth before aseptic action was 192.20±117.54, and after aseptic action, no bacterial growth was found with a P Value of 0.005. In group B (octenidine hydrochloride 0.1%) before aseptic action was performed, the average bacterial growth value was 212.20 ± 107.21, and after aseptic action, no bacterial growth was found with a P Value of 0.004.

Conclusion: There was no significant difference in the bacterial profile after aseptic with povidone iodine 10% and octenidine hydrochloride 0.1%.

Keywords: aseptic; bacteria; neuroaxial block; octenidine hydrochloride 0.1%; povidone iodine 10%

INTRODUCTION

Antiseptics are used to reduce microbes on the skin, mucosa, or wounds to prevent infection. Octenidine hydrochloride is a bispyridine type antiseptic with activity against gram-positive and gram-negative bacteria. The bactericidal mechanism of octenidine hydrochloride on gram-negative bacteria is not specific. After binding to the bacterial surface, it then enters through the lipopolysaccharide layer and interacts with the outer lipid membrane, causing lipid disruption, which ultimately leads to bacterial cell lysis. After binding to the bacterial surface, it then enters through the lipopolysaccharide layer and interacts with the outer lipid membrane, causing lipid disruption, which ultimately leads to bacterial cell lysis. Similarly, inducing membrane disruption was also found in gram-positive bacteria.[1]

Octenidine hydrochloride is a cationic surfactant that has been used as an antiseptic, available in concentrations of 0.1% to 2.0% due to its antibacterial activity against gram-positive and gram-negative bacteria. Octenidine hydrochloride is not absorbed through mucous membranes, skin and wounds. Octenidine hydrochloride has been tested against *Enterococcus faecalis* and is a commonly used antiseptic in medical facilities.[2] In addition, it is also highly biocompatible and is a substitute for chlorhexidine.[3]

Octenidine hydrochloride was introduced more than 20 years ago for skin, mucous membrane and wound antisepsis. The success of decolonization of *Staphylococcus Aureus* with therapy containing octenidine hydrochloride ranges between 6 and 87%.[8.9] In a study conducted by Guddety, the use of octenidine hydrochloride showed better results when compared with povidone iodine in healing diabetic ulcers.[4]

In a study at Dr. Hasan Sadikin Hospital, Bandung, the antiseptic chlorhexidine - alcohol had lower bacterial growth compared to povidone iodine in epidural catheters.[5]

In Indrawan's research, the effectiveness of the antiseptic combination chlorexidine gluconate cetrimide - alcohol 70% was better when compared to the antiseptic povidone iodine 10% on the density of germs in spinal anesthesia procedures.[12] According to Bhatnagar, meningitis after spinal anesthesia is considered rare but is essentially a serious complication. The incidence of infectious complications after neuraxial blockade ranges from 0% to 0.04%. These complications can occur not only during spinal anesthesia but also after lumbar puncture, epidural analgesia/anesthesia, myelography and other neurosurgical procedures involving the spine. A 35-year-old man, a case of torn left leg ligaments was planned for arthroscopic action and spinal anesthesia was performed, then the patient was suspected of having meningitis and underwent cerebro spinal fluid (CSF), computerized tomography (CT) head and fundoscopy examinations. Microscopic examination shows several gram-stained growths.[6]

METHOD

This research is an experimental research type of two group pre-test–post-test study. This design is a design that groups patients into certain groups who receive different treatments based on group division. The patient population is patients who will undergo surgery with neuraxial block anesthesia in the operating room of Haji Adam Malik General Hospital, Medan. Samples were

taken from a population sample that met the inclusion and exclusion criteria who would undergo surgery with neuraxial block anesthesia in the operating room of the Haji Adam Malik General Hospital, Medan. The samples were selected based on the random sampling method manually using coins with a nominal and image system with a sample size of 10 samples in each group.

Randomly selecting and dividing the research samples into two groups, namely the group given 10% povidone iodine antiseptic and 0.1% octenidine hydrochloride. In group A patients, after the patient was positioned for neuraxial blockade, before treatment, the patient was immediately swabbed using a cotton swab by swabbing vertically and then horizontally while rotating the cotton swab, then the cotton swab was inserted into a tube containing tryptic soy broth (TSB). The patient's back is aseptically swabbed using 10% povidone iodine then using 70% alcohol, then wait until it dries and then swabbed with a cotton swab again, then the cotton swab is inserted into a tube containing tryptic soy broth (TSB), then sent to the microbiology lab to be cultured for the next 4 days to see the type of germs that grow in the culture medium.

The patients in group B, after the patient was positioned for the neuraxial blockade, before treatment, the patient was immediately swabbed using a cotton swab in a vertical direction then horizontally while rotating the cotton swab, then the cotton swab was inserted into a tube containing TSB. The patient's back is aseptically cleaned using octenidine hydrochloride spray 0.1%, then wait until it dries and then swab it with a cotton swab again, then the cotton swab is inserted into a tube containing TSB, then sent to the microbiology lab to be cultured for the next 4 days to see the type of germs that grow in the culture medium.

RESULTS

The average age value in group A, povidone iodine 10% is 40.50 ± 12.70 compared to group B, octenidine hydrochloride 0.1% is 40.70 ± 13.9 (Table 1). There was no statistical difference in mean age between the two groups with a P value of 0.943.

In terms of gender, 2 (20%) subjects were male and 8 (80%) subjects were female in group A, and in group B, 3 (30%) subjects were male and 7 (70%) subjects were female. In the distribution of gender data, it was found that more women were the research subjects. However, there was no statistically significant difference in both groups with a P value of 0.606 where female gender was the most common gender in the study sample in both groups.

In the magnitude of the diagnosis group A, povidone iodine 10% obtained the type of digestive surgery as much as 1 (10%), obgyn as much as 3 (30%), urology as much as 5 (50%) and orthopedics as much as 1 (1%). In group B, octenidine hydrochloride 0.1%, the types of obstetric surgery were 6 (60%) and orthopedic surgery were 4 (40%).

Table 2 explains the data on the number of bacteria identified in each sample taken from the skin swab of the research subject before the administration of antiseptic. The swab results are then cultured and the type of bacteria that grows is identified. In this research, it was found that there was growth of only 1 type of bacteria in group A as many as 3 (30%) samples and in group B as many as 0 (0%) samples. Meanwhile, the results of bacterial growth identification

of ≥ 2 types of bacteria were found in 7 (70%) samples in group A and 10 (100%) samples in group B. In this research, dominant bacterial growth of more than 1 type of bacteria was found in each culture sample of both groups. Statistically, no significant differences were found in the characteristics of the two groups.

Table 3 identifies the types of bacteria that grew on each cultured skin swab sample. In this research, 8 types of bacterial genera were found to grow in all sample cultures studied. In the results of this research, the type of germ that grew the most in group A was *Staphylococcus sp*. A total of 10 (58.8%) samples. Followed by bacteria of the *Acinetobacter sp*, *Micrococcus sp* types. Meanwhile, in group B, the type of germ that grew the most was the genus *Staphylococcus sp*. As many as 6 (30%) samples, followed by the types of *Micrococcus sp*, *Acinetobacter sp, Pseudomonas sp, Kocuria sp*.

In the research (Table 4), observations were made on the number of bacterial colonies that grew in culture samples taken before the administration of antiseptics. In cultures from samples taken from the skin, the average bacterial growth value in group A was 192.20 ± 117.54 and in group B was 212.20 ± 107.21. Statistically, there was no difference in the average number of columns between Group A and Group B.

Table 5 a comparison is made of changes in bacterial colony values before and after aseptic actions are carried out. In group A (povidone iodine 10%), the average value of bacterial growth before aseptic action was 192.20±117.54, and after aseptic action, no bacterial growth was found with a P Value of 0.005. In group B (hydrochloride 0.1%) before aseptic action was carried out, the average bacterial growth value was 212.20 ± 107.21, and after aseptic action was carried out, no bacterial growth was found with a P Value of 0.004.[6]

Table 1. Characteristics of research subjects

Characteristics	Povidone Iodine 10%	Octenidine Hydrochloride 0.1%
Age	40.50±12.70	40.70±13.91
Gender		
Man	2 (20)	3 (30)
Woman	8 (80)	7 (70)
Type of operation		
Digestive surgery	1 (10)	0 (0)
Obgyn	3 (30)	6 (60)
Urology	5 (50)	0 (0)
Orthopedics	1 (10)	4 (40)

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.800[a]	3	0.032
Likelihood Ratio	11.265	3	0.010
Linear-by-Linear Association	0.235	1	0.628
N of Valid Cases	20		

Table 2. Pre aseptic bacteria

Number Type of Bacteria	Povidone Iodine 10%	Octenidine Hydrochloride 0.1%	P Value
1 Type of Bacteria	3 (30)	0 (0)	0.060
≥ 2 Types of Bacteria	7 (70)	10 (100)	

Table 3. Profile of germs growing from pre-aseptic culture results

Number types of Bacterial	Povidone Iodine 10%	Octenidine Hydrochloride 0.1%
Acinetobacter sp.	4 (23.5)	2 (10)
Staphylococcus sp.	10 (58.8)	6 (30)
Pseudomonas sp.	0 (0)	2 (10)
Leuconostoc sp.	0 (0)	1 (5)
Micrococcus sp.	2 (11.8)	5 (25)
Kocuria sp.	1 (5.9)	2 (10)
Trichosporon sp.	(0)	1 (5)
Proteus	0 (0)	1 (5)

Table 4. Number of bacterial colonies growing from pre-aseptic culture results

Number of Colonies	Mean±SD	P Value
Povidone Iodine 10%	192.20±117.54	0.77
Octenidine Hydrochloride 0.1%	212.20±107.21	

Table 5. Profile of germs growing from pre and post aseptic culture results

Types of Antiseptics	Mean ± SD (Pre Aseptic)	Mean ± SD (Post Aseptic)	P Value
Povidone Iodine 10%	192.20 ± 117.54	0	0.005
Octenidine Hydrochloride 0.1%	212.20 ± 107.21	0	0.004

DISCUSSION

The antiseptic substance chlorhexidine - alcohol has lower bacterial growth compared to povidone iodine in epidural catheters. Post-epidural catheter culture was positive for bacteria in 7 of 38 on chlorhexidine-alcohol and 5 of 38 on povidone iodine ($p < 0.05$).[7]

Based on the results of this study, it can be recommended to use the antiseptic octenidine hydrochloride spray 0.1% or povidone iodine 10% in neuraxial block actions to prevent infection, but the antiseptic octenidine hydrochloride spray 0.1% is more practical in terms of use. Octenidine Hydrochloride is toxic to cartilage tissue, and therefore should not be used for intra-articular irrigation. Long-term use of 10% povidone iodine can worsen wounds and inhibit the wound healing process because it is toxic to fibroblasts, causes allergic reactions, irritates the skin and can cause toxic effects on surrounding living tissue. The toxic effects caused by povidone iodine 10% can disrupt the wound healing process by disrupting the epithelialization process.[8]

In Indrawan's research, the effectiveness of the antiseptic combination chlorexidine gluconate cetrimide - alcohol 70% was better when compared to the antiseptic povidone iodine 10% on the density of germs in spinal anesthesia procedures.[9]

In this research, there was no allergic reaction after aseptic action of povidone iodine or octenidine hydrochloride 0.1%. However, povidone iodine 10% is less likely to cause irritation compared to chlorhexidine and quaternary ammonium compounds. So, overall, povidone iodine is considered a weak allergen, with an allergenicity prevalence of 0.4%. The results of this research are expected to provide useful scientific information regarding the effectiveness of Octenidine Hydrochloride 0.1% and povidone iodine 10% on bacterial growth in neuraxial block procedures.[10]

In this study, the most pre-aseptic germs were found to be *Staphylococcus species*, this is in line with the statement of the Indonesian Association of Dermatologists and Venereologists that skin and soft tissue infections caused by pyogenic bacteria are most often dominated by *Staphylococcus species*, especially *Staphylococcus Aureus* and *Staphylococcus Epidermidis.*[11]

Octenidine hydrochloride in a concentration of 0.05 - 0.1% is able to kill bacteria in just 1 minute against the bacteria and fungi tested, including *S. Aureus, Pseudomonas Aeruginosa and Candida Albicans*, and to date there have been no reports of cases of acquired resistance to this antiseptic.[12] Colonization of germs on the skin is very risky to contaminate, which can cause bacteria to move to a new environment and can grow as pathogenic germs, the addition of alcohol will further increase the bactericidal effect.[13]

In previous research conducted by Guddety in a randomized controlled trial comparing the administration of octenidine gel with povidone iodine dressing in wound healing in chronic diabetic ulcers, the results showed that octenidine gel had shown good progress in healing ulcers in terms of reducing the area of ulcers compared to povidone iodine dressings.[14]

Alcohol solution is bactericidal after 10 seconds, and 10% povidone iodine is bactericidal after 15-20 seconds. Octenidine hydrchloride 0.1%, has antimicrobial activity within 30 seconds After a contact time of 1 minute, octenidine hydrochloride was more effective against *S. aureus, E. coli* than povidone iodine. Povidone iodine has broad antimicrobial effectiveness against Gram-positive and Gram-negative organisms, spores and various viruses. Octenidine also has a broad spectrum of antimicrobial effectiveness that includes Gram-positive and Gram-negative bacteria, Methicillin Resistant *Staphylococcus Aureus* (MRSA), plaque-forming organisms such as *Actinomyces sp* and *Streptococcus sp*, atypical organisms such as *Chlamydia sp* and *Mycoplasma sp*, spores, and some viruses (e.g. hepatitis B virus and herpes simplex virus).[15]

CONCLUSION

Our findings in this study indicate that there is no significant difference in the bacterial profile after administration of 10% povidone iodine and 0.1% Octenidine hydrochloride antiseptics, so based on the results of this study it can be recommended to administer 10% povidone iodine or 0.1% Octenidine hydrochloride as an antiseptic and aseptic action before performing neuraxial blockade to prevent bacterial infection after neuraxial blockade.

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