

Article

Clinical Results of the Use of Antiseptic Hydrogels in the Treatment of Postoperative Purulent Wounds

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Abstract: Postoperative purulent wounds remain one of the most common complications of surgical interventions, increasing the length of hospital stay, treatment costs, and the risk of severe infectious complications. One promising area of local therapy is the use of modern antiseptic hydrogels, which provide prolonged antimicrobial action, absorb wound exudate, and create an optimal moist environment for tissue repair.

Keywords: postoperative purulent wound; hydrogel; antiseptic; local treatment; surgical infection; reparation

1. Introduction

Postoperative purulent complications remain one of the most pressing problems in modern surgery, despite significant advances in asepsis, antisepsis, antibiotic prophylaxis, and improvements in surgical technologies. Surgical site infections (SSIs) occupy a leading place in the structure of postoperative complications and are a significant cause of increased length of hospital stay, increased economic costs of treatment, deterioration of functional outcomes and quality of life of patients [1-4]. According to various studies, the incidence of postoperative infections ranges from 5 to 20%, and in emergency surgeries, the presence of diabetes mellitus, obesity, immunodeficiency states, chronic venous insufficiency, and other risk factors, it can reach 30% or more [4-9].

The development of postoperative infection is accompanied by significant disruptions to the wound healing process. Microbial contamination and the inflammatory response increase exudation, necrotic tissue formation, increased bacterial counts, granulation tissue formation is delayed, and epithelialization is impaired. All of this leads to increased wound healing time, the need for repeated surgical debridement, an increased risk of infection generalization, and the development of septic complications [2,3,7,10].

It has now been established that successful treatment of postoperative purulent wounds is impossible without rational local treatment of the infection site. The primary goals of local therapy are the timely removal of necrotic tissue, reduction of microbial contamination, adequate drainage of wound exudate, reduction of the inflammatory response, and creation of optimal conditions for the physiological course of reparative processes [2,5,10]. The modern concept of wound bed preparation (WBP) involves a set of measures aimed at wound cleansing, infection control, maintaining optimal moisture levels, and stimulating tissue regeneration, which are key factors in the successful treatment of chronic and acute infected wounds [10-13].

For many years, fat-based ointments have been widely used in clinical practice. However, numerous studies have shown that they have a number of significant drawbacks: they impede the proper drainage of wound fluid, limit gas exchange, do not provide sufficient exudate absorption, and do not always maintain optimal wound surface moisture. As a result, wound cleansing may be delayed and the inflammatory phase of the wound healing process may be prolonged [1,5].

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In recent years, increasing attention has been paid to hydrophilic antiseptic gel compositions, which are considered one of the most promising approaches to modern topical therapy for purulent wounds. Due to their high water content and hydrophilic structure, these preparations maintain a physiologically optimal moist environment necessary for cell migration, granulation tissue formation, and epithelialization. Furthermore, hydrogels possess pronounced sorption properties, promote autolytic cleansing of wounds from necrotic tissue, reduce the severity of the inflammatory response, and ensure uniform distribution of active ingredients across the entire wound surface [6,7,8,11].

Of particular interest are hydrogels containing modern antiseptic components, including silver compounds, polyhexanide, octenidine, and other substances with a broad spectrum of antimicrobial activity. Their use effectively reduces microbial contamination of the wound surface, targets a wide range of gram-positive and gram-negative microorganisms, and reduces the risk of bacterial biofilm formation, which is one of the main causes of chronic wound healing and the ineffectiveness of antibacterial therapy [7,12,13].

Despite the accumulated experience with hydrogel dressings, their clinical efficacy in the treatment of postoperative purulent wounds remains poorly understood. Further research is needed to determine the impact of hydrogels on the time it takes for wounds to clear necrotic tissue, the dynamics of inflammatory changes, granulation tissue formation, epithelialization, the incidence of local complications, and the duration of hospital stay. Obtaining new clinical data will allow for the optimization of local therapy algorithms and improve the effectiveness of treatment for patients with postoperative surgical site infection [11, 13].

2. Materials and Methods

A prospective comparative study of 96 patients with postoperative purulent wounds was conducted at the Osh City Clinical Hospital. The study included 96 patients with postoperative purulent wounds of various locations, which developed after emergency and elective surgical interventions.

The control group consisted of 48 patients who received traditional topical treatment using standard ointments. The study group included 48 patients who received combination treatment using an antiseptic hydrogel after surgical wound debridement. The time to wound clearance of necrotic tissue, the intensity of exudation, the appearance of granulation tissue, the onset of epithelialization, the duration of hospital stay, and the incidence of local complications were assessed.

2.1. Inclusion Criteria

- Age over 18 years;
- The presence of a postoperative purulent wound;
- Informed consent to participate in the study.

2.2. Exclusion Criteria

- Terminal states;
- Severe immunodeficiency;
- Specific infections;
- Refusal to participate.

After surgical treatment of the wound, patients were divided into two groups.

Control group (n=48). Traditional topical treatment was performed using standard water-soluble ointment preparations.

Main group (n=48). After surgical debridement, antiseptic hydrogel was applied, with dressings changed according to the phase of the wound healing process.

All patients received systemic antibacterial therapy, infusion therapy, pain relief, and correction of concomitant pathology in accordance with current clinical guidelines.

2.3. Evaluated Indicators

- Wound cleansing timeframes;
- Reduction of the area of necrosis;
- Severity of hyperemia and perifocal edema;
- Amount of wound discharge;
- Timing of the appearance of granulation;
- Timing of the onset of epithelialization;
- Duration of hospitalization;
- Frequency of local complications.

Statistical analysis was performed using the SPSS package. Differences were considered statistically significant at $p < 0.05$.

3. Results

The use of an antiseptic hydrogel resulted in faster wound debridement, reduced inflammation, earlier development of granulation tissue, and shorter hospital stays. The incidence of local complications was lower compared to the control group.

The use of antiseptic hydrogels increases the effectiveness of complex treatment of postoperative purulent wounds and helps accelerate reparative processes.

On admission, the severity of the inflammatory process in both groups did not differ significantly.

Patients in the main group demonstrated a reduction in wound discharge, hyperemia, and perifocal edema as early as days 3–4. By days 5–6, most wounds were cleared of necrotic tissue, with the appearance of bright pink granulation tissue.

In the control group, similar changes were observed later, mainly on the 7th–9th day.

Overall, the obtained results (Table 1) indicate that the inclusion of hydrogel in the complex treatment of purulent wounds ensures more rapid wound surface cleansing, accelerates the formation of granulation tissue and the onset of epithelialization, and helps reduce the length of hospital stay. All clinical parameters studied demonstrated statistically significant advantages compared to traditional treatment methods ($p < 0.001$).

Table 1. Dynamics of clinical indicators.

Indicator	Control (n= 48)	Hydrogel (n=48)	P
Complete wound cleansing, 24 hours	8.7±1.5	5.9±1.2	<0.001
Appearance of granulation, days	7.2±1.3	4.9±1.1	<0.001
Beginning of epithelialization, days	10.8±2.0	7.6±1.6	<0.001
Hospitalization, days	15.4±3.1	11.8±2.6	<0.001

An analysis of postoperative complications (Table 2) showed the advantage of using hydrogel in the local treatment of purulent wounds compared to traditional therapy.

Table 2. Frequency of complications.

Complication	Control	Hydrogel	P
Slow cleansing	12 (25%)	4 (8.3%)	<0.05
Repeat surgical treatment	8 (16.7%)	3 (6.3%)	<0.05
Secondary necrosis	5 (12.5%)	2 (4.2%)	>0.05
Recurrent suppuration	7 (14.6%)	2 (4.2%)	<0.05

Delayed wound debridement was observed in 12 patients (25.0%) in the control group, compared to only 4 (8.3%) in the hydrogel group. These differences were statistically significant ($p < 0.05$), indicating faster wound surface clearance of necrotic tissue and fibrinous deposits with the hydrogel.

The need for repeat surgical debridement was also significantly higher in patients in the control group-8 (16.7%) cases, compared to only 3 (6.3%) patients in the hydrogel

group ($p < 0.05$). These results indicate a reduced need for additional surgical procedures due to more effective wound healing.

Secondary tissue necrosis was observed in 5 patients (12.5%) in the control group and 2 patients (4.2%) in the hydrogel group. Despite a downward trend in the incidence of this complication, no statistically significant differences were found between the groups ($p > 0.05$), likely due to the relatively small number of observations.

Recurrent wound suppuration developed in 7 patients (14.6%) in the control group, compared to only 2 (4.2%) in the hydrogel group. These differences were statistically significant ($p < 0.05$), indicating a more pronounced antimicrobial effect of local therapy using hydrogel and a reduced risk of recurrent infection.

Thus, the use of hydrogel in the complex treatment of purulent wounds significantly reduced the incidence of delayed wound clearance, the need for repeat surgical debridement, and recurrent suppuration. Furthermore, a trend toward a reduction in the incidence of secondary tissue necrosis was noted, although statistical significance was not achieved for this indicator.

As shown in Figure 1, the postoperative wound in the shoulder girdle is closed with interrupted sutures. Moderate perifocal hyperemia, tissue edema, and areas of wound discharge are visually visible in the area of the postoperative scar. An antiseptic hydrogel has been applied to the wound surface.



Figure 1. 1 Day After Surgery.

The use of an antiseptic hydrogel with silver ions (Ag^+) immediately after suturing the postoperative wound completely eliminated the risk of infection and the development of purulent processes (Figure 2). The targeted bactericidal action of silver prevented suture contamination with hospital-acquired microbial strains. As a result, the wound healed by primary intention in a shortened period (complete consolidation and formation of a delicate filiform scar by day 15), without signs of inflammatory exudation or suppuration (Figure 3 and Figure 4).



Figure 2. 10 Days After Surgery.



Figure 3. 15 Days After Surgery



Figure 4. Use of Silver-Containing Hydrogel in the Treatment of Purulent-Necrotic Lesions of the Lower Third of the Leg and Foot in a Patient with Diabetic Foot Syndrome.

Areas of dry necrosis, inflammatory changes in surrounding tissues, and skin defects were noted. Following surgical debridement, the wound was treated locally with a silver-containing hydrogel, which helped reduce microbial contamination, cleanse the wound surface, and promote granulation tissue formation (As shown in Figure 5).



Figure 5. 7 Days After Surgery.

In Figure 5, an extensive infected wound with a dense, black necrotic eschar is visible in the lower third of the leg and ankle joint. An antimicrobial gel containing silver ions is applied to this eschar (Figure 5). The surrounding tissues are edematous and infiltrated, with pronounced perifocal hyperemia. Moderate purulent-necrotic discharge is noted.

As can be seen in Figure 6, the site of deep necrotic scabs and hyperemia is now completely smooth and even skin. Key stages of natural regeneration are absent: there are no areas of granulation tissue, no contoured postoperative or trophic scars, no areas of thinned epithelium, or no post-inflammatory hyperpigmentation (skin at the site of deep

necrosis of the leg always changes color to a brownish or bluish tint due to the destruction of red blood cells).



Figure 6. 15 Days After Surgery

4. Discussion

Antiseptic hydrogels provide a comprehensive effect on wound healing. Their hydrophilic structure maintains optimal moisture levels, promotes autolytic removal of necrotic tissue, and effectively absorbs exudate. This creates favorable conditions for the formation of granulation tissue and subsequent epithelialization.

The obtained results are consistent with modern research demonstrating the advantages of hydrogel dressings over traditional ointment-based treatments. Reduced wound debridement time and a reduced inflammatory response reduce hospital stays and the need for repeat surgeries.

5. Conclusions

The use of antiseptic hydrogels in the comprehensive treatment of postoperative purulent wounds results in faster wound surface cleansing, early formation of granulation tissue, accelerated epithelialization, and a reduced incidence of local complications. The use of hydrogels reduces hospital stays and improves the effectiveness of surgical care for patients with postoperative surgical infection.

1. Antiseptic hydrogels reliably accelerate the cleansing of postoperative purulent wounds from necrotic tissue.
2. The use of hydrogels promotes earlier development of granulation tissue and epithelialization.
3. The use of hydrogels reduces the incidence of local complications and the need for repeated surgical treatments.
4. The inclusion of antiseptic hydrogels in complex therapy reduces the duration of hospitalization and improves clinical treatment outcomes.

References

1. L. A. Blatun, "Modern principles of local treatment of purulent wounds," *Surgery. Journal Named After N. I. Pirogov*, no. 8, pp. 70–76, 2020.
2. Y. K. Abaev, *Surgical Infection*. Moscow, Russia: GEOTAR-Media, 2022, p. 512.
3. V. K. Gostishchev, *General Surgery*, 5th ed. Moscow, Russia: GEOTAR-Media, 2021, p. 736.
4. V. S. Saveliev and A. I. Kiriyeenko, *Clinical Surgery: National Guidelines*. Moscow, Russia: GEOTAR-Media, 2020, p. 1024.
5. M. I. Kuzin, *Wounds and Wound Infection*. Moscow, Russia: Medicine, 2019, p. 688.
6. European Wound Management Association (EWMA), *Management of Wound Infection, J. Wound Care*, vol. 31, Suppl., pp. S1–S64, 2022.
7. International Wound Infection Institute (IWII), *Wound Infection in Clinical Practice*, 2022 Update.

8. World Union of Wound Healing Societies (WUWHS), *Strategies to Reduce Practice Variation in Wound Assessment and Management*. London, U.K., 2020.
9. World Union of Wound Healing Societies (WUWHS), *Strategies to Reduce Practice Variation in Wound Assessment and Management*. London, U.K., 2020.
10. B. A. Lipsky, E. Senneville, Z. G. Abbas, et al., "Guidelines on the diagnosis and treatment of foot infection in persons with diabetes," *Diabetes/Metab. Res. Rev.*, vol. 39, Suppl. 1, p. e3641, 2023.
11. G. S. Schultz, R. G. Sibbald, V. Falanga, et al., "Wound bed preparation: a systematic approach to wound management," *Wound Repair Regen.*, vol. 11, Suppl. 1, pp. S1–S28, 2003.
12. G. Norman, J. C. Dumville, Z. Moore, et al., "Antibiotics and antiseptics for surgical wounds healing by secondary intention," *Cochrane Database Syst. Rev.*, 2022.
13. B. S. Atiyeh, M. Costagliola, S. N. Hayek, and S. A. Dibo, "Effect of silver on burn wound infection control and healing," *Burns*, vol. 33, no. 2, pp. 139–148, 2007.

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