

ORIGINAL ARTICLE**STUDY OF EFFECT OF TOPICAL NANO SILVER GEL ON WOUND HEALING**Rakesh Sharma¹, Rajkamal², Ravi Kumar³, Sahil Mittal³, Amandeep Kaur³¹Associate Professor In-charge Surgery 7, ²Senior Resident, ³Junior Resident

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ABSTRACT:

The objective is to study the effect of topical silver nano gel on wound healing. The effect of topical silver nano gel on wound healing was tested on 50 cases of surgical wounds of any origin out of which one group of 25 cases were treated with topical nano silver gel and other similar group of 25 cases were treated with conventional dressings such as betadine, hydrogen peroxide and Vaseline gauze etc. The effect of topical nano silver gel on wound healing was found to be significantly higher than conventional dressings. Nano Silver gel was found to be very good antiseptic, anti inflammatory and anti microbial as compared to conventional antiseptics in our study of 50 cases.

Key words: Nano silver gel, wound healing.

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INTRODUCTION

Silver is well known as an antiseptic agent (silver nitrate and silver sulphadiazine) for ages. However, the delivery system in the form of a salt has been a limiting factor for its successful and widespread biological use. The development of nanochemistry has produced micro fine particles which increase silver's solubility and releases silver ions in concentration of 70-100 ppm. Nanocrystalline silver system kills all microbes found in the wound including fungi, MRSA and vancomycin-resistant enterococcus (VRE). In this study the effect of topical nano silver gel was studied.

MATERIALS AND METHODS

This prospective study was conducted on 50 patients from Surgical wards of Guru Nanak Dev hospital, Amritsar between 2013-2016. Wound anywhere over body due to diabetes, burn, trauma, vascular or any other pathology were included. Patients were divided into 2 groups of 25 each, in group 1 nano silver gel was applied over the wound after cleansing the wound with conventionally used materials as povidone iodine, hydrogen peroxide, Vaseline gauze etc where as in group 2 only conventional dressing was done without nano

silver and it served as a control group. In both the groups dressing was done on alternate days.

Exclusion criteria:

1. Patients with total serum protein less than 5.5 mg/dl
2. Patients with Haemoglobin < 8 mg/dl.
3. Patients on immunosuppressants
4. Malignant ulcers.
5. Uncontrolled Diabetes.
6. Deep burn wounds.
7. Uraemia
8. Jaundice
9. DVT
10. Tuberculosis

FOLLOW UP-

Patients were followed up to either healing of wound or when wound was ready for grafting.

Results were compared in terms of.

1. Wound bed score.
2. Reduction in wound size with successive dressings.
3. Type of wound discharge (if present) either serous or purulent
4. Microbiological evaluation by repeated pus cultures from wound on 1st, 2nd and 3rd week Wound Bed score

Classification system that scores the following parameters:

WOUND BED SCORE			
	Score 0	Score 1	Score 2
Black eschar	>25% area with eschar	1-25% area	0% area
Eczema/dermatitis	Severe	Moderate	Mild/None
Depth of wound	Severely depressed	Mild depressed	None
Scarring	Severe	Moderate	Mild/None
Colour of wound bed	<50% pink granulations	50-75%	>75 %
Oedema	Severe	Moderate	Mild/None
Resurfacing epithelium	Over <25% of edge of wound	25-75% edge	>75% edge
Exudative amount	Severe	Moderate	Mild/None
Tick Score in each column			
Total (max.-16)			

STATISTICAL ANALYSIS

1. To study the effect of topically applied nanosilver gel on wound healing.
2. To evaluate the local antimicrobial and healing promotion properties of nano silver in wounds.
3. P value is used in the study

RESULT

In group A only 12% of cases had slough whereas in group B 44% of cases had slough (p value 0.02) which was significant.

In group A %age reduction in size of wounds during the study was 84.06±3.20 whereas in group B it was 76.48±3.17 (p value 0.01). There was significant reduction in size of wound in group A.

In group A 80% of wounds healed within 3 week whereas in group B only 28% of wounds healed within 3 week study period. In group A, 4% wound did not heal at 3 week and in group B 16% of wounds did not heal (p value 0.002; Significant).

DISCUSSION

The silver nanoparticles show efficient antimicrobial property compared to other salts due to their extremely large surface area, which provides better contact with microorganisms. The nanoparticles get attached to the cell membrane and also penetrate inside the bacteria. The bacterial membrane contains sulfur-containing proteins and the silver nanoparticles interact with these proteins in the cell as well as with the phosphorus containing compounds like DNA. When silver nanoparticles enter the bacterial cell it forms a low molecular weight region in the centre of the bacteria to which the bacteria conglomerates thus, protecting the DNA from the silver ions. The nanoparticles preferably attack the respiratory chain, cell division finally leading to cell death. The nanoparticles release silver ions in the bacterial cells, which enhance their bactericidal activity. Silver absorbed by epidermal cells induces production of metallotheanine which in turn increases uptake of zinc and copper, which increases RNA and DNA synthesis. This then promotes cell proliferation and tissue repair. In any case of non-healing chronic wound there is an excess of matrix metalloproteinases (MMP), which increases the inflammation and inflammatory cell exudates and degrade the growth factors. Nanocrystalline silver

decreases the MMP activity both in-vivo and in-vitro because of its inhibitory effect on zinc activity, which is required for MMPs, as also its inhibitory effect on release of proinflammatory cytokines and tumour necrosis factor-alpha. Silver nanoparticles used as drug disinfectant have some risks as the exposure to silver can cause agyrosis and argyria also; it is toxic to mammalian cells.

The following conclusions were drawn from the prospective study of two types of dressings.

- o Host factors such as anaemia with hypoproteinemia, diabetes mellitus, obesity were found to be significantly delaying the healing of all types of wounds.
- o No systemic or local allergic manifestation were seen in the study expect mild irritation and pain during application of betadine especially in burns patients. There was no evidence of hepatotoxicity or nephrotoxicity.
- o Nano silver gel is safe and effective in all types of wound management and gives better efficacy and faster response as compared to traditional povidone iodine and other topical antiseptics.
- o It has been demonstrated that there is remarkable reduction in common signs of inflammation like odema and erythema and remarkable increase in signs of healing of the ulcer i.e. granulation and fibrin formation.
- o Global efficacy evaluation also confirms the superiority of Nano Silver Gel over other antiseptics, as good to excellent – efficacy response was recorded in relatively more number of patients in Nano Silver Gel treated group as compared to other antiseptic without NSG treated group
- o Treatment with Nano Silver Gel reduces the microbial flora, is less painful during cleaning and debridement procedures. It can be used safely in various conditions such as diabetic foot ulcers, venous stasis ulcers, bed sores, burns, cuts, abrasions, post operative infective wounds, cellulites and abscesses.
- o Burns treated with Nano Silver Gel heal easily with better cosmetic results and less chelation relative to previous standard burn treatment.

CONCLUSION

The result of this study therefore appear to show more favourable results for Nano Silver Gel group than for conventional dressing without NSG. However, although the results are highly statistically significant, the strength of evidence depends upon the study design. The results of this study justify further research into the use of Nano Silver Gel in treatment of various wounds and ulcers. It is important to ensure that possible source of bias in further studies are excluded e.g. by randomization of patients to treatment and by blinded assessment of outcomes.

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