



## ROLE OF SUPEROXIDE SOLUTIONS IN DIABETIC FOOT

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**ABSTRACT** **Background:** Diabetes mellitus is one such metabolic disorder that impedes the normal steps of the wound healing process. Diabetic foot ulcer is challenging problem to every clinician in day to day practice. These wounds have been managed by local dressings with various agents like provide one iodine, EUSOL, acetic acid, hydrogen peroxide, local antibiotics ointments or powders etc since long time. Use super oxidized solution is new concept in wound management.

**Material and method:** The present study was carried out in the Department of Surgery, Adesh Medical College Bathinda, and India. 50 Patients in age group of 6 to 65 yrs with different types of wounds were included in this study. Criteria for inclusion in the study consisted of any wounds in patients irrespective of its aetiology, anatomic site, and size. However, exclusion criteria were age more than 65 yrs or less than 6 yrs of age, patients with haemoglobin less than 8 gm/dl, having signs of septicaemia and immunodeficiency disorders.

**Results:** All 50 cases were infected at the time of presentation to our department. After few days use of super oxidized solution all wound become sterile and granulation tissue appears. Definite procedure were done once wound become sterile with healthy granulations after the use of super oxidized solution

**KEYWORDS :** Super-oxidized waters (SOWs), diabetic wounds, Diabetes mellitus (DM), Super oxide solutions(SOS)

## INTRODUCTION

Diabetes mellitus (DM) is most common noncommunicable chronic disease in India affecting about 7% of adult population. Non-healing foot ulcers one among the many complications that increase the morbidity of the patients. Super added infections can further increase duration of healing or may potentially ending in the loss of the limb. One of the major causes of non-healing of ulcer in diabetes is infection caused by a variety of microorganism such as Staphylococcus aureus and Pseudomonas aeruginosa which invade the wound and multiply, producing harmful toxic substances, causing destruction of tissue and disturbance in wound healing. Diabetic foot is one of the most significant and devastating complications of diabetes, and is defined as a foot affected by ulceration that is associated with neuropathy and/or peripheral arterial disease of the lower limb in a patient with diabetes<sup>1</sup>. The prevalence of diabetic foot ulceration in the diabetic population is 4–10%; the condition is more frequent in older patients. Diabetic foot ulcer is a major complication of diabetes mellitus and probably the major component of the diabetic foot<sup>2,3</sup>. Diabetes mellitus is one such metabolic disorder that impedes the normal steps of the wound healing process. Many studies show a prolonged inflammatory phase in diabetic wound, which causes a delay in the formation of mature granulation tissue and parallel reduction in wound tensile strength. Diabetic foot ulcer is challenging problem to every clinician in day to day practice. These wounds have been managed by local dressings with various agents like providone iodine, EUSOL, acetic acid, hydrogen peroxide, local antibiotics ointments or powders etc since long time<sup>4</sup>. Super-oxidized waters (SOWs) have been investigated as disinfectants for instruments and hard inanimate surfaces in hospitals and some literatures have been described the use of SOWs in humans for various indications including the treatment of infectious skin defects or ulcers. SOWs have been recommended for hand washing of medical personnel. In vitro, various SOWs exert distinct microbicidal activity against a large number of bacteria and Candida species. In contrast to other common disinfectants (e.g. ethanol), SOWs can even kill spores of Bacillus atrophaeus and B.cereus<sup>5</sup>. Use super oxidized solution is new concept in wound management.

## Mechanism of action superoxide solution

Superoxide solution is a hypotonic solution with an osmolarity of 13mOsm/kg and containing hypochlorous acid, Sodium hypochlorite, chloride dioxide, ozone, hydrogen peroxide and sodium chloride. Super oxidized solution is an electrochemically processed aqueous solution manufactured from pure water and sodium chloride. During this electrolysis process reactive species of oxygen and chlorine are

formed. These released reactive species creates an unbalanced osmolarity, so that it damages the integrity of the cell membrane, then reacts and denatures the lipids and proteins of single cell organism.

## MATERIAL AND METHOD

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All patients were carefully examined clinically. Wound discharge was sent for culture and sensitivity. Empirical antibiotics– Ciprofloxacin and Metronidazole were started and changed to sensitive antibiotics after sensitivity report. Surgical debridement was done whenever necessary. All diabetic ulcers were irrigated daily with super oxidized solution and covered with gauze soaked in super oxidized solution, within 5 days granulation tissue appears in all the cases.



Fig 1:-diabetic foot

Fig 2:- after multiple dressings with superoxide

Fig 3:-after skin grafting

## Purpose of study

- To reduced hospital stay.
- To reduce mortality/morbidity.
- Reduces number of dressings

## RESULTS

All 50 cases were infected at the time of presentation to our department. After few days use of super oxidized solution all wound become sterile and granulation tissue appears. Definite procedure were done once wound become sterile with healthy granulations after the use of super oxidized solution. In the management of diabetic foot ulcer, a super oxide solution debrides necrotic tissue, reduces microbial load, promotes granulation and decreases the healing time, without damaging the normal tissue or complications. Those patients, who have small superficial ulcers or not fit for definite surgery, can be managed conservatively with super oxidized solution only. The moistening effect and minimum toxicity found with the use of this super oxidized solution makes it a good choice for diabetic foot ulcer management. Overall, topical superoxidised solution dressings accelerated the healing process resulting in faster recovery through reduction in ulcer area in patients with infected diabetic ulcers compared to topical povidine iodine dressing. Superoxidised solution is effective and economical alternative for better management of diabetic foot ulcers. It is safe and can be used in various types of wounds like diabetic ulcers, venous ulcers, burns and post-operative wounds

## CONCLUSION

Super oxide solutions(SOS) is safe and effective in all types of wound management and gives better efficacy and faster response as compared to traditional povidone iodine topical application. It has been demonstrated that there is remarkable reduction in common signs of inflammation like odema, erythema and remarkable increase in signs of healing of the ulcer i.e. granulation and fibrin formation. Treatment with SOS 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. Application is easy and treatment is less expensive compared to povidone iodine.

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