

**FULL PAPER**

# Efficiency of healing of wounds of abscesses and phlegmons of the submandibular triangle

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As a result of a study of patients with abscesses and phlegmon of the submandibular triangle, 39 patients aged 20 to 30 years received treatment with an immunomodulator. Before and after treatment of wounds, the immune status was assessed: local immunity of the oral cavity (SIgA), indicators of cellular immunity (blast transformation reaction with phytohemagglutinin - PHA LTT (phytohemagglutinin lymphoblast transformation test)), indicators of humoral immunity (IgA, IgG, IgE). The results obtained proved the clinical efficacy of the immunomodulatory drug, which accelerated the healing period of abscesses and phlegmon of the submandibular triangle in this group of patients.

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**KEYWORDS**

Abscess; phlegmon; wound healing; immunity.

**Introduction**

Abscesses and phlegmon of the submandibular triangle are an indisputable indication for surgical intervention [1,2]. World practice and the experience of specialists show not always successful wound healing in patients [3-5]. These patients have weakened immunity [6-9]. Therefore, the question arises about the additional use of medications that will lead to faster and more effective wound healing in patients. A drug is needed that, in combination, has an immunomodulatory, anti-inflammatory, and hemostatic effect. The choice of the chitosan

solution for the study was determined precisely by its complex local effect in the area of the inflammatory process.

The objective of the research is to evaluate the efficacy of wound healing of abscesses and phlegmon of the submandibular triangle using an immunomodulator.

**Method**

To address this problem, we selected 39 patients aged 20 to 30 years, and formed the control group consisting of 18 healthy individuals. All patients were under the supervision of a dentist and immunologist.

They received local treatment of wounds with a 2% solution of acid-soluble chitosan. Chitosan quickly and efficiently heals wounds and normalizes immune responses. Chitosan is made of the shells of sea red-footed crabs by removing acyl. Chitosan, a derivative of chitin, is a positively charged ion with a high degree of activity, which depends on the degree of purification of chitin by acylation. The higher the degree of acyl removal is, the higher the functional effect of this product is.

In the human body, chitosan decomposes into low molecular weight substances and is easily absorbed by the body. It interacts well with cells. Its main component, hyaluronic acid, is a necessary component for the human body. After dissolving, chitin turns into gel, quickly absorbs and removes any toxic substances from the body. Chitosan speeds up the wound healing process, prevents hemorrhages and relieves pain. In plastic surgery, chitosan is used to treat postoperative sutures for quick healing without scars [10, 11].

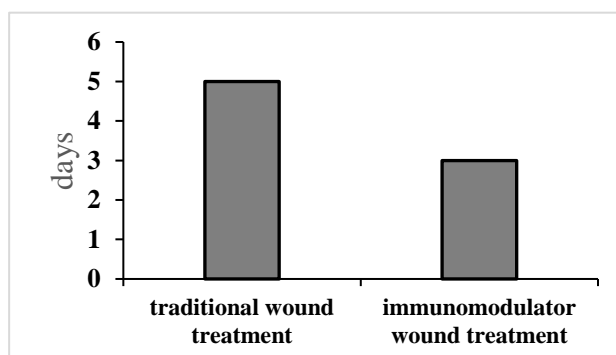
To assess the quality of wound healing of abscesses and phlegmon of the submandibular triangle in this group of patients, a 2% solution of acid-soluble chitosan was prepared: 20 drops of lemon juice were added to 200 ml of drinking water, then the contents of 2 capsules of chitosan were added. The wound surface was treated with a chitosan solution twice a day for 5 days. At the end of therapy, the results were evaluated. The clinical picture of the efficacy of wound healing of abscesses and phlegmon of the submandibular triangle was assessed by

the intensity of pain in the wound area by the severity of edema, hyperemia, and tissue regeneration.

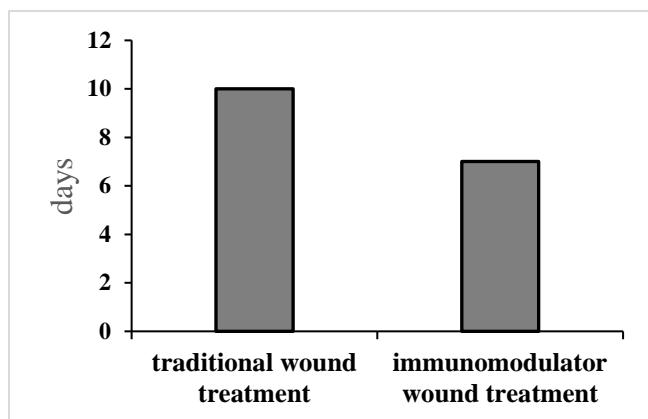
Before and after immunomodulator therapy, the immunological status was assessed, which included local immunity of the oral cavity, humoral immunity, and cellular immunity. The indices of the cellular link of immunity were studied - the phytohemagglutinin lymphoblast transformation test according to N. Ling's method [12]. When studying the indices of local immunity, the content of secretory immunoglobulin (SIgA) in saliva was determined by G. Mancini radial immunodiffusion. The parameters of humoral immunity (IgA, IgG) were assessed using simple radial immunodiffusion [13]. The concentration of total (IgE) was assessed using a radioimmunosorbent test. Statistical processing of the results was performed using Student's t-tests.

## Results and discussion

All patients with abscesses and phlegmon of the submandibular triangle were divided into two groups. The first group of patients received traditional wound treatment, and the second group received an immunomodulator for wound treatment. Patients of the first group, after traditional wound treatment, had a longer tissue regeneration observed, while the second group reported rapid wound healing (Figure 1.2). They were recommended to debride the oral cavity, treat concomitant diseases, and temper the body.



**FIGURE 1** Timing of wound healing in patients with abscesses of the submandibular triangle, days



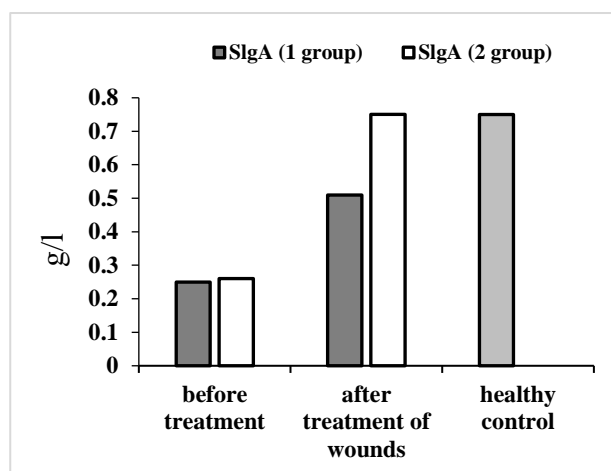
**FIGURE 2** Timing of wound healing in patients with phlegmon of the submandibular triangle, days

The clinical efficacy of wound healing of abscesses and phlegmon in 39 patients aged 20 to 30 years was assessed by a comparative analysis of immunological parameters before and after treatment with an immunomodulatory drug (Figures 3-5).

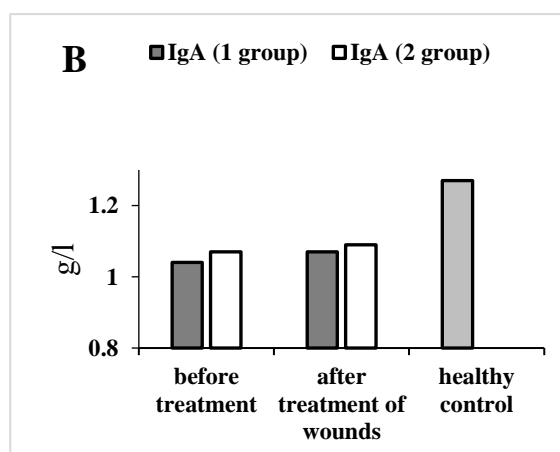
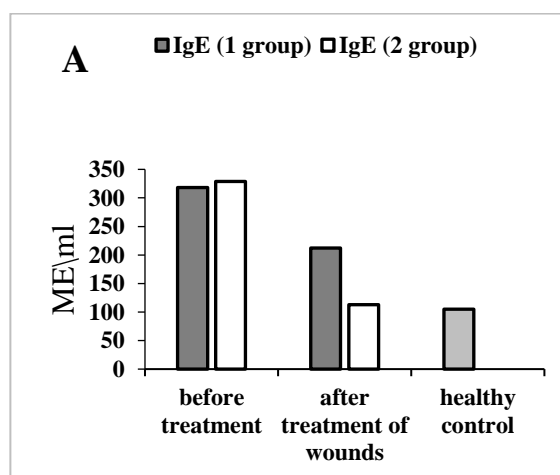
Before treatment, the local immunity of the oral cavity (SIgA) was  $0.25 \pm 0.11$  g/l in the first group, and  $0.26 \pm 0.049$  g/l in the second. Humoral immunity (IgA) in the first group was  $1.04 \pm 0.3$  g/l, and in the second group -  $1.07 \pm 0.8$  g/l, IgG in the first group was  $9.11 \pm 0.5$  g/l, and in the second group -  $10.65 \pm 0.9$  g/l, IgE in the first group was  $318 \pm 1.13$  IU/ml, and in the second group -  $329 \pm 1.45$  IU/ml. Cellular immunity of PHA LTT in the first group was  $31.4 \pm 0.2\%$ , and in the second group -  $35.6 \pm 0.1\%$ , T-lymphocytes in the first group were  $31.5 \pm 0.3$ , and in the second group -  $33.3 \pm 0.7\%$ .

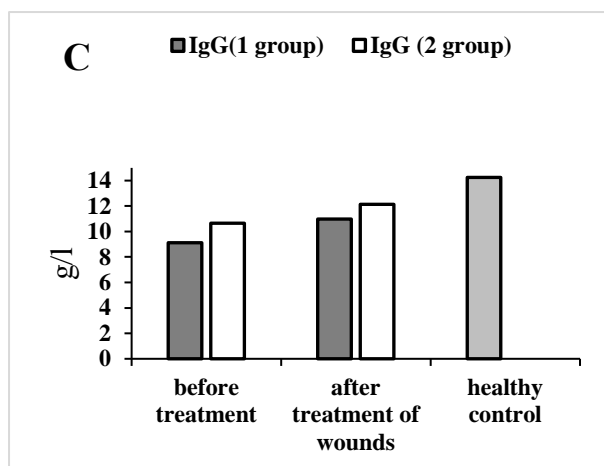
After treatment of wounds with an immunomodulator, the local immunity of the oral cavity (SIgA) was  $0.51 \pm 0.012$  g/l in the first group, and  $0.75 \pm 0.016$  g/l in the second group. Indicators of humoral immunity (IgA) in the first group were  $1.07 \pm 0.3$  g/l, and in the second group -  $1.09 \pm 0.7$  g/l; IgG was  $10.99 \pm 0.1$  g/l in the first group, and  $12.14 \pm 0.5$  g/l in the second group; IgE indices were  $212 \pm 1.35$  IU/ml in the first group, and  $113 \pm 1.66$  IU/ml in the second group. Cellular immunity (PHA LTT) was  $34.1 \pm 0.2\%$  in the first group, and  $54.5 \pm 0.5\%$  in the second group, T-

lymphocytes in the first group were  $41.1 \pm 0.2\%$ , and in the second group -  $45.6 \pm 0.7\%$ .

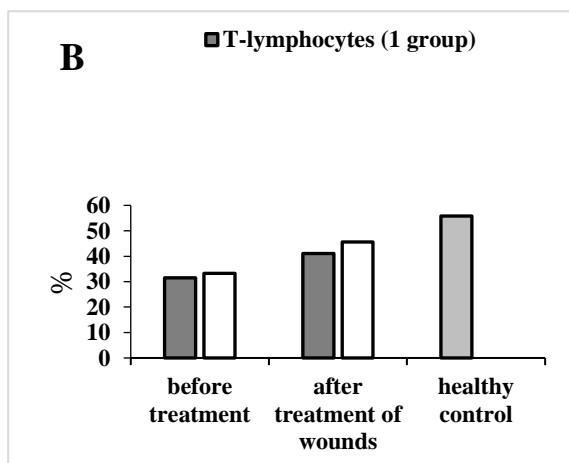
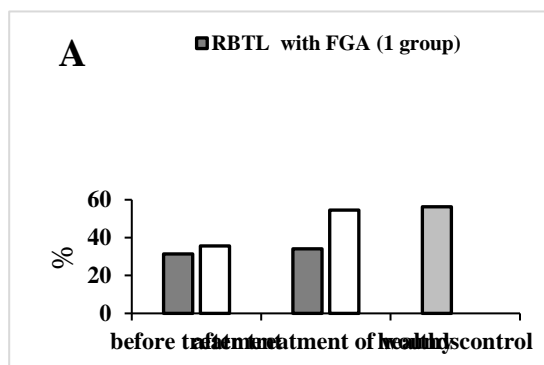


**FIGURE 3** Local immunity of the oral cavity in patients with abscesses and phlegmon of the submandibular triangle before and after treatment with an immunomodulator (SIgA, g/l)





**FIGURE 4** Humoral immunity in patients with abscesses and phlegmon of the submandibular triangle before and after treatment with an immunomodulator. **A)** IgE, IU/ml, **B)** IgA, g/l, **C)** IgG, g/l.



**Figure 5.** Cell-mediated immunity in patients with abscesses and phlegmon of the submandibular triangle before and after treatment with an immunomodulator **A)** PHA LTT, %; **B)** T-lymphocytes, %.

## Summary

Healing of wounds of abscesses and phlegmon of the submandibular triangle with an immunomodulator in patients showed that the immunological indices of local immunity increased, that is, they approached the group of healthy people. In the link of humoral immunity, IgA and IgG significantly ( $p < 0.001$ ) increased, and the concentration of IgE significantly ( $p < 0.001$ ) decreased. Cell-mediated immunity - PHA LTT and T-lymphocyte populations significantly ( $p < 0.001$ ) increased, and approached the group of healthy people.

Successful regeneration is observed in 78% of patients with abscesses and phlegmon of the submandibular triangle.

## Conclusion

We can conclude that using a 2% solution of acid-soluble chitosan accelerated wound healing in comparison with traditional methods of treating abscesses and phlegmons of the submandibular triangle. The proposed remedy showed an improvement in the state of immunity of patients in 93% of cases.

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