

## ORIGINAL RESEARCH

### **Efficacy of Dermabrasion in the Treatment of External ulcers - A Randomised Controlled Trial**

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#### **ABSTRACT**

**Background:** Management of ulcers is a topic of great interest. Some of the basic methods of managing ulcers can be listed as Debridement of non-viable tissues, reduction of edema, appropriate dressing, Antibiotics if necessary, Control of co-morbidities, Close wounds surgically with grafts or flaps. Debridement prepares the wound for healing by reducing the bioburden. Without an adequate debridement, a wound is persistently exposed to cytotoxic stressors and competes with bacteria for scarce resources such as oxygen and nutrients. Dermabrasion is a tool in the management of dermatological conditions like post-acne scarring, naevi, adenoma sebaceum and also in the management of burns. In this study the use of dermabrasion as a debridement tool in the management of ulcers shall be evaluated. **Aims and Objectives of the Study:** To assess the usefulness and effects of dermabrasion in the management of ulcers. To compare the outcome of dermabrasion with the conventional method. **Assessment of Wound healing.** No of days of Hospital stay, Pain during the procedure.

**Materials and Methods:** From the 100 patients presenting to outpatient clinic or admitted into the hospital with an ulcer on the extremity were recruited into the study.

**Results:** In this study the mean VAS scores was  $4.9 \pm 1.110$  in the conventional group and in the trial it was  $2.55 \pm 1.227$ . In this study the mean WOUND scores was  $13.22 \pm 2.320$  in the conventional group and in the trial it was  $12.28 \pm 2.456$ . No statistically significant difference was noted between the 2 groups in terms of Wound scores ( $p=0.139$ ). In this study the mean ASEPSIS scores was  $48.38 \pm 2.118$  in the conventional group and in the trial it was  $46.79 \pm 2.310$ . No statistically significant difference was noted between the 2 groups in terms of Wound scores ( $p=0.311$ ).

**Conclusion:** Dermabrasion reduces the pain during the procedure significantly, promotes granulation and decreases the healing time without damaging the normal tissue or producing complications.

**Keywords:** Dermabrasion, wound healing, chronic ulcers.

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## INTRODUCTION

Wound may be defined as the interruption of continuity in a tissue, usually following trauma. Skin is predominantly affected although any tissue, whether nerve, bone or organ may be involved. Wound is a microcosm of the patient. Most wounds heal with minimal intervention in a healthy individual. Conversely, the incidence of nonhealing wounds and delayed wound healing is higher in patients with systemic diseases, particularly those who are hospitalized.

There are many causes of ulcers. Venous insufficiency accounts for 80% to 90%, arterial insufficiency for 5%, and a mixture of arterial and venous accounts for another 5%. Approximately 2% of ulcers are caused by diabetes and only 1% of ulcers will be caused by one of the many diseases. Non healing Ulcers are costly to treat, cause loss of work time, and tend to be chronic and recurrent. Leg ulcers affect about 2% of the population in developed countries. Patients with ulcers have a poorer quality of life than age matched controls because of chronic pain, odour and reduced mobility. The repair or reconstitution of a defect in an organ or tissue, commonly the skin.<sup>[1]</sup>

Wound healing involves a complex interaction between epidermal and dermal cells, the extracellular matrix, controlled angiogenesis, and plasma derived proteins—all coordinated by an array of cytokines and growth factors. It is a dynamic process and a complex series of events that begins at the moment of injury and can continue for months to years. This dynamic process is classically, divided into three overlapping phases—*inflammation, proliferation, and remodeling*. A wound heals in an orderly set of stages and in a predictable amount of time.<sup>[2,3]</sup> Acute and chronic wounds are at opposite ends of a spectrum of wound healing types that progress toward being healed at different rates.<sup>[2]</sup> Chronic wounds seem to be detained in one or more of the phases of wound healing. For example, chronic wounds often remain in the inflammatory stage for too long.<sup>[3,4]</sup> In acute wounds, there is a precise balance between production and degradation of molecules such as collagen; in chronic wounds this balance is lost and degradation plays too large a role.<sup>[5,6]</sup> Chronic wounds may never heal or may take years to do so. These wounds cause patients severe emotional and physical stress as well as creating a significant financial burden on patients and the whole healthcare system. Chronic wounds mostly affect people over the age of 60.<sup>[7]</sup> The incidence is 0.78% of the population and the prevalence ranges from 0.18 to 0.32%.<sup>[8,9]</sup> As the population ages, the number of chronic wounds is expected to rise.<sup>[1]</sup> The key to successful wound healing is meticulous wound care and the optimization of wound healing capacity.

India alone currently counts over 35 million people with diabetes, which is estimated to touch 73.5 million by 2025 (Worldwide annually more than one million amputations done of these 70 % are due to diabetes). In India, diabetic foot infection constitutes 10 % of hospital admissions, and of the 40,000 legs amputated per year; the majority are due to diabetic foot

infection.<sup>[11]</sup> Infection is one of the most important factors in determining the risk of amputation in patients with diabetes.<sup>[10]</sup> If a standardized treatment is applied with a multidisciplinary foot care team, major amputation can be avoided in about 80-90% and in 95% of patients with infection.<sup>[11]</sup> Management of ulcers is a topic of great interest. Some of the basic methods of managing ulcers can be summarized as Debridement of non-viable tissues, reduction of edema, appropriate dressing, Antibiotics if necessary, Control of comorbidities, Close wounds surgically with grafts or flaps.<sup>[12]</sup>

Debridement prepares the wound for healing by reducing the bioburden. Without an adequate debridement, a wound is persistently exposed to cytotoxic stressors and competes with bacteria for scarce resources such as oxygen and nutrients.

Dermabrasion is a tool in the management of dermatological conditions like post-acne scarring, naevi, adenoma sebaceum and also in the management of burns.<sup>[13]</sup> In this study the use of dermabrasion as a debridement tool in the management of ulcers shall be evaluated.

### **Aims and Objectives**

1. To assess the usefulness and effects of dermabrasion in the management of ulcers.
2. To compare the outcome of dermabrasion with the conventional method.
  - a. Assessment of Wound healing. No. of days of Hospital stay. Pain during the procedure.

### **MATERIALS & METHODS**

#### **Source of patients:**

This is a prospective study conducted on 100 patients (55 conventional group, 45 trial group) attending surgical outpatient clinic or admitted in the surgical wards during the study period over an year. Subjects of this study include all individuals with ulcers over extremities. Randomization is done by allotting random numbers to all the patients, these patients were grouped into 2 groups, i.e CONVENTIONAL and TRIAL groups who were treated with conventional and dermabrasion wound treatment respectively.

All patients who presented to the hospital with ulcers or who developed ulcer following debridement were taken into the study. A detailed history and clinical examination was done and patients were randomly put into CONVENTIONAL and TRIAL groups as mentioned above. Relevant investigations were done.

CONVENTIONAL GROUP patients were subjected to standard conventional treatment for ulcers existing in our hospital setup i.e.; antibiotics, regular cotton gauze with betadine dressings, occasional mechanical debridement as required.

TRIAL GROUP patients received all the components of standard treatment except for conventional debridement which was replaced by Dermabrasion done on alternate days.

Informed consent was obtained from the patients.

Device: Dermabrasion is done using high-speed rotating head dermabrader with 4200rpm.

Wound Assessment: The wound healing will be assessed and quantified using the ASEPSIS score,<sup>[12-14]</sup> which is a scoring method for wound infections. Based on the ASEPSIS wound score, wound healing was quantified by a blinded investigator from postoperative days.<sup>[3,7,11,15]</sup>

**Table 1: The ASEPSIS WOUND score**

Criterion Points	
Additional treatment Antibiotics for wound infection	10
Drainage of pus under local anaesthesia	5
Debridement of wound under general anaesthesia	10
Serous discharge	0-5
Erythema	0-5
Purulent exudates	0-10
Separation of deep tissues	0-10
Isolation of bacteria from wound	10
Stay as in-patient prolonged over 14 days as result of wound infection	5

**Pain assessment:** Visual analogue scale(VAS) is used for the assessment of pain before and after the procedure and is compared to the conventional method. It is a 10 cm line grading pain from NO pain to WORST pain as experienced by the patient 15.

**Follow up:** Patients of both the groups were followed up every week up for the first month and then after once in 15 days up to 3 months or till the wound was completely healed or flap/grafting is done whichever is earlier.

**Inclusion criteria:** Age limit: 20-80 years, All subjects having ulcers in upper or lower extremities attending attending surgical outpatient clinic or admitted to the wards with an ulcer.

**Exclusion criteria:** Patients with less than two weeks of treatment period, Patients suffering from anemia, hypoproteinemia, chronic steroid intake, malnourishment and malignancy.

## RESULTS

**Table 2: Age-wise Distribution of the Study Group**

Age in years	Conventional		Trial		Total	
	No	%	No	%	No	%
21-30 yrs	2	3.64%	4	8.89%	6	6.00%
31-40 yrs	13	23.64%	10	22.22%	23	23.00%
41-50 yrs	9	16.36%	11	24.44%	20	20.00%
51-60 yrs	17	30.91%	8	17.78%	25	25.00%
61-70 yrs	11	20.00%	10	22.22%	21	21.00%
70-80 yrs	3	5.45%	2	4.44%	5	5.00%
Total	55	100.00%	45	100.00%	100	100.00%

The patients in both the groups were selected randomly. In the study 25% were in the age group between 51 to 60 years. In the trial group 22.2 % and 31% in the conventional group were in the age group of 51-60 years.

In this study the mean age group was  $48.3 \pm 12.17$  in the trial and in the conventional group the mean age in years was  $53.26 \pm 14.23$ . Both the groups are comparable with age.

This study had 53 males and 47 females. 58.5% of trial group were males, 41.5% were females. In the conventional group 62% were males and 38% were females. Mean Ulcer sizes of both groups of the study population were comparable. In this study, 37.5% patients from the conventional group and 46% from the trial group had co-morbidities. Both the groups were comparable to each other.

In this study the mean duration of hospital stay was  $18.33 \pm 4.7$  days in the trial and in the conventional group it was  $12.22 \pm 4.8$  days.

In this study, Majority, 85% of the patients from the trial group had a VAS score of 1-3. Where as in the conventional group 87.5% patients had a VAS score between 4-6. This difference in the two groups was statistically significant with a p value  $<0.05(0.002)$ .

**Table 3: Comparison of Mean VAS (Visual Analogue Scale) SCORE**

	Range	Mean	Std deviation
Conventional	3-7	4.9	1.110
Trial	1-5	2.55	1.227

In this study the mean VAS scores were  $4.9 \pm 1.110$  in the conventional group and in the trial it was  $2.55 \pm 1.227$ .

**Table 4: Comparison of WOUND SCORE**

	Range	Mean	Std deviation
Conventional	8-16	13.22	2.320
Trial	8-19	12.28	2.456

In this study the mean WOUND scores were  $13.22 \pm 2.320$  in the conventional group and in the trial it was  $12.28 \pm 2.456$ . No statistically significant difference was noted between the 2 groups in terms of Wound scores ( $p=0.139$ ).

**Table 5: Comparison of ASEPSIS SCORE**

	Range	Mean	Std deviation
Conventional	42-52	48.38	2.118
Trial	43-54	46.79	2.310

In this study the mean ASEPSIS scores was  $48.38 \pm 2.118$  in the conventional group and in the trial it was  $46.79 \pm 2.310$ . No statistically significant difference was noted between the 2 groups in terms of Wound scores ( $p=0.311$ ).

With the followup assessment of wound healing status in both the trial and conventional groups the following observations were made.

1. **FIRST FOLLOWUP:** At the end of first follow up, 83% had healing ulcers, 6% had their ulcers completely healed, 9% were lost in follow up and 2% were taken up for definitive

surgery. At the end of first follow up in Trial group, 74% had healing ulcers, 5% had their ulcers completely healed, 17% were lost in follow up and 4% were taken up for definitive surgery.

2. **SECOND FOLLOWUP:** At the end of second follow up in Conventional group, 76% had healing ulcers, 11 % had their ulcers completely healed, 11% were lost in follow up and 2% were taken up for definitive surgery. At the end of second follow up in Trial group, 76% had healing ulcers, 9% had their ulcers completely healed, 13% were lost in follow up and 2% were taken up for definitive surgery. At the end of second follow up in Conventional group, 64% had healing ulcers, 11% had their ulcers completely healed, 18% were lost in follow up and 7% were taken up for definitive surgery.
3. **THIRD FOLLOWUP:** At the end of third follow up in Trial group, 66% had healing ulcers, 19 % had their ulcers completely healed, 11% were lost in follow up and 4% were taken up for definitive surgery. At the end of third follow up in Conventional group , 56% had healing ulcers, 19% had their ulcers completely healed, 18% were lost in follow up and 7% were taken up for definitive surgery.
4. **FOURTH FOLLOWUP:** At the end of fourth follow up in Trial group, 47 % had healing ulcers, 38 % had their ulcers completely healed, 11% were lost in follow up and 4% were taken up for definitive surgery. At the end of fourth follow up in Conventional group, 27% had healing ulcers, 44% had their ulcers completely healed, 20 % were lost in follow up and 9% were taken up for definitive surgery.
5. **FIFTH FOLLOWUP:** At the end of fifth follow up in Trial group, 22% had healing ulcers, 64% had their ulcers completely healed, 11% were lost in follow up and 3% were taken up for definitive surgery. At the end of fifth follow up in Conventional group, 17% had healing ulcers, 56% had their ulcers completely healed, 18% were lost in follow up and 9% were taken up for definitive surgery.

## DISCUSSION

Dermabrasion has been used for a number of years to treat a variety of dermatologic conditions, including facial skin resurfacing and scar revision. Dermabrasion found its niche in treating acne and traumatic facial scars, and in cosmetic facial resurfacing.

Small, portable hand-held dermabraders are the most popular units available today and are able to generate rotation speeds of 18 000–35 000 revolutions per minute. End pieces, including wire brushes, diamond fraises and serrated wheels, attach to the end of the dermabrader to allow precise resurfacing and treatment.

As with all cosmetic surgical procedures, appropriate patient selection and room preparation (with appropriate lighting and monitoring equipment) are essential to assure optimal outcomes with the dermabrasion procedure. Patients must understand all of the potential risks, benefits and limitations associated with the procedure.

Dermabrasion is technique-dependent and the surgeon should be well versed on the technique prior to performing this therapy. Gentian violet solution is used to delineate the areas to be treated. Refrigerant topical anesthesia is used to freeze the skin prior to the procedure. Holding the skin taut, the dermabrasion procedure occurs in a routine manner, treating one anatomic unit at a time.

Postoperatively, patients may have an open or closed dressing system. Postoperative medical treatment is also recommended, including the use of antiviral agents, antibacterials and corticosteroids. The re-epithelialization process is usually complete in 5–7 days and residual erythema is common for up to 4 weeks. Adequate sun protection is essential following dermabrasion.

Total of 100 patients with ulcers attending surgical outpatient clinic or admitted into HOSPITAL were recruited into the study based on the inclusion and exclusion criteria mentioned earlier. The patients in both the groups were selected randomly. In the study 25% were in the age group between 51 to 60 years. In the trial group 22.2 % and 31% in the conventional group were in the age group of 51-60 years.

In this study the mean age group was  $48.3 \pm 12.17$  in the trial and in the conventional group the mean age in years was  $53.26 \pm 14.23$ . Both the groups are comparable with age.

Both the groups are comparable with age. A study undertaken in the USA in 2004 through the 2002 National Hospital Discharge Survey, evaluated 275,000 in patient records from 500 hospitals from 1996 onwards. This study revealed that elderly had twice the risk of developing an ulcer.<sup>[16]</sup>

Dumfarth et al,<sup>[17]</sup> has indicated that the incidence of wound healing disorders in the conventional treatment group was 22% as compared with the shock wave therapy group 4% 7. In this study the mean ASEPSIS scores was  $47.78 \pm 2.208$  in the conventional group and in the trial it was  $47.49 \pm 2.210$ . No statistically significant difference was noted between the 2 groups in terms of Wound scores ( $p=0.331$ ) in our study, the results from both the groups are comparable in terms of wound healing rates.

Dumfarth et al,<sup>[17]</sup> showed tissue effects were seen with Low-energy shock wave therapy (SWT) improves healing of diabetic and vascular ulcers by over expression of vascular endothelial growth factor and down regulation of necrosis factor  $\kappa$ B. Higher incidence of wound healing disorders necessitating antibiotic treatment in the control group 22% as compared with the SWT group 4% was observed.

Shehadi et al,<sup>[18]</sup> in their study showed that dermal thickness was increased by as much as 40% in the thinner skin and by 27% in the thicker skin. Similarly, the increase in collagen-bundle thickness was 22%, whereas the increase in the epidermal thickness was 9%.

Dryburgh et al,<sup>[19]</sup> in their study showed that dermal thickness was increased by as much as 46% in the thinner skin and by 32% in the thicker skin. Similarly, the increase in collagen-bundle thickness was 20%, whereas the increase in the epidermal thickness was 6%

Davies et al,<sup>[20]</sup> in their study of management of necrotic ulcers showed that dermal thickness was increased by as much as 40 % in the thinner skin and by 28 % in the thicker skin. Similarly, the increase in collagen-bundle thickness was 21%, whereas the increase in the epidermal thickness was 8%

In this study the mean duration of hospital stay was  $18.33 \pm 4.7$  days in the trial and in the conventional group it was  $12.22 \pm 4.8$  days. The pain during the procedure was found to be significantly reduced when compared to the conventional debridement group. Pain was assessed using Visual Analogue Scale (VAS). In this study the mean VAS scores was  $4.9 \pm 1.110$  in the conventional group and in the trial it was  $2.55 \pm 1.227$ . The  $p < 0.05$  makes it statistically significant and hence Dermabrasion has the benefit of being minimally painful in

comparison with the conventional treatment. At the end of the final and fifth follow up in Trial group, 22% had healing ulcers, 64% had their ulcers completely healed, 11% were lost in follow up and 3% were taken up for definitive surgery. And in Conventional group, 17% had healing ulcers, 56% had their ulcers completely healed, 18% were lost in follow up and 9% were taken up for definitive surgery.

Dermabrasion has similar results that are comparable to Conventional debridement in the management of ulcers.

## CONCLUSION

Results from the present study show that in the management of ulcers, dermabrasion reduces the pain during the procedure significantly, promotes granulation and decreases the healing time though statistically not significant, without damaging the normal tissue or producing complications. The minimal pain and minimum damage to the healthy granulation tissue with the use of dermabrasion makes it a good choice for ulcer management with similar results when compared to conventional mechanical debridement. However, larger sample size must be considered to fully establish the effects in wound healing. Dermabrasion has similar results that are comparable to conventional mechanical debridement in the management of ulcers.

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