Research Article

Comparative Evaluation of the Use of a Chitosan-based Multicomponent Remedy in Patients with Acantholytic Lesion of the Tissues of the Prosthetic Bed to Provide Conditions for the Use of Removable Dentures

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Abstract

The article describes the offered by us multicomponent remedy based on chitosan, to provide analgesic and wound-healing effect in patients with acantholytic lesions of the prosthetic bed tissues.

Objective of the study. To improve the conditions of removable dentures use for patients with acantholytic pemphigus.

Materials and methods. The study involved 56 patients with acantholytic pemphigus, aged from 45 to 63 years old, who were divided into 2 clinical groups. The main group used the proposed remedy; the comparative group received the standard local pemphigus treatment. Methods for determining the area of mucus lesion and the method for determining the intensity of pain syndrome were used to evaluate the final results.

Results of the study and their discussion. The average value of visual analogue scale (VAS) was 4.76 ± 0.56 cm in patients of the main group during the first day. During the 7th and 14th day, the value decreased to 2.4 ± 0.28 cm and 1.87 ± 0.12 cm, respectively. In patients of the comparison group, the average value of VAS was 5.07 ± 0.36 cm as for the first day and 4.45 ± 0.45 and 2.36 ± 0.17 cm during the 7th and 14th days, respectively. The ratio of the mean value of the affected area in patients of the main group and the comparison group was 1.04 during the first day, and during the 7th and 14th day the area of injury in patients of the main group was lower 1.29- and 1.84-fold, respectively.

Conclusions. The results of the study confirm the necessity of using a multicomponent remedy based on chitosan together with the removable dentures in patients with acantholytic pemphigus, due to its clearly expressed epithelial and analgesic action.

Keywords

acantholytic pemphigus; chitosan; acantholysis; prosthetic bed

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Problem statement and analysis of the latest research

In the middle of the last century, it was noted that adding of some polymers to the dosage forms increases the time of their income on the surface of the mucous membrane and increases the effectiveness of therapy [4]. With the development of the theory of mucoadhesion and the improvement of practical methods, many polymers allowed for the use in pharmacy, as well as new materials and their mixtures, were studied for the presence of mucoadhesive properties. Mucoadhesive polymer (MAP) should be characterized by certain physical-chemical properties, including hydrophilicity, a large amount of groups capable of forming hydrogen bonds, the mobility of chains, sufficient for diffusion, both through mucus and epithelial tissue [7]. The ability to drain water from the surface of the

mucous membranes in dry form leads to a strong initial interaction [6]. When moisturized, MAP forms viscous substances, which increases the time of their stay on the surface of the mucous membrane and promotes the appearance of adhesive interactions.

Studies are focused on the development of mucoadhesive systems that create contact with the surface due to Van der Waals interactions and hydrogen bonds. Although these strengths are weak, a sufficiently strong adhesion is achieved through the formation of numerous contacts.

Therefore, polymers of high molecular weight and a large number of polar groups (COOH and OH) are characterized by stronger mucoadhesion with minimal toxicity. To date, chitosan is the only mucoadhesive polymer possessing positively charged groups with proven absence of toxicity [9].

Chitosan (2-amino-2-deoxy- β -D-glucan) is a polymer ob-

tained from the component of the exoskeleton of arthropods – chitin by partial or complete deacetylation. This polysaccharide is characterized by pronounced immunotropic action, as well as antibacterial, antioxidant, detoxicate, analgesic and wound-healing ability [1, 6].

Chitosan can serve as a precursor to a number of glycosaminoglycans, chondroitin-4-sulfate, chondroitin-6-sulfate, keratan-sulfate, hyaluronic acid, which are involved in the formation and metabolism of tissues, including bones, cartilage and mucous membrane. Chitosan is harmless in the toxic way. It has good biocompatibility with tissues of living organisms, biodegradability, and pronounced sorption properties [5, 9].

The study of the use of a multicomponent remedy (gel, paste) on the basis of chitosan in the clinic of orthopedic dentistry will allow someone to improve the adaptation to the removable prosthetics of patients with pemphigus with acantholytic lesion of the prosthetic bed tissues, by reducing the pain sensation that occurs through the contact of the prosthetic base and the affected areas, prevention the emergence of a distant symptom of Nikolsky as a result of mechanical irritation of the unaffected areas of the mucous membrane of the prosthesis and the acceleration of the epithelization and reduction of the area of mucous membrane erosions. The above-mentioned effect is possible due to such properties of the offered by us remedy as mucoadhesion, local anesthetic and wound-healing effect. The use of this remedy creates a buffer between the prosthesis and the prosthetic bed, which helps significantly reduce the effect of the prosthesis base onto the mucous membrane.

1. Materials and Methods

The patients were divided into 2 clinical groups: the main group and the comparison group. The main group included 28 patients with acantholytic pemphigus aged 45 to 63 who use removable dentures. These patients have used the remedy offered by us: water-insoluble colloidal solution of chitosan (4%) and anesthetic was applied by thin layer onto the surface of the base of removable laminar denture, after which the patients were offered to use this construction.

The group of comparison included 28 patients with acantholytic pemphigus, aged 45 to 63 years, who use the removable dentures. They were performed a common local therapy of acantholytic lesions on the mucous membrane.

To evaluate the final results, we have used the method to determine the area of mucous lesions and the method for determining the intensity of pain syndrome.

Determination of the area of lesions of MMOC using the modified method of O.S. Gileva (according to Nurieva N.S.)

The method used to determine the area of damage of the mucous membrane of the oral cavity (MMOC) and the red border of the lips by the authorship of the prof. Gileva O.S. involves the use of sterile rubbers. When using this method the area of lesion is defined using the circling of defects with chemical pencil, imposing on them sterile rubbers and moving the reflection of contour from the rubber onto the reference

grid, followed by manual counting of damaged area using the formula $S = \frac{m^2_1 + m^2_2 + m^2_3 + m^2_4}{n}$, where $m^2_1, m^2_2, m^2_3, m^2_4$ – the sum of all areas of erosions on the inner surface of the cheeks (1), mouth (2), gums (3) and the lips (4), n – number of measurements.

The modified method (according to Nurieva N.S.) involves the use of silicone imprint masses instead of rubbers. Such a method is more practical in dental practice, and allows you to more easily and accurately copy the contour of the element of lesion. We, in turn, offer to abandon the use of chemical pencils, because of the possibility of allergic reactions in patients, and additional irritation of element of the damage. To indicate the contour of the lesion, we used a correction mass, which was administered using the applicator [3].

The evaluation of the pain syndrome was performed using the visual analogue scale (VAS) (assessed by the subjective sensation of pain intensity) (*Visual Analogue Scale (VAS) (Huskisson E. C., 1974)*). This method of subjective evaluation of pain consists in the fact that the patient is asked to mark a point that corresponds to the severity of pain on a non-graded line of 10 cm long. The left border of the line corresponds to the definition of "0" (absence of pain), the right one – "10" (pain is unbearable). As a rule, they usually use a paper, cardboard or plastic ruler 10 cm long. On the reverse side of the ruler there are centimeter divisions, in which the doctor notes the acquired value and enters it into the observation checklist. An unequivocal benefit of this scale is its simplicity and convenience. When dynamically evaluated, the change in pain intensity is considered to be objective and significant if the true value of VAS is different from the previous one more than at 13 mm. The visual analogue scale reflects the intensity of pain experienced by the patient at the moment of the examination. The pain intensity is marked by patient himself/herself.

The examination complex was performed three times during the period of exacerbation of the acantholytic pemphigus, and its manifestations on the mucous membrane: during the 1st, 7th, 14th days.

The data was processed using Statistica software. The criterion for statistical reliability was considered to be the value of $p \leq 0.05$, where p – is the level of statistical significance.

2. Results and Discussion

Having analyzed the results of the study, we obtained the following data. The average value of VAS was 4.76 ± 0.56 cm in patients of the main group during the first day. During the 7th and 14th days the value decreased to 2.4 ± 0.28 cm and 1.87 ± 0.12 cm, respectively. In patients of the comparison group, the average value of VAS was 5.07 ± 0.36 cm as of the first day and 4.45 ± 0.45 and 2.36 ± 0.17 during the 7th and 14th days, respectively. As it can be seen from the given diagrams (Fig. 1, 2), in the main and the comparison groups the indeces of VAS (visual analogue scale) and area of the damage tended to decrease.

Figure 1. Dynamics of VAS indeces

This is logically due to the strengthening of total glucocorticosteroid therapy, and the reduction of manifestations of exacerbation symptoms. However, we observe a significant decrease of the damage area in the main group during the 7th and 14th day, which in turn leads to a decrease of the intensity of pain sensation while using the removable dentures in patients of the main group. The ratio of the average value of the affected area in patients of the main and comparison groups was 1.04 during the first day, and during the 7th and 14th days the area of injury in patients of the main group was lower at 1.29 and 1.84 times, respectively.

This therapeutic effect is possible due to the mucoadhesion of the offered by us remedy, which provides longer analgesic and wound healing action and the ability to significantly reduce the negative mechanical impact of the prosthesis base on the mucous membrane.

3. Conclusions

The use of a chitosan-based multicomponent remedy (gel, paste) is necessary in patients with acantholytic pemphigus with acantholytic damage of tissues in patient using removable dentures, since it provides faster epithelization of erosion than conventional local therapy, reduces pain sensation during dentures' use, which in turn improves the general condition of the patient, facilitates its adaptation to removable prosthesis. It is planned to expand the scope of further research to establish the most effective algorithm for the combined use of offered by us means and removable dentures in different conditions: during meals, conversations, in a state of rest, for the provision of the ability of patients with acantholytic damage of tissues of the prosthetic bed to use qualitatively the removable dentures.

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Figure 2. Area of damage of MMOC (mm²)

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