ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

ORIGINAL RESEARCH

Role and evaluation of superoxidised solution and gel (microdacyn) in the treatment of pressure ulcers

[1]Dr Param Hans, [2]Dr Bhupinder Singh, [3]Dr Harmohinder Kumar Attri, [4]Dr Sumitoj Singh Dhaliwal, [5]Dr Baldev Singh, [6]Dr Ranjit Kumar

[1]Medical Officer, S.D.H, Garhshankar,DistHoshiarpur,Punjab, India.
[2]Assistant Professor,Deparment of surgery,Government Medical College, Amritsar, Punjab, India.
[3]Department of Biochemistry,Government Medical College, Amritsar, Punjab, India.
[4]Professor, Department of Surgery,Government Medical College, Amritsar, Punjab, India.
[5]Professor, InchargeSurgical Unit-4,Guru Nanak Dev Hospital, Amritsar, Punjab, India.
[6]Assistant Professor, Department of Pharmacology, Government Medical College,Amritsar, Punjab, India.

Correspondence:
Dr Bhupinder Singh
Assistant Professor, department of surgery, Government Medical College, Amritsar, Punjab,India.

Received: 17 September, 2022 Accepted: 22 October, 2022

Abstract

Background and Aim: Pressure ulcers are loclized damage to the skin and/ or underlying tissue that usually occur over a bony prominence as a result of pressure, or pressure in combination with shear or friction. Superoxidised solution has been introduced lately with capability of treating wound.Hence the aim of present study is to determine the efficacy and safety of (microdacyn) superoxidised solution and gel in treatment of pressure ulcers.

Materials & Methods: The present study was conducted at Guru Nanak Dev Hospital, Amritsar. It included 50 patients having pressure ulcers, which were treated with superoxidised solution and gel dressings and were observed at day 1, 7, 14, 21, 28, and 42.Assessment of the pressure sores was done by using PUSH scoring system. Data was assessed and analysed using SPSS keeping value of p less than 0.05.

Results: The mean PUSH score of all the ulcers decreased with time depicted wound healing. It reduced from 9.32 at day 1 to 2.48 at day 42.The mean healing rate was 78.2%, the mean healing time was 5.3weeksandmeanreductioninulcersizewas93.3%.No adverse effect was noticed in any form of skin irritation, unpleasant odour,burningsensation,desquamation,hyper or hypopigmentation of intact skin by the use of superoxidised solution.

Conclusion: Application of superoxidised solution shows reduction in wound infection, marked reduction in wound size, early appearance of granulation tissue and epithelisation, promoting wound healing with no adverse effects. This makes it a novel antiseptic and a good choice for wound care.

Keywords: PUSH score, Superoxide solution, ulcer, wound

Introduction

Pressure ulcers are a type of injury that breaks down the skin and underlying tissue when an area of skin is placed under constant pressure for certain period causing tissue ischaemia, cessation of nutrition and oxygen supply to the tissues and eventually tissue necrosis. Constant pressure resulting in 'distortion or deformation damage' is probably the most accurate description of a pressure ulcer.[1]

The majority of people affected with pressure sores are those having health conditions (mental or physical) that necessitate immobility, especially those who are confined to bed or chair for prolonged periods of time. Several other health conditions that influence blood supply and capillary perfusion, such as type-2 diabetes, can make a person more vulnerable to pressure ulcers.[2]

Superoxidised solutions may represent an alternative to currently available options for wound healing .They are electrochemically processed aqueous solution manufactured from pure solutions which is rich in reactive oxygen species with neutral pH and longer half life (>12 month).[3]. It has shown to be both safe and efficient as a wound care product that moistens, lubricates, debrides and reduces the microbial load of various wound types.[4] Use of superoxide solution lessens the healing time, decreases hospitalization rate, reduces unpleasant odour and improves the appearance of granulation tissue and epithelisation. It also attacks bacteria, viruses, fungi and spores without adversely affecting the surrounding healthy tissue.[5]

Hence the present study has been conducted to determine the efficacy and safety ofsuperoxidised solution and gel (Microdacyn) in treatment of pressure ulcers.

Materials & methods

Fifty cases having pressure ulcers were taken up for study after getting approval from the Thesis and Ethical Committee of the Institution. Informed consent in the patient's own vernacular language was taken from each and every patient prior to the start of the study. The wound site was cleaned with normal saline followed by application of superoxidised solution for 30 seconds and then followed by application of wound care hydrogel. The solution was applied in form of spray and the hydrogel was applied by a pump. The antibiotics were administered in the cases after culture and sensitivity. Observations were made during dressing and examination of the patients on the day 7,14,21,28 and at day 42. Assessment of the pressure sores was done by using PUSH scoring system.

Inclusion criteria included thepatients developing bed sores, pressure sores, patients of head injury, unconscious patients, with spinal cord injury (paraplegic patients), bed ridden patients due to orthopedic trauma/surgery, cerebrovascular accident, old age having no control of stools or urine &were able to fulfill all obligations of the study whereas those having pressure ulcers scheduled for surgical closure within 14 days, use of any immunosuppressant medications within 30 days of screening and pregnant women were excluded from study.

Data was collected and statistical analysis was done using SPSS software, p value less than 0.05 was considered to be statistically significant.

Results

In our study it was observed that, total 50 ulcers were treated with superoxidised solution and gel. Out of them, 64% (Group A) pressure ulcers were completely healed and 36% (Group B) were still healing at day 42. The 36% ulcers were grouped as still healing instead of non healing as all these ulcers were improved and were in epithelisation phase at the end of the study but were not healed completely due to certain risk factors.(table 1)

ISSN 2515-8260 Volume 9, Issue 7,Summer2022

Table 1- Showing treatment of ulcers

Treatment/Results	No. OfUlcers
Total no. of ulcer treated with superoxidisedsolution	50(100%)
Completelyhealed(GroupA)	32(64%)
Still healing(GroupB)	18(36%)

The falling trend of mean PUSH score was indicator of wound healing. The mean PUSH score of all the ulcer decreased from 14.34 to 3.12 from day 1 to day 42. Healing rate was 78.2%. The completely healed (Group A) ulcer attained the score 0 at day 42. The mean healing time was 5.3 weeks. The mean score among still healing (Group B) ulcers decreased from 15.94 to 8.67 from day 1 to day 42. The falling trend in (Group B) ulcers make them still healing ulcers instead of non healing ulcers.(table 2)

Table 2 showing falling trend of mean PUSH score

Total PUSHscoreat	Total		GroupA(Healed)		GroupB(Stillhealing)		p-value
	Mean	SD	Mean	SD	Mean	SD	
Day1	14.34	2.18	13.44	2.02	15.94	1.43	0.000
Day7	12.96	2.68	11.59	2.31	15.39	1.09	0.000
Day14	10.74	3.77	8.88	3.50	14.06	0.73	0.000
Day21	8.22	4.63	5.69	3.81	12.72	1.41	0.000
Day28	5.66	4.96	2.50	3.10	11.28	1.07	0.000
Day42	3.12	4.31	0.00	0.00	8.67	1.65	0.000

The subscore of all the ulcers decreased from 2.66 to 0.38 depicting wound healing. The Group A ulcers attained the subscore of 0 at the day 42 showing complete healing while the subscore of group B decreased from 3.28 to 0.94 from day 1 to day 42. The falling trend instead of being static makes the group B ulcers still healing instead of non healed ulcers (table 3).

Table 3 showing falling trend of tissue type subscore

Tissue typesubscoreat	Total		GroupA(Healed)		GroupB(Stillhealing)		p-value
	Mean	SD	Mean	SD	Mean	SD	
Day1	2.66	0.80	2.31	0.59	3.28	0.75	0.000
Day7	2.12	0.69	1.75	0.51	2.78	0.43	0.000
Day14	1.68	0.68	1.34	0.55	2.28	0.46	0.000
Day21	1.08	0.67	0.75	0.51	1.67	0.49	0.000
Day28	0.64	0.48	0.44	0.50	1.00	0.00	0.000
Day42	0.38	0.49	0.00	0.00	0.94	0.24	0.000

The total PUSH score ranges from 0-17. The subscore 0 marks the complete wound healing. The number of ulcers having 0 subscore increases from day 14 to day 42. The 64% ulcers are completely healed at day 42. At day 1, 82% ulcers lie in subscore range of 13 to 17 which shows decreasing trend in subsequent weeks as 64%, 40%, 26% and 4% at day 7, 14, 21 and 28 respectively. None of the ulcer had subscore range of 13-17 at day 42 depicting improvement in the rest of the 36% ulcers.(table 4)

Table 4 showing distribution of ulcers in different push scoreranges

TotalPUSH score	Day1		Day7		Day14		Day21		Day28		Day42	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
0	0	0.00	0	0.00	1	2.00	6	12.00	17	34.00	32	64.00
1-6	0	0.00	1	2.00	7	14.00	12	24.00	10	20.00	5	10.00
7-12	9	18.00	17	34.00	22	44.00	19	38.00	21	42.00	13	26.00
13-17	41	82.00	32	64.00	20	40.00	13	26.00	2	4.00	0	0.00

Discussion

Pressure ulcers have been described as one of the expensive and physically debilitating complications in the 20th century.[6] The incidence of pressure ulcers is different in each clinical setting. Incidence rates of as low as 0.4% to as high as 38% have been reported in the inpatient department while prevalence has been reported as 3.5% to 69%. In Indian setting, the prevalence of pressure ulcers in hospitalized patients has been reported to be 4.94% in a study conducted by Chauhan et al.[7]

A major breakthrough for pressure ulcer management over the last decades was the demonstration of novel dressings. Ideally, dressings should confer moisture balance, protease sequestration, growth factor stimulation, antimicrobial activity, oxygen permeability and the capacity to promote autolytic debridement that facilitates the production of granulation tissues and the re-epithelialization process.

The present study was conducted at Guru Nanak Dev Hospital, Amritsar. It included 50 patients having pressure ulcers, which were treated with superoxidised solution and gel dressings and were observed at day 1, 7, 14, 21, 28, and 42.

Out of 50 ulcers, 64% were healed completely and 36% were still healing. The mean PUSH score of the total ulcers had decreased gradually from day 1 to day 42. The mean PUSH score was 14.34 and 3.12 at day 1

The mean PUSH score was 13.44 at day 1 and it became zero at day 42. While in group B (still healing ulcers) it decreased from 15.94 at day 1 to 8.67 at day 42.Gardner et al in 2005 studied thirty-two pressure ulcers. Twenty-one (66%) healed during the study and 11 (34%) did not heal. The PUSH scores decreased significantly over time among the healed ulcers but did not among the unhealed ulcers. Similarly, PUSH scores were significantly lower among the healed compared with the unhealed ulcers.[8]

In the study, FereshtehEftekharizadeh, in 2016 concludes that the superoxidized water is a safe and effective solution for chronic wounds. The use of SOW as an adjunct local antimicrobial treatment produced improved outcomes over PI due to recent studies all over the world.[9]

The mean healing time in our study was 5.3 weeks. Usually chronic ulcers take weeks to months to heal but the lower healing period in our study shows the effectiveness of superoxidised solution and makes it cost effective too.Robert G. Frykberg in 2015 explained that chronic wounds like pressure ulcers/venous ulcers show prolonged or excessive inflammation, persistent infections, formation of drug-resistant microbial biofilms and the inability of dermal and/or epidermal cells to respond to reparative stimuli andtake months for healing.[10] In contrast ,the average healing time in our study was comparable to other studies which used superoxidised water v/s povidine iodine. Piaggesi has estimated 10.5 weeks forsuperoxidised water (SOW) and16.5 weeks for PI (povidine-iodine) to heal a wound with $p<0.05$.[11] On the other hand, Luca dalla Paula needed 43 days for SOW and 55 days for PI to deal with such wounds in patients ($p<0.0001$).Other studies from Aragon reported 6.8 weeks for wound to be treated by SOW.[12] All the ulcers which were still healing at day 42, were epithelised which was evident from the tissue type sub score of the group B ulcers. The epithelization and decrease in PUSH score in still healing ulcers points that the use of super oxidized solution has greatly reduced the need for surgical reconstruction of pressure sores and hence reduced the hospital stay and treatment expenditure to a great extent.[13]

Conclusion

The use of super-oxidized solutions as wound care productsis cutting edge concept. The results of this study suggest that within the setting of a comprehensive wound managementprogram,superoxidized solutionan dgelpromotes the healing of chronic ulcers /

ISSN 2515-8260 Volume 9, Issue 7,Summer2022

pressure ulcers, bydecreasing thebacterial load, cutting short the prolonged inflammatory phase, improving gresponsetore parativestim ulationand reducing thewoundsize. Although super oxidized water is extremely effective agent in wound management, but a multidisciplinary approach to wound care including assertion of glycemic control, nutritional support and to use the preventive measures to halt the progress of pressure sores can offload the burden of the disease to a great extent.

References

1. Gebhardt K. Pressure ulcer prevention. Part 1. Causes of pressureulcers.NursingTimes.2002;98(11):41-4.
2. Leblebici B, Turhan N, Adam M, Akman MN. Clinical and epidemiologic evaluation of pressure ulcers in patients at a university hospital in Turkey. Journal of Wound Ostomy& Continence Nursing. 2007;34(4):407-11.
3. Wadher B, Shende K, Joshi A, Naranje N, Magar S. Acidic environment and wound healing: a review. Wounds: a compendium of clinical research and practice. 2015;27(1):5-11.
4. Kapur V, Marwaha AK. Evaluation of effect and comparison of superoxidised solution (oxum) v/s povidone iodine (betadine). Indian Journal of surgery. 2011;73(1):48-53.
5. Eftekharizadeh F, Dehnavieh R, Hekmat SN, Mehrolhassani MH. Health technology assessment on super oxidized water for treatment of chronic wounds. Medical journal of the Islamic Republic of Iran. 2016;30:384.
6. WadherB,ShendeK,JoshiA,NaranjeN,MagarS.Acidicenviron mentand wound healing:areview.Wounds:acompendium of clinical researchand practice.2015;27(1):5-11.
7. KapurV,MarwahaAK.Evaluationof effect and comparison ofsuperoxidised solution (oxum) v/s povidone iodine (betadine). IndianJournalofsurgery.2011;73(1):48-53.
8. Eftekharizadeh F,Dehnavieh R,Hekmat SN,Mehrolhassani MH.Health technology assessment on super oxidized water for treatmentof chronic wounds. Medical journal of the Islamic Republic of Iran.2016;30:384.
9. PiaggesiA,Goretti C,MazzurcoS, Tascini C,LeonildiA ,RizzoLetal.A randomized controlled trial to examine the efficacy and safety of anew super-oxidized solution for the management of wide postsurgicallesions.Theinternationaljournaloflowerextremitywounds.2010;9(1):10-5.
10. Assaloni MD, DaRos R. Superoxidized solution (SOS) therapy forinfecteddiabeticfoot ulcers. Wounds.2006;18(9):262-70.
11. Aragón-Sánchez J, Lázaro-Martínez JL, Quintana-Marrero Y, Sanz-CorbaláníI,Hernández-HerreroMJ,Cabrera-GalvánJJ.Super-oxidized solution (DermacynWound Care) as adjuvant treatment inthepostope rative management of complicated diabetic foot osteomyelitis: preliminary experience in a specialized department.Thein ternational journal of low erextremity wounds. 2013;12(2):130-7.
12. Landa-Solis C, Gonzalez-Espinosa D, Guzman-Soriano B, Snyder M,Reyes-Teran G, Torres K et al. MicrocynTM: a novel superoxidizedwater with neutral pH and disinfectant activity. Journal of HospitalInfection. 2005;61(4):291-9.
13. GunaydinM,EsenS,KaradagA,UnalN,YanikK,OdabasiHetal.Invitroanti microbiala ctivity of Medilox ® super-oxidizedwater. Annals of clinicalmi crobiologyan dantimi crobials.2014;13(1):29.