EFFICACY ASSESSMENT OF ANTISEPTIC-ANTIMICROBIAL COMBINATION THERAPY FOR SOFT TISSUE INFLAMMATORY CONDITIONS

Khayitov I.B.[1], Babajonov A.B.[1], Goziev J.O.[2]

[1] Tashkent State Medical University, Tashkent, Uzbekistan

[2] Ibn Sino First City Clinical Hospital of Tashkent, Tashkent, Uzbekistan

BACKGROUND. Skin and soft tissue infections (SSTIs) including abscesses, cellulitis, infected wounds, and necrotizing infections remain a significant challenge in surgical practice. The efficacy of antiseptic-antimicrobial combination therapy is determined by synergistic factors: broad-spectrum antimicrobial activity, enhanced tissue penetration, prolonged residual bactericidal effect, and favorable influence on wound healing [1]. The rationale for combining chlorhexidine with alcohol lies in their complementary mechanisms — chlorhexidine provides sustained antimicrobial activity through binding to bacterial cell membranes, while isopropyl alcohol delivers rapid bactericidal effect through protein denaturation, creating synergistic antimicrobial action [2].

The microbiological landscape of SSTIs demonstrates pathogen diversity with Staphylococcus aureus predominance, including MRSA reaching 18-40% prevalence globally [1,3]. Recent meta-analyses have demonstrated chlorhexidine-alcohol combinations exhibit significant superiority over aqueous solutions in preventing surgical site infections [2,4]. However, correlation between in vitro microbiological activity and clinical outcomes remains insufficiently investigated [5]. Previous regional research has established fundamental approaches to surgical infection management [6].

OBJECTIVE. To assess the efficacy of antiseptic-antimicrobial combination therapy in surgical treatment of soft tissue inflammatory

conditions through comprehensive evaluation of microbiological activity and clinical effectiveness with quantitative correlation analysis.

METHODS. This prospective randomized study was conducted at Ibn Sino First City Clinical Hospital of Tashkent (January 2022 – December 2024), enrolling 105 patients with SSTIs. Mean age was 45.3±12.7 years; gender distribution: 60% males, 40% females. Nosological distribution: abscesses 36.2%, cellulitis 42.9%, infected surgical wounds 14.3%, necrotizing infections 6.6%.

Inclusion criteria: age >18 years, clinically confirmed SSTI requiring surgery, no antibiotic therapy within 14 days, informed consent. Exclusion criteria: pregnancy, severe decompensated comorbidities, allergy to antiseptics, immunodeficiency.

Patients were randomized into three groups (n=35 each): Group I — chlorhexidine 0.05% aqueous; Group II — povidone-iodine 10%; Group III — combination antiseptic (chlorhexidine 2% + isopropyl alcohol 70%). The combination was selected based on evidence that higher chlorhexidine concentrations in alcohol vehicles provide optimal efficacy [2,4]. All patients received standardized surgical treatment with radical debridement, drainage, and daily wound irrigation (≥200 ml antiseptic).

RESULTS. Pathogen distribution: S. aureus 41.9% (MRSA 18.1%, MSSA 23.8%), Streptococcus spp. 23.8%, gram-negative bacteria 24.8%, anaerobes 9.5%. Polymicrobial infections occurred in 34.3%. Initial bacterial load: 10^6-10^8 CFU/ml.

Complete pathogen eradication by day 5: Group III 88.6%, Group II 77.1%, Group I 71.4% ($p<0.05$). Bacterial reduction ≥2 $\log_{10}$ CFU/ml: Group III 94.3%, Group II 82.9%, Group I 77.1% ($p<0.05$). MRSA eradication: Group III 89.5%, Group II 73.7%, Group I 66.7% ($p<0.05$). Mean eradication time: Group III 3.8±1.1 days, Group II 4.9±1.4 days, Group I 5.4±1.6 days ($p<0.05$).

Clinical outcomes demonstrated consistent superiority of combination therapy. Wound cleansing time: Group III 5.2±1.3 days versus 6.9±1.7 and 7.8±1.9 days ($p<0.05$). Granulation appearance: Group III 6.4±1.2 days versus 7.8±1.5 and 9.3±1.8 days ($p<0.05$). VAS pain score (day 3): Group III 3.1±0.8 versus 4.2±1.0 and 4.7±1.2 points ($p<0.05$). Hospitalization: Group III 8.3±2.1 versus 10.4±2.5 and 11.7±2.8 bed-days ($p<0.05$). Complications: Group III 5.7% versus 11.4% and 14.3%.

Spearman correlation analysis revealed strong associations between microbiological efficacy and clinical outcomes: wound cleansing time ($r=-0.76$), complication rate ($r=-0.68$), hospitalization duration ($r=-0.71$), and granulation appearance ($r=0.73$), all $p<0.001$.

CONCLUSIONS. The combination chlorhexidine 2% with isopropyl alcohol 70% demonstrated significant superiority in both microbiological efficacy (88.6% versus 71-77% eradication) and clinical outcomes. The synergistic action provides rapid bactericidal effect combined with sustained residual activity. Maximum efficacy against MRSA (89.5% versus 66.7-73.7%) is particularly valuable given increasing antimicrobial resistance. Implementation of this approach reduces wound cleansing time by 33-48%, decreases complications 2-2.5-fold, and shortens hospitalization by 20-29%.

KEYWORDS: soft tissue infections, antiseptics, chlorhexidine, isopropyl alcohol, combination therapy, MRSA, clinical-microbiological correlation, surgical treatment.

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