DECAMETOXIN-BASED ANTI-SEPTIC SOLUTIONS VS POVIDONE-IODINE IN PREVENTIVE THERAPY OF THE SKIN IN VENOUS CATHETER CARE

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Summary. The main route of development of catheter-associated sepsis is a secondary contamination of subcutaneous tunnel by the patient's own skin microflora. There is long and positive experience of application of decametoxin-based antiseptics Amosept and Horosten for skin decontamination. In this study we compare effectiveness of antiseptic solutions on the basis of decametoxin and Povidone-iodine for preventive treatment of patients' skin before installing and during the use of vascular catheter. Also the influence of application of different skin antiseptics on the rate of catheter-associated infections was studied. After the treatment of the skin by decametoxin-based antiseptics microorganisms were not appearing. In 3 hours after treatment by Povidone-iodine there was found the number of microorganisms resulting in 3.2 CFU/cm^2, in case of Amosept application - 0.9, and alcohol solution of decametoxin – 0.3. In 24 hours after the processing the differences in the number of microorganisms on the skin in Povidone-iodine and Amosept group slightly decreased. The areas of skin treated by 0.1 % alcohol solution of decametoxin remained the least contaminated. Treatment of skin by Amosept or 0.1 % alcohol solution of decametoxin resulted in decreasing of the rate of catheter-associated infections by 3.5 and 12.5 % respectively, as compared to the treatment by Povidone-iodine – 52 %.
Key words: *decametoxin, catheter, infection, prevention, skin decontamination.*

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INTRODUCTION

Venous catheters are the most common devices implanted to provide venous access for patients' treatment. The main route of catheter-associated sepsis is a secondary contamination of subcutaneous tunnel by the micro flora of patient's skin. For catheters that are set for a period of 10 days, there is a correlation between a high level of colonization of the skin, the outer surface of the catheter and catheter-associated sepsis [1]. Therefore, one should aim the prevention efforts at reducing the colonization of the skin during catheter installing and at microorganism growth control in the place where catheter is installed to prevent contamination of catheter tunnel and catheter itself. Worldwide it is recommended to use 70% solution of ethyl alcohol, alcohol solutions of iodine and chlorhexidine, iodophor, chlorhexidine solutions to prepare the skin to catheter installing and further care. However, despite this range about 80,000 cases of catheter-associated bacteremia is registered even in the United States annually [2].

In terms of search for new anti-septic medicinal product for prevention of catheter-associated infection, a well-known domestic medicinal product with high antimicrobial activity – decamethoxin – is of high-potential. There is long and positive experience of application of decametoxin-based antiseptics Amosept and Horosten for skin decontamination. When comparing the disinfecting action of Horosten with a cosmetic soap, antibacterial soap, anti-septic agents based on benzalkonium chloride and chlorxylenol in the conditions of artificial contamination of hands, the efficacy of domestic product was higher than that of traditional hygiene products and imported drugs for skin disinfection [3]. Preparation of hand skin with Amosept in the conditions of artificial contamination provided complete removal of allochthonic flora [4]. Application of Amosept for skin preparation for surgery provides with abacterial skin up to the end of surgery. [5]

The objective of this study was to compare the efficacy of antiseptic solutions based on Decametoxin and Povidone-iodine in preventive treatment of patients' skin prior to installing venous catheters. Also the effect of skin preparation by different antiseptics on the development of catheter-associated infections was studied.

SUBJECT AND METHODS OF THE STUDY

Determination of the effectiveness of skin preparation in patients by various antiseptics before installation of intravascular catheters during the treatment process was completed by quantitative imprint method on solid medium. For this purpose sterile culture dish 3 cm in diameter was filled with 5% blood beef-extract agar and it was pressed firmly to the skin in the area of catheter installation. Imprint was incubated at 37°C for 24 hours and the number of colony forming units (CFU) was counted, and morphological properties of microorganisms were determined. Imprints on solid medium were performed from the same area of skin prior to catheter installing, directly after skin preparation with antiseptic, in 3 h and in 24 h after that and before removal of catheter.

Before installation of central venous catheters and during subsequent care patients' skin was prepared by means of one of three ways mentioned below. In the control group patients' skin was prepared with Povidone-iodine solution. The skin in the area of catheterization was three times applied with Povidone-iodine solution. When changing the dressing, the skin around the catheter was treated similarly. Patients of the first experimental group before installing central venous catheter and during further

care were treated with Amosept, which is a film-forming alcoholic solution containing 0.5% decametoxin. Before applying Amosept the skin was three times wiped with 70% alcohol to remove dirt and keratinized epidermis. Amosept was applied in an amount of 5 ml, all manipulations were started after the formation of a transparent film. When changing the dressing, the skin was treated with alcohol solution and Amosept was applied again. For skin preparation of patients of second experimental group decametoxin 0.1% solution in 70% ethanol was used. Antiseptic was applied three times before catheter installing. When changing the dressing, the skin around the catheter was prepared twice. Further care for all catheters was performed under the same scheme. Sterile gauze was replaced every 48 hours or earlier, if it got dirty or wet. The skin around the catheter was treated with one of the mentioned above antiseptics for 20-30 seconds. When changing the dressing, place, where a catheter was installed, was examined for signs of inflammation. The solutions to remove the catheter was made by a doctor regardless of the course of the study.

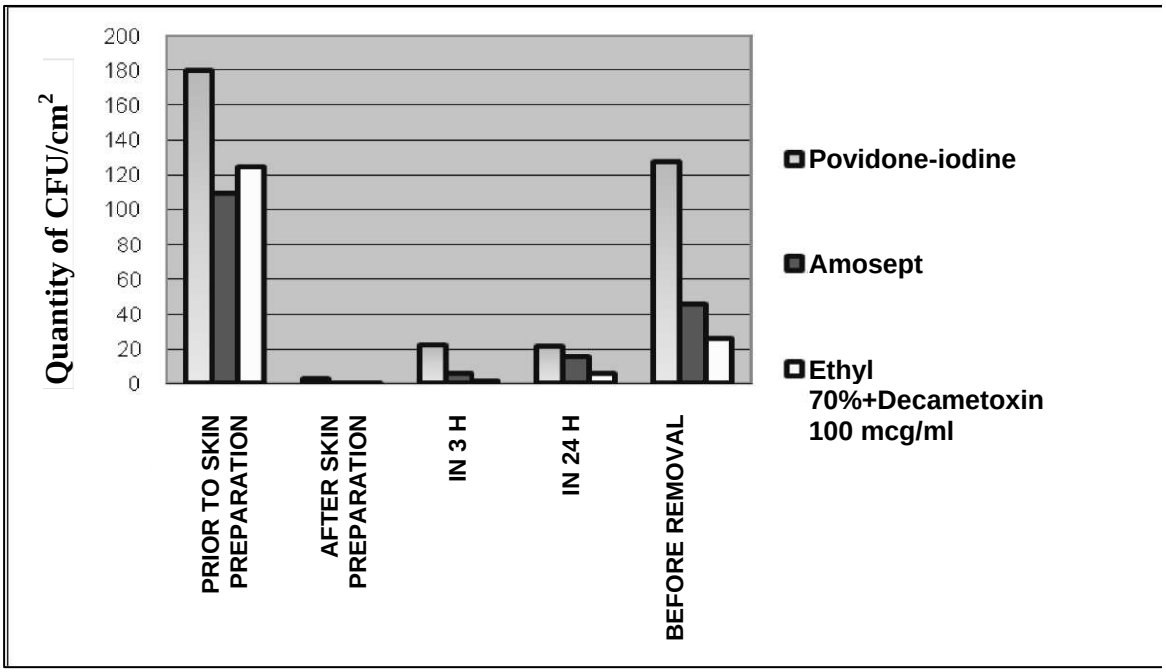
The study of microbial contamination of central venous catheters in patients was carried out by semiquantative estimation method. The segment of catheter was rolled over the surface of the dish with solid medium. In 24 h the number of CFU was counted and the species composition of microorganisms was determined. Positive result with more than 15 CFU during catheter sowing points to a degree of catheter and catheter tunnel colonization that is leading to the development of local catheter puncture wound infection and catheter-associated septicemia.

RESULTS AND DISCUSSIONS

The results of bacteriological study of the degree of microbial contamination of the skin using different means of antiseptic preparation of the skin is shown in Fig.

When using any of the investigated antiseptics the reduction of a number of microorganisms on the skin was observed. Preparation of the skin with Povidone-iodine did not lead to sterility of the skin in imprints on culture medium made directly after the treatment, and there was growth of microorganisms. After preparation of the skin with medicinal products containing decametoxin no growth of bacteria was observed; in 3 hours after treatment with Povidone-iodine – 3.2 CFU/cm2 was detected; in case of Amosept – 0.9, and in case of decametoxin alcohol solution – 0.3. In 24 hours after the treatment the difference in organisms on the skin treated with Povidone-iodine and Amosept showed reduction. The skin areas prepared with 0.1% decametoxin alcohol solution were the least contaminated. The same tendency preserved up to removal of catheters.

All participants of the study prior to skin preparation had staphylococci; almost with the same frequency – tetracocci, streptococci and gram-negative and gram-positive bacilli. After the influence of Povidone-iodine, in 3 hours there were no streptococci or tetracocci observed. The impact on bacilli and staphylococci was less pronounced. 24 h after the treatment, most examined patients had the skin around catheter colonized by the same groups of microorganisms as before applying antiseptic preparation. Given the fact that this area of skin is under the dressing, the emergence of microorganisms can be explained by their translocation from deeper skin layers.



In the control group of patients where the skin was prepared with Povidone-iodine solution, 62 vascular catheters were sifted. There were 32 positive results, and 58 strains were allotted. Among them, 18 (29%) of catheters were recognized to be infected by shedding criterion of more than 15 CFU from one segment, 29 strains of microorganisms were allotted. In the analysis of all microorganisms isolated from vascular catheters, staphylococci dominated. The second were aerobic gram-negative bacilli, then two cases of enterococci and two cases of diphtheroids, one case of *Candida spp* allocation. Among the various types of cocci *S. epidermidis* dominates, followed by *S. haemolyticus*.

In several cases the microorganisms belonging to the taxon *Micrococcus* were sifted. In the group of aerobic non-fermentable gram-negative bacilli acinetobacters were

most frequent. From 12 (20%) catheters microorganisms were in associations.

In the group of patients where the skin was prepared with the solution of 0.1% decametoxine in 70% ethanol, the sifting of 24 central venous catheters was performed. 4 positive cases were determined, 5 strains were allocated. Among them 3 (12.5%) catheters are recognized to be infected by shedding criterion of more than 15 CFU. In one case the association of *S. epidermidis* and *A. Iwoffi* was determined. Among all the microorganisms, isolated from vascular catheters, staphylococci dominated.

In patients where the skin was prepared with Amosept, the sifting of 28 central venous catheters was performed. The positive result was revealed in 1 case, *A. Iwoffi* strain was isolated.

CONCLUSIONS

In the vein catheterization the main source of contamination of vascular catheters is the skin, and contamination occurs via the outer surface of the catheter. Contaminants related to the microflora of the skin dominate in the spectrum. Gram-negative bacilli, particularly aerobic gram-negative non-fermentable bacilli acquire more actuality.

The results of bacteriological study of the degree of microbial contamination of the skin around the place of catheter installing and the results of catheter sifting show higher preventive efficiency of Amosept and 0.1% alcohol solution of decametoxin iodine-based antiseptics.

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