

ПЕРСПЕКТИВЫ ИСПОЛЬЗОВАНИЯ ПРЕПАРАТОВ СЕРЕБРА ДЛЯ ЛОКАЛЬНОГО ЛЕЧЕНИЯ РАНЕВОЙ ИНФЕКЦИИ

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✓ Резюме

Цитоморфологические исследования выявили, что дифференцированный подход с применением двухкомпонентной мази на основе ионов серебра в сочетании Повидон-йодом с учетом фазы течения раневого процесса при лечении раневой инфекции, в отличие от традиционных методов лечения имеет ряд положительных моментов. В частности, на 2-2,5 дня быстрее происходит очищение раны от инфекции, на 2,5-3,0 суток ускоряется процесс перехода раневого процесса из I во II фазу, уже на 4-5 сутки лечения цитологическая картина сменяется воспалительно-регенераторным типом цитограммы, которая характерна неосложненному течению воспалительного процесса, также резко уменьшается количество гнойно-некротических, дисрегенераторных осложнений в ране, что способствует быстрому рубцеванию и эпителизации ее поверхности.

Ключевые слова: раневая инфекция, Повидон-йод, двухкомпонентные препараты серебра

ЖАРОҲАТ ИНФЕКЦИЯСИНИ ДАВОЛАШДА КУМУШ САҚЛОВЧИ ВОСИТАЛАРИНИ ҚЎЛЛАШ ИСТИҚБОЛИ

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Цитоморфологик тадқиқотлар шуни кўрсатдики, жароҳат инфекциясини кечиш босқичларини инобатга олган ҳолда, икки компонентли кумуш ионлари асосидаги малҳам ва повидон – йод эритмасини дифференциялашган ҳолда қўллаш, одатий даволаш усулларидан фарқли равишда бир қанча ижобий таъсир кўрсатади. Хусусан, жароҳатнинг инфекциядан тозаланиши 2,0-2,5 кунга тезроқ амалга ошиб, жароҳат кечиш босқичининг I босқичдан II чи босқичга ўтиши 2,5-3,0 суткага тезлашади. Даволашнинг 4-5 суткасида цитоморфологик кўриниш яллиғланиш жараёнининг асоратланмаган кечиши мос бўлиб, яллиғланиш регенератор типга ўзгаради, шунингдек жароҳатдаги йирингли-некротик ҳамда дисгенератор асоратлар камайиб, жароҳатда фаол чандиқланиш ва эпителизация жараёни бошланади.

Калит сўзлар: жароҳат инфекцияси, Повидон-йод, икки компонентли кумуш сақловчи восита.

PROSPECTS FOR THE USE OF SILVER PREPARATIONS FOR THE LOCAL TREATMENT OF WOUND INFECTION

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✓ Resume

Cytomorphological studies have revealed that a differentiated approach with the use of a two-component ointment based on silver ions combined with Povidone-iodine, taking into account the phase of the wound process in the treatment of wound infection, in contrast to traditional methods of treatment, has a number of positive aspects. In particular, the wound is cleared of infection by 2,0-2,5 days faster, the process of transition of the wound process from phase I to phase II is

accelerated by 2,5-3,0 days, already on the 4-5 day of treatment, the cytological picture is replaced by an inflammatory-regenerative type of cytogram, which is characteristic of the uncomplicated course of the inflammatory process, and the number of purulent-necrotic, dysregenerative complications in the wound, which contributes to rapid scarring and epithelization of its surface.

Key words: wound infection, Povidone-iodine, two-component silver preparations

Relevance

The treatment of wound infection is still one of the topical problematic surgery. In recent decades, the number of patients with purulent surgical pathology has not tended to decrease [1,3,4]. When a pathological process is generated, signs of a systemic inflammatory reaction (SIRR) with organ dysfunctions develop, leading to disability and mortality up to 10-25% [11,13,14]. The basis for the treatment of wound infections is local debridement and dressings, depending on the stage of the wound process. Until now, a number of methods of local treatment of wound infection that cannot be taken into account have been proposed, which are constantly being updated, and there is a search for highly effective, safe ways to correct the pathological process [2,6,10,16]. The outcome of the entire treatment process largely depends on the correctness of determining the stage of the course of the wound process, the severity of endogenous intoxication, the choice of drugs and substances for the treatment of wound infection [7,12,17]. A possible way to overcome antibiotic resistance and increase the effectiveness of the impact on wound infection can be the use of local medicinal substances based on iodine and silver compounds. At the same time, preparations containing simultaneously other classes of antimicrobial substances are attractive [5,8,9,15]. In terms of their antimicrobial action, local silver preparations in most cases surpass routine methods of affecting the wound, and their combination with a solution of Povidone-iodine can lead to the desired effect in the treatment of wound infection.

All of the above indicates the advisability of the combined use of Povidone-iodine solution and preparations based on silver compounds in the complex treatment of wound infection.

Purpose of the study: To study the cytomorphological picture under the influence of two-component silver preparations in combination with Povidone-iodine on wound infection.

Material and methods

Experimental studies were carried out in vivo on laboratory animals (white without pedigree rats) with a model of a festering wound obtained during its infection with 1 ml of daily suspension

containing 0.5 ml of *E. coli* 109 KOE / ml and 0.5 ml of *P. aeruginosa* 109 KOE / ml according to the method proposed by S.A. Lepekhova. 2013 The proposed model in its characteristics corresponded to the clinical course of the wound process.

Depending on the method of wound infection treatment, laboratory animals are divided into 4 groups of 10 rats. The laboratory rats of the first control group were not treated. The animals of the second group underwent sanitation of the infected wound surface with 10% Povidone-iodine solution. The animals of the third group underwent local sanitation of the wound surface with a two-component Sulfargin ointment, which contains silver ions Ag + and sulfadiazine (Sulfanilamide). In animals of group IV, local treatment varied depending on the phase of the course of the wound process and was carried out by the combined use of a solution of Povidone-iodine and Sulfargin in phase I of inflammation, in the second phase of the wound process, only Sulfargin ointment was used, once a day. In all studied groups of animals, local treatment began with primary surgical debridement of the wound, followed by the above-mentioned therapeutic measures for groups of laboratory animals. Cytomorphological studies of wounds were carried out from the first day after the start of treatment and continued over time for 3, 5, 7, 9-10 days.

Result and discussion

Experimental studies carried out in vivo revealed that microscopic examination of samples taken from a festering wound and surrounding tissue from the first day revealed the absence of epidermis. The edges were loosened with necrobiotic changes, and were also covered with detritus, consisting of keratin and blood clots. A bloody-necrotic mass with an admixture of leukocytes covered the surface of the wound. The wound defect penetrated to the muscle layer. The dermis was edematous, loosened, with foci of necrosis and hemorrhage.

Hyperemic vessels are visible, which are surrounded by neutrophilic-leukocyte infiltration. It even covered the appendages of the skin. On the 5-7th day of experimental studies, the purulent-necrotic mass was determined on the

surface of the wound and surrounding tissue, which in places in the circumference of the wound destroyed the epidermis and formed foci of accumulation of leukocytes, especially around the hair follicles. Also, in the dermis, around the wound, massive areas were determined, consisting of inflammatory granulation tissue. A feature of this infiltrate was the predominance of neutrophilic-leukocyte infiltration with the formation of microabscesses and foci of necrosis. The epidermis was subjected to various destructive and dysregenerative changes. In particular, abscesses formed in the thickness of the epidermis and new (secondary) foci of necrosis appeared closer to the wound defect.

With hyperplasia and destruction of hair follicles in the wound area, the dermis was transformed into a polymorphic inflammatory granulation tissue infiltrate. On its surface layers there were many microabscesses, necrosis and keloid. Inflammatory infiltrates are oriented to the vessel and consisted mainly of neutrophilic leukocytes. Thrombi were detected in the lumen of individual vessels. At the same time, in places in the infiltrate, foci consisting of mature fibrous tissue were determined. However, they also had a chaotic structure with edema and perivascular inflammatory infiltrate.

The cytological picture on days 1-3 of the study was characterized by the predominance of detritus, fragments of destroyed neutrophils, the absence of cellular reactions and phagocytosis. In all animals, pathogenic microorganisms were inoculated from the wound, and their association predominated. The average concentration of microbes in the wound was 109 mt / g. On the 5-7th and 9-10th days, incomplete phagocytosis was detected and a large number of neutrophils in a state of destruction were determined. The microbial landscape of the wound during these periods was characterized by an increase in the number of the above associations in 8 observations, and the mean geometric concentration of microbes in the wound was 109-10 mt / g, which indicated the progression of the purulent process in the wound.

The results of studies using a 10% solution of Povidone-iodine as a local solution indicated a significant subsidence of the purulent-necrotic process in dynamics.

So by 3-5 days in the wound surface, small layers of necrosis and leukocyte mass were determined. There was less inflammatory granulation tissue at the bottom and around the wound, and it occupied a smaller area. The inflammatory-proliferative infiltrate occupied only the surface layers of the wound, which were

represented by leukocyte infiltration and interlayers of hemato-histiogenic cells. The underlying layers, represented by fibrous connective tissue, consisted of uneven, dense fibrous tissue forming hyalized foci. Among them, small hair cylinders and thick-walled vessels were identified. Epithelialization of the wound surface due to hyperplasia of squamous epithelium was detected along the edges of the wound. At the same time, on the 7th day, the activity of proliferation of structural elements was noted in the form of reproduction of young connective cells and hyperplasia of the integumentary epithelium. Outgrowths of various sizes and shapes were formed, on the surface of which hyperkeratosis was detected.

At a later date of observation, it was noted that the wound was surrounded on all sides by predominantly fibrosed scar tissue. But this scar tissue by the 9th day had an inferiority and was characterized by the presence of foci of pathological hyperplastic changes in the form of persistence of inflammatory infiltrates, hyalized foci and pathological regeneration of the skin appendages. At the bottom and in the circumference of the wound, an intensification of regenerative processes was noted, where the foci of inflammation in size and activity decreased, while the layers of fibrous connective tissue remained only around the vessels. The number of vessels decreased, their walls normalized in the form of fibrosis.

Cytological parameters on the third day 3 corresponded to those in animals of group I. However, by the 5-7th day, the picture was characterized by the content of neutrophils of an average degree of preservation, amounting to 90%, the rest of the cells were represented by lymphocytes, monocytes, macrophages and polyblasts. It should be noted that on the third day, the species composition of microflora in most animals was represented by a microbial association. In dynamics, by the 5-7th day, the average geometric concentration of microbes in the wound was 105-7 mt / g. On the 9-10th day, there was a decrease in the number of neutrophils to 60%, an increase in the number of young connective tissue cells and a decrease in the amount of microflora, the average geometric concentration of microbes in the wound was 104-5 mt / g of tissue. All this indicated the beneficial effect of a 10% solution of Povidone-iodine, which promotes cleansing of necrotic tissues. At the same time, the area of the inflammatory granulation tissue remains extensive; in its thickness, inflammatory hyalized foci remain. In the dermis and epidermis, dysregenerative

changes occur in the form of hyperplasia of hair follicles and papillomatous growth of the epidermis. Cytological studies confirmed the transition of the wound process to the second phase only by the 7-9th day of treatment.

As noted above, the animals of the third group underwent local sanitation of the wound surface with a two-component Sulfargin ointment that contains silver ions Ag + and sulfadiazine (Sulfanilamide). Studies have shown that the morphological picture on the third day of treatment was almost identical to that in animals of groups I and II. On the 4-5th day, it was similar to the morphological picture observed in animals of group II on the 5-7th day. However, in the subsequent periods of observation, although purulent-necrotic overlay was not determined at the bottom of the wound and the surface of the surrounding areas, there was enough inflammatory granulation tissue at the bottom and around the wound, and they occupied a large area. The inflammatory-proliferative infiltrate spread to all layers of the wound and was represented by leukocyte infiltration. The underlying layers, like the overlying ones, were loose, edematous. In some places myxomatosis and fibrinoid swelling were identified. Well-developed, full-blooded thick-walled vessels were identified among them. At the edges of the wound, a slight epithelialization of the wound surface was determined due to hyperplasia of the squamous epithelium with pronounced dysregenerative changes. The results of the cytological examination on the third day 3 were the same as in the previous groups. The picture typical for group II on the 5-7th day could be observed in group III already on the 3-4th day. At the same time, there was no microbial association during these periods, and their average geometric concentration in the wound was 103-4 mt / g of tissue. All this testified to the regression of the inflammatory process and its transition to the second phase. Its further use in the second phase of the wound process activated the processes of repair and regeneration.

Thus, the results of an experimental study of group III animals made it possible to conclude that the use of a two-component Sulfargin ointment containing silver ions Ag + and sulfadiazine (with an antibiotic of the sulfonamide group) can, in a short time, reduce the microbial contamination of the wound below the critical level and contribute to the early transition of inflammation in the second phase of its course and activates the processes of repair and regeneration.

The results of morphological studies indicated the disappearance of purulent-necrotic, dysregenerative and hyperplastic changes in the wound area. Acceleration of scarring and epithelialization of the wound surface was noted. In the early stages after applying the ointment based on silver ions, less pronounced discirculatory, inflammatory changes in the edges of the wound were observed. Only a small layer of necrotic detritus was detected. Inflammatory infiltration invaded the shallow layers of the surrounding tissue and was represented by an infiltration of hematohistiogenic cells.

In experimental animals of group IV, local treatment differed depending on the phase of the course of the wound process and was carried out by the combined use of a solution of Povidone-iodine and Sulfargin in phase I of inflammation, in the second phase of the wound process, only Sulfargin ointment was used, once a day.

The studies revealed that the morphological picture on the third day of treatment was similar to the morphological picture observed in animals of group III on the 5-7th day. The results of morphological studies testified to the disappearance of purulent-necrotic, dysregenerative and hyperplastic changes in the wound area already at an early stage from the start of treatment. Acceleration of scarring, epithelialization of the wound surface was noted. At the same time, less pronounced discirculatory, inflammatory changes in the edges of the wound were observed.

The results of the cytological study on the third 3 day showed that no microbial association was observed during these periods, while their average geometric concentration of microbes in the wound was 103-4 mt / g of tissue, that is, it was below the critical level. All this testified to the regression of the inflammatory process and its transition to the second phase. On the 5th day of treatment, a negative bacteriological result was noted, while further treatment of the wound process continued with the use of only Sulfargin ointment in the form of mono therapy without a combination of 10% Povidone-iodine solution, which contributed to the activation of the reparation and regeneration processes. It can be stated that already on the 4th-5th day of treatment in animals of group IV, the inflammatory-regenerative type of cytogram was revealed. This picture is characteristic of the uncomplicated course of the inflammatory process. The number of neutrophils decreased to 60%, and 30% of the cells were represented by lymphocytes, fibroblasts and macrophages. The content of the latter reached 7%, which is an objective criterion

for cleansing the wound from purulent-necrotic tissues. Thus, summarizing the results of experimental studies, it can be noted that a differentiated approach to the use of topically 10% Povidone-iodine solution in combination with a two-component Sulfargin ointment containing silver ions Ag + and sulfanilamide, taking into account the phase of the course of the wound process in the treatment of purulent wounds, in contrast to conventional methods of treatment has a number of positive aspects.

In particular, the wound is cleared from infection by 2.0-2.5 days, the process of transition of the wound process from phase I to phase II is accelerated by 2.5-3.0 days, the number of purulent-necrotic, dysregenerative complications in the wound is significantly reduced, which contributes to the rapid scarring and epithelialization of its surface.

Conclusions

1. The results of experimental studies on animals using a 10% solution of Povidone-iodine as a local treatment for wound infection indicate a significant subsidence of the purulent-necrotic process in dynamics.

2. Experimental studies have led to the conclusion that the use of a two-component Sulfargin ointment in the treatment of wound infection that contains silver ions Ag + and sulfadiazine can, in a short time, reduce the microbial contamination of the wound below the critical level and contribute to the early transition of inflammation into the second phase of its course and activates repair and regeneration processes.

3. A differentiated approach in the treatment of wound infection using topically a 10% solution of Povidone-iodine in combination with a two-component ointment Sulfargin containing silver ions Ag + and sulfanilamide, taking into account the phase of the wound process, in contrast to conventional treatment methods, accelerates the clearance of the wound from infection by 2.0- 2.5 days faster, the process of transition of the wound process from phase I to phase II is accelerated by 2.5-3.0 days, the number of purulent-necrotic, dysregenerative complications in the wound is significantly reduced.

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