

## COMPARATIVE STUDY OF TOPICAL APPLICATION OF NANO SILVER AND POVIDONE IODINE DRESSING ON ULCER HEALING

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Received: 10/01/2017

Revised: 31/05/2017

Accepted: 11/06/2017

### ABSTRACT

**Background:** Treatment of ulcers stays a constant surgical and medical challenge. Present study was conducted to know the efficacy of Nano silver dressings versus Povidone iodine dressings for wound healing. **Material & Methods:** The present study was prospective comparative interventional study. 100 Patients of ulcer were selected from outdoor. The patients randomized into 2 groups- 50 in the Povidone iodine dressing group and 50 in the Nano silver dressing group. **Results:** Out of 100 Maximum patients were in the age group of 41-60 years, Both the dressing groups were statistically similar (p value = 0.551) for age and (p value = 0.248) for gender wise distribution. After the day 1 and the end of 1st week we got statistically non-significant results between both groups (p value > 0.05) in appearance of granulation tissue. But this difference was highly statistically significant (p value <0.001) at the end of 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> week, faster appearance of healthy granulation tissue was seen in the Nano Silver topical gel group patients. At the end of 6th week, all patients in either group had no slough and had healthy granulation tissue. (p value <0.001). **Conclusions:** In present study there is very promising results shown in terms of rapidity of healing, removal of slough and also complete healing by topical Nano silver gel. Hence, we conclude that Nano Silver should be considered as a better option in contrast to Povidone iodine in safe and rapid management of patients with ulcer.

**Key words:** ulcer, healing, nano silver, povidone iodine.

### INTRODUCTION:

Wound is describe as the disruption of cellular and anatomical flow of tissue integrity and sometimes allied with loss of function with highly diverse in their aetiology. Wounds are mainly due to physical, chemical, surgical and microbial injuries. Reinstatement of damaged tissue plays a significant role in survival of life

and it is on the horizon of all surgical manipulations. (1)

Healing is the response to injury in strives to restore normal structure and function. Healing is an important biological process with well-organized cellular and biochemical events which results in tissue repairs and regeneration. The approach of wound care is to promote wound

healing with shortest time possible along with minimal pain and discomfort with minimal scarring to the patient.(2)

Extrinsic factors that affect wound healing includes: Temperature, Mechanical stress, Chemical stress, Debris, Infection, Desiccation and maceration, Medications, Substance use, and Radiation therapy. Intrinsic factor that that affect wound healing includes: Age, Health status, Nutritional status and Body built. There about nearly 6 million people suffer from the chronic wounds worldwide. The prevalence of the chronic wounds in India was reported about 4.5 per 1000 population, where as that of acute wounds it was at 10.5 per 1000 population.(3) There about 10% of population will develop a chronic wound in lifetime with a related morbidity and mortality of 2.5%.(4) Many new approaches and novel agents that promote wound healing and have met with studies and experimental research. Discovery of new drugs and different pharmacological models have been screened scientifically, but the potential of most of them remains unexplored.(5)

Management of ulcer is a multidimensional approach which includes regular debridement followed by use of different dressing materials like povidone iodine, hydrogels, foams, Ionic silver or skin replacement, which helps in autolytic breakdown and provides an antibacterial environment. Ionic silver has vast antiseptic and anti-inflammatory properties along with broad spectrum antibiotic effects. (6) Since Greeks and ancient Americans, silver coins were used to disinfect the stored liquids mainly water. (7) As the nanotechnology makes possible to expands silver particles surface area to nano scale, it helps in raise the contact period with wound to protect it from bacteria or fungi, therefore increasing the bactericidal and fungicidal effects.

This study aim at evaluating the effectiveness of Povidone iodine versus Nano silver dressing in terms of time of healing, infection control with formation of granulation tissue, duration of hospital stay and lastly cost of the treatment.

## MATERIALS AND METHODS

The present study was prospective comparative interventional study carried out at RDBP Govt. Jaipuria hospital, attached to RUHS college of Medical sciences, Jaipur (Rajasthan) during the period of January 2016 to December 2016. 100 Patients of ulcer were selected from outdoor by simple random sampling. The sample size was calculated by Epi info v7 at 5% absolute precision and 95% confidence limit. Data were collected after taking consent using a Case Record form which included all particulars- history, clinical findings, and culture sensitivity of discharge from ulcers. Randomization was done by random number method for allotting of the patients into 2 groups- 50 in the Povidone iodine dressing group and 50 in the Nano silver dressing group.

Patients of diabetic ulcers associated with PVD and varicose vein (Diagnosed via Doppler Study), osteomyelitis, on steroid therapy or suffering from malignancy were not included in the study group. All patients were started strict antibiotic therapy as per culture report followed by daily debridement along with dressing with their respective dressing materials enlisted for study. End point parameters included rapidity of healing, complete healing of small ulcers, appearance of bacteria free healthy granulation tissue, and presence of slough.

The data were analyzed using MS Excel 2010, Epi Info v7 and SPSS v22.

## RESULTS

In present study Patients from both the groups were found almost comparable in terms of age, sex and surface area of ulcers. Out of them Maximum patients were in the age group of 41-60 years, being 70% in Povidone iodine group and 60% in Nanosilver group. Male preponderance was seen in both the groups- 80% (PI) versus 70% (Nanosilver) group. Both the dressing groups were statistically similar (p value = 0.551) for age and (p value = 0.248) for gender wise distribution. (Table 1)

In present study all 100 Patients of ulcer were selected from the outpatient department who were already divided in two groups as above stated in table 1, now they studied for the appearance of the granulation tissue despite of culture sensitive antibiotic coverage and the group wise topical administration of povidone

iodine and nanosilver gel. We found that after the day 1 and the end of 1st week we got statistically non-significant results between both groups (p value > 0.05) means that there is no difference in appearance of granulation tissue in both groups at that stage.

After the end of 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> week, faster appearance of healthy granulation tissue was seen in the Nano Silver topical gel group patients –20%, 56%, 84% and 96% respectively and this difference was highly statistically significant (p = <0.001). Similarly, there is statistically significant difference found in presence of slough (p = <0.05) and marked decrease shown by the application of nanosilver gel topical application. At the end of 6th week, all patients in either group had no slough and had healthy granulation tissue. (Table 2 and Table 3) Table 2: Appearance of Granulation Tissue following treatment in both groups

**Table 1: Demographic Distribution of the Patient data**

Parameters	Povidone iodine	Nanosilver	p value
<b>Age (Years)</b>			
<b>0-20</b>	0	0	<b>.551</b>
<b>21-40</b>	13(26%)	18(36%)	
<b>41-60</b>	35(70%)	30(60%)	
<b>61- 80</b>	2(4%)	2(4%)	
<b>Total</b>	<b>50</b>	<b>50</b>	<b>100</b>
<b>sex</b>			
<b>Male</b>	40(80%)	35(70%)	<b>.248</b>
<b>Female</b>	10(20%)	15(30%)	

**Table 2: Appearance of Granulation Tissue following treatment in both groups**

Appearance of Granulation Tissue	Povidone iodine	Nanosilver	p value
Baseline (Day 1)	01(2%)	02(4%)	.783
1 Week (7th day)	03(6%)	10(20%)	.139
2 Weeks (14th day)	07(14%)	28(56%)	<.001
3 Weeks (21st day)	15(30%)	42(84%)	<.001
4 Weeks (28th day)	30 (60%)	48(96%)	<.001
5 Weeks (35th day)	40(80%)	50(100%)	<.001
6 Weeks (42nd day)	50(100%)	50(100%)	<.001

**Table 3: Presence of Slough following treatment in both groups**

Presence of Slough	Povidone iodine	Nanosilver	p value
Baseline (Day 1)	49(98%)	48(96%)	.893
1 Week (7th day)	47(94%)	40(80%)	.354
2 Weeks (14th day)	43(86%)	22(44%)	<.001
3 Weeks (21st day)	35(70%)	08(16%)	<.001
4 Weeks (28th day)	20 (40%)	02(4%)	<.001
5 Weeks (35th day)	10(20%)	00(0%)	<.001
6 Weeks (42nd day)	00(0%)	00(0%)	<.001

## DISCUSSION

The primary of treatment for ulcer is surgical debridement and use of variable solutions or materials for the biodegradable therapy. Selecting proper dressing material is a major decision for the of affective disinfection and removal of necrotic debris from ulcers aimed at

modifying the micro condition of wound and to promote its healing, for this purpose a prospective randomized clinical trial was conducted. Very few studies were available which compare the outcomes between Povidone iodine and Nanosilver dressing; hence our study enlightens the comparative analysis. In the

present study we found that at the end of 3<sup>rd</sup> week there is only 30% decrease in slough by povidone iodine contrary to the study conducted by Kapur V & Marwaha AK, they reported 90% decrease in slough by 3<sup>rd</sup> week with Povidone iodine. (8) Hence time required for decrease of slough is longer in our study with povidone iodine.

In present study group who received Nanosilver showed 84% of slough reduction in 3<sup>rd</sup> week ( $p < 0.001$ ) and 96% by 4<sup>th</sup> week ( $p < 0.001$ ) while another study done by Singh S and Apte A reported that mean time taken for slough reduction in Nano silver group was 2 weeks and 3 weeks in Povidone iodine group with a  $p$  value  $< 0.0001$ . (9)

In the present study we found statistically highly significant difference ( $p < 0.001$ ) between appearance of granulation tissue between povidone iodine and nanosilver group which is similar to findings obtained from the study conducted by Ramanaiah NV and Saikrishna et al found that appearance of granulation tissue 94.81% in Nano Silver group vs. 84.69% in Povidone iodine at the end of 5<sup>th</sup> week and the difference was also statistically significant ( $p < 0.05$ ). (10)

## CONCLUSION

Ulcer is not merely a serious health problem for the patient, but also a major health care concern because of pain, discomfort, loss of man days and prohibitive cost of treatment. Povidone iodine had been in used for dressing of ulcers for a very long time with good results and also proved the same in numerable studies. On the other hand Nano silver is a comparatively new substance and has not been as universally used as Povidone iodine. In present study there is very promising results shown in terms of rapidity of healing, removal of slough and also complete

healing by topical Nano silver gel. Since not many studies found with this compound, there were very limited comparison with other studies. So, the essentiality for more elaborate studies needed for the efficacy of Nano silver to result in faster and better healing. Hence, we conclude that Nano Silver can be considered as a better option in contrast to Povidone iodine in safe and rapid management of all patients with ulcers.

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