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A Comparative Study To Assess The Outcome Of Dressing With Medical-Grade Honey Versus Antiseptic Ointment (Colloidal Silver 32 PPM) On Open, Infected Surgical Wounds

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Abstract
Background: *Surgical site infections (SSI) remain a significant cause of postoperative morbidity, prolonged hospital stay, and increased healthcare costs. Conventional antiseptic dressings such as silver-based ointments are widely used; however, concerns regarding cytotoxicity and delayed wound healing have been reported. Medical-grade honey (MGH), a sterile, standardized, and unadulterated product, has re-emerged as a potential alternative owing to its antimicrobial, anti-inflammatory, and wound-healing properties.*
Aim: *To compare the clinical and biochemical outcomes of dressing open, infected surgical wounds with medical-grade honey versus colloidal silver (32 ppm) antiseptic ointment.*
Methods: *This prospective randomized controlled study was conducted at a single tertiary-care centre from January 2024 to June 2025. Fifty postoperative patients with open, infected surgical wounds were randomized into two groups: Group A (MGH dressing, n = 25) and Group B (colloidal silver 32 ppm dressing, n = 25). Outcomes were assessed using ASEPSIS scores, Visual Analogue Scale (VAS) for pain, total leukocyte count (TLC), C-reactive protein (CRP), D-dimer, albumin–globulin (A/G) ratio, and pus culture reports on postoperative days 3, 5, 7, and 10.*
Results: *Patients in the MGH group demonstrated earlier reduction in ASEPSIS scores, faster resolution of infection markers, improved pain scores, and earlier appearance of healthy granulation tissue compared to the silver ointment group. No adverse reactions were observed with medical-grade honey.*
Conclusion: *Medical-grade honey is a safe, effective, and economical alternative to silver-based antiseptic ointments for the management of open, infected surgical wounds, with potential benefits in infection control, pain reduction, and wound healing.*
Keywords: *Medical-grade honey, colloidal silver, surgical site infection, open wounds, wound dressing*

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I. Introduction

Honey is a naturally occurring substance that has been used for centuries in traditional and Ayurvedic medicine for its antimicrobial and analgesic properties [1-3]. Renewed scientific interest has been supported by extensive laboratory and animal studies demonstrating that medical-grade honey (MGH)—defined as unadulterated, standardized, and gamma-irradiated honey—possesses potent antibacterial and wound-healing properties [4,5]. Its hyperosmolar nature draws water out of bacterial cells, inhibits microbial growth, disrupts biofilms, reduces persistent inflammation, promotes fibroblast infiltration, facilitates autolytic debridement, and enhances granulation tissue formation [6-8].

Recent clinical studies have highlighted the efficacy of medical-grade honey in the management of chronic wounds, postoperative wounds, and cesarean section wound infections, with significant reductions in wound size, pain, and healing time [9,10,14]. These properties have led to its re-emergence as a viable dressing material in modern surgical practice [11,12].

Silver-containing antiseptic ointments are commonly used in open, infected surgical wounds due to their broad-spectrum antimicrobial activity and ability to disrupt biofilms [8,13]. However, silver compounds have been associated with cytotoxic effects on keratinocytes and fibroblasts, delayed epithelialization, and, in rare cases, systemic absorption leading to argyria and visual disturbances [17,20]. Such concerns raise questions regarding their long-term safety and impact on wound healing [28,29].

Given these considerations, there is a growing need to explore safer and equally effective alternatives [18,21]. Medical-grade honey offers several advantages, including reduced need for repeated debridement,

decreased antibiotic usage, and potential mitigation of antimicrobial resistance [22,23,25]. Despite promising evidence, comparative clinical studies between medical-grade honey and silver-based dressings in open, infected surgical wounds remain limited, particularly in the Indian context [27,30].

Aim

To compare the outcomes of dressing open, infected surgical wounds with medical-grade honey versus antiseptic ointment (colloidal silver 32 ppm).

Objectives

1. To analyze the clinical and biochemical outcomes of medical-grade honey as a dressing material for open, infected surgical wounds.
2. To compare these outcomes with those achieved using silver-containing antiseptic ointment.

II. Methodology

Study Design

Prospective randomized controlled study.

Study Setting

Single-centre hospital-based study conducted in the Departments of General Surgery and Obstetrics & Gynecology at ESIC Medical College & Hospital, Faridabad, Haryana.

Study Population

All postoperative patients presenting with open, infected surgical wounds classified as CDC Class I, II, or III operative wounds.

Sample Size

Fifty post-laparotomy patients with superficial surgical site infection were included. Patients were randomized into: -

Group A: Medical-grade honey dressing (n = 25)
Group B: Colloidal silver 32 ppm antiseptic ointment dressing (n = 25)

Inclusion Criteria

- Patients aged 14–65 years
- Superficial surgical site infection following:
  - Clean (Class I)
  - Clean-contaminated (Class II)
  - Contaminated (Class III) surgeries
- Southampton SSI grades I–IV

Exclusion Criteria

- Age < 14 years or > 65 years
- Immunocompromised states (diabetes mellitus, post-transplant status, steroid therapy, HIV/AIDS)
- Burst abdomen
- Dirty-infected surgeries (Class IV)
- Known allergy to honey or silver preparations

Study Procedure

Eligible patients were randomized into two groups. Group A received daily wound dressing with medical-grade honey and normal saline, while Group B received colloidal silver 32 ppm ointment with normal saline. Wound assessment and laboratory investigations were performed on postoperative days 3, 5, 7, and 10.

Outcome Measures

- ASEPSIS score
- Pain assessment using Visual Analogue Scale (VAS)
- Total leukocyte count
- C-reactive protein
- D-dimer
- Pus culture and sensitivity

Statistical Analysis

Data were entered in Microsoft Excel and analyzed using SPSS version 29.0. Continuous variables were expressed as mean ± standard deviation and categorical variables as percentages. Appropriate statistical tests were applied, with $p < 0.05$ considered statistically significant.

Ethical Considerations

Institutional Ethics Committee approval was obtained prior to study initiation. Written informed consent was taken from all participants.

III. Results

A total of 50 patients were analyzed, with 25 patients in each group. Baseline demographic and wound characteristics were comparable between the two groups. The medical-grade honey (MGH) group demonstrated consistently superior outcomes across clinical, biochemical, and microbiological parameters when compared with the colloidal silver 32 ppm group.

1. ASEPSIS Score Comparison (Mean ± SD)

Post-operative Day	MGH Group (n=25)	Colloidal Silver Group (n=25)	p-value
Day 3	28.4 ± 4.2	32.9 ± 4.8	<0.05
Day 5	20.6 ± 3.9	26.8 ± 4.5	<0.01
Day 7	13.2 ± 3.1	19.7 ± 3.8	<0.001
Day 10	6.1 ± 2.0	11.8 ± 2.9	<0.001

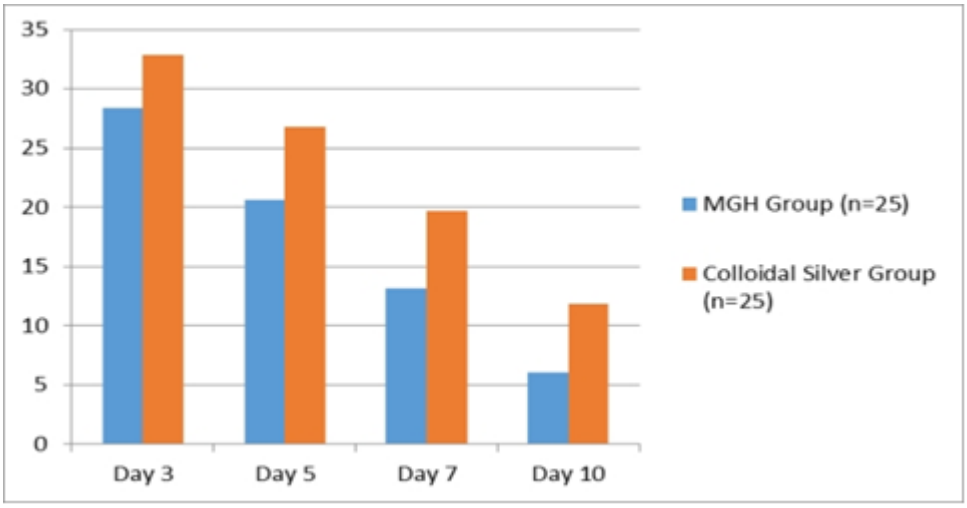


Table 2. Visual Analogue Scale (VAS) for Pain (Mean ± SD)

Post-operative Day	MGH Group (n=25)	Colloidal Silver Group (n=25)	p-value
Day 3	6.8 ± 0.9	7.4 ± 0.8	<0.05
Day 5	4.9 ± 0.8	6.1 ± 0.9	<0.01
Day 7	3.1 ± 0.7	4.6 ± 0.8	<0.001
Day 10	1.4 ± 0.5	2.8 ± 0.6	<0.001

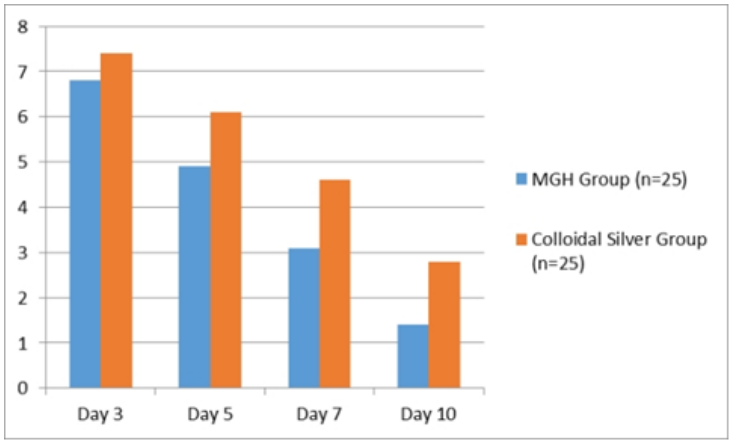


Table 3. Total Leukocyte Count (cells/mm³, Mean ± SD)

Post-operative Day	MGH Group (n=25)	Colloidal Silver Group (n=25)	p-value
Day 3	13,200 ± 1,100	14,100 ± 1,200	<0.05
Day 5	10,900 ± 1,000	12,400 ± 1,100	<0.01
Day 7	8,600 ± 900	10,300 ± 1,000	<0.001
Day 10	7,100 ± 800	8,900 ± 900	<0.001

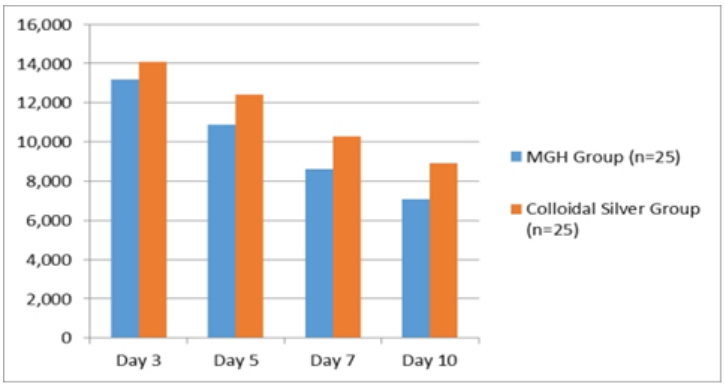


Table 4. C-Reactive Protein (CRP, mg/L, Mean ± SD)

Post-operative Day	MGH Group (n=25)	Colloidal Silver Group (n=25)	p-value
Day 3	48.6 ± 6.5	55.2 ± 7.1	<0.05
Day 5	32.4 ± 5.8	41.7 ± 6.3	<0.01
Day 7	18.9 ± 4.6	27.8 ± 5.2	<0.001
Day 10	8.7 ± 2.9	15.6 ± 3.8	<0.001

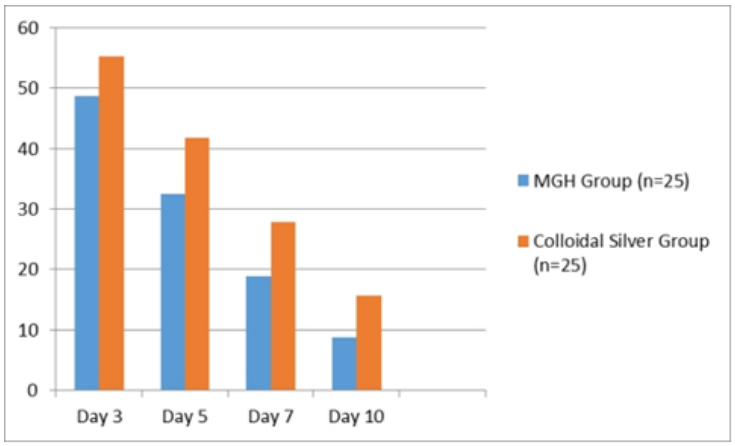


Table 5. D-Dimer Levels (ng/mL, Mean ± SD)

Post-operative Day	MGH Group (n=25)	Colloidal Silver Group (n=25)	p-value
Day 3	1,120 ± 180	1,260 ± 190	<0.05
Day 5	860 ± 150	1,040 ± 170	<0.01
Day 7	620 ± 130	810 ± 150	<0.001
Day 10	410 ± 110	590 ± 130	<0.001

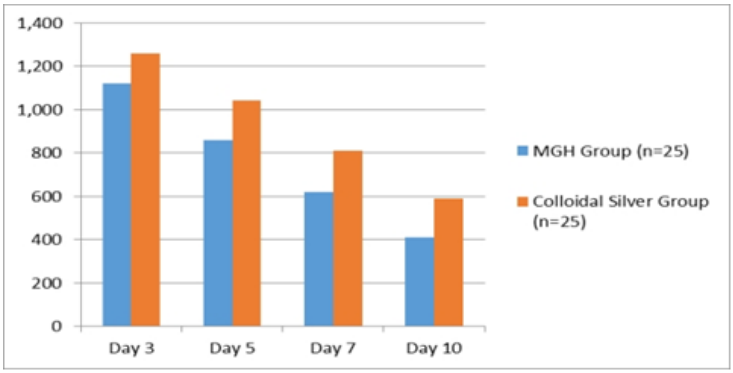
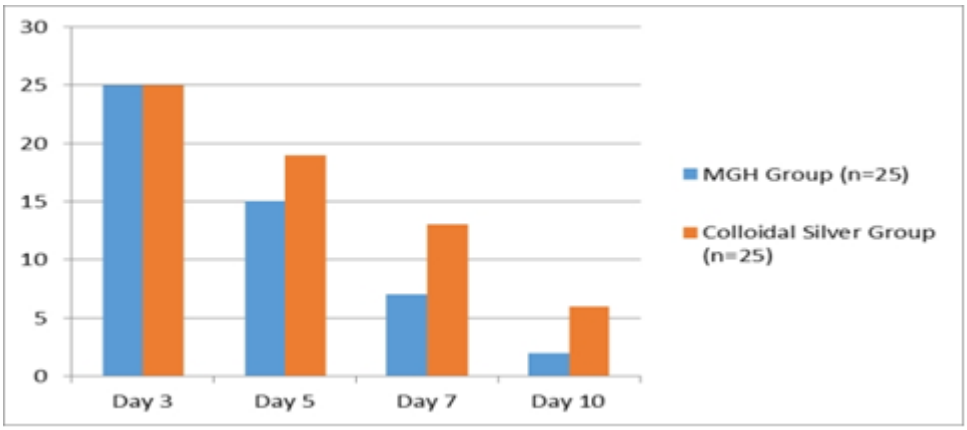


Table 6. Pus Culture Positivity Rates

Post-operative Day	MGH Group (n=25)	Colloidal Silver Group (n=25)	p-value
Day 3	25 (100%)	25 (100%)	–
Day 5	15 (60%)	19 (76%)	<0.05
Day 7	7 (28%)	13 (52%)	<0.01
Day 10	2 (8%)	6 (24%)	<0.05



Interpretation: The medical-grade honey group showed a faster decline in infection severity, inflammatory markers, pain scores, and microbial load compared to the colloidal silver group, with statistically significant differences from postoperative day 5 onwards.

IV. Discussion

The present prospective randomized controlled study demonstrates that medical-grade honey is superior to colloidal silver 32 ppm antiseptic ointment in the management of open, infected surgical wounds. Patients treated with medical-grade honey showed a significantly faster reduction in ASEPSIS scores, indicating more rapid resolution of surgical site infection. This finding is consistent with earlier reports highlighting honey's ability to disrupt bacterial biofilms, exert broad-spectrum antimicrobial action, and promote granulation tissue formation [4, 13].

Pain reduction, as assessed by VAS scores, was significantly greater in the honey group from postoperative day 5 onwards. The soothing, anti-inflammatory properties of honey and its ability to maintain a moist wound environment likely contribute to improved patient comfort and compliance [6,15,16]. Similar analgesic benefits of honey dressings have been reported in chronic and postoperative wound studies [18,19].

Biochemical markers of infection and inflammation, including total leukocyte count, C-reactive protein, and D-dimer levels, normalized earlier in the medical-grade honey group. This suggests a more effective control of local and systemic inflammatory response [24,25]. The faster decline in pus culture positivity further supports honey's potent antimicrobial activity even against resistant strains found in surgical settings [21,23]. These results reinforce the role of MGH as a safe, effective, and economical alternative to silver-based products [29,30].

V. Implications

- Improved ASEPSIS scores and faster normalization of inflammatory markers may be achieved with medical-grade honey.
- Early arrest of progression from superficial to deep or organ-space SSI.
- Broad antimicrobial activity against common SSI pathogens including MRSA, *Streptococcus pyogenes*, and *Pseudomonas aeruginosa*.
- Improved wound cosmesis and patient satisfaction.
- Reduced antibiotic requirement and lower risk of antimicrobial resistance. Enhanced pain relief due to the soothing properties of honey.

VI. Conclusion:

In this randomized controlled study, medical grade honey demonstrated superior clinical, biochemical, and microbiological outcomes compared with colloidal silver (32 ppm) for open, infected surgical wounds, with earlier reductions in ASEPSIS scores, pain, inflammatory markers, and culture positivity, and no observed adverse events. These findings support medical grade honey as a safe, effective, and economical dressing option that may enhance infection control, expedite wound healing, and improve patient comfort. Given the single-

centre design, modest sample size, and short follow-up, larger multicentre trials with longer monitoring and cost-effectiveness analyses are warranted. Pending further validation, medical grade honey can be considered a preferred first-line dressing in appropriate patients, particularly in resource-constrained settings.

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