



Plastic Surgery

EFFICACY OF LIMITED ACCESS DRESSING AND CONVENTIONAL DRESSINGS IN HEALING OF CHRONIC ULCERS.-A COMPARITIVE STUDY

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ABSTRACT

Aim: To assess the efficacy of limited access dressing as compare with conventional moist dressing in chronic wound healing and to prove that limited access dressing can be used as treatment option in the management of chronic ulcers.

Material Methods: This is a prospective randomized comparative study were data from 120 patients with chronic ulcer of which 60 patients underwent conventional moist dressing and remaining 60 patients were subjective to limited access dressing. The results were compared after 10 days. Variables compared based on the rate of granulation tissue formation, culture sensitivity report on 5 day (1 sample) and day before skin grafting, (second sample) earliest day in which the wound bed is ready for skin grafting and percentage of graft take up. Variables are compared using Chi-square test and Fisher exact test. **Results:** In study group, the mean granulation tissue formation was 98.3% of the total ulcer area at the end of ten days; 55 out of 60 patients were taken up for skin grafting on or before 18 day of commencement of therapy and the percentage of graft take up was more than 95% in 55 out of 60 patients. In control group, the mean granulation tissue formation was 54%, 56 out of 60 patients were subject to skin grafting after 30 days or later and percentage of graft take up for most patient was the range of 75-85%. **Conclusion:** The conclude the limited access dressing help in faster healing of chronic wounds, better graft take up and reduces hospital stay of the patients, and he me has to be considered as treatment option for non healing wounds.

KEYWORDS : Limited Access Dressings, Chronic Wound

INTRODUCTION

Acute and chronic wounds affect at least 10% of the population. With the population advancing in age, increasing in weight and with the resultant increase in co- morbidities of diabetes and venous insufficiency, an increase in the number of patients with chronic wounds is reported .Regardless of etiology, chronic wounds are difficult to treat in the presence of coexisting factors like infection or diabetes mellitus which prevent normal wound healing. Chronic wounds represent a significant risk factor for hospitalization, amputation, sepsis, and even death. From the patient's perspective, chronic wound therapy is often uncomfortable or painful and is a constant financial burden especially in developing countries.

Chronic wounds or non healing ulcers are one for the most common surgical conditions a surgeon comes across in his day to day practice. Chronic wounds represent a significant economic burden both to the individual and the economy of the society. Chronic wounds may never heal whatever the management given or may take years to do so. These wounds cause patients and their family severe emotional and physical stress and create a significant financial burden on Following trauma of the healthy tissue, a predictable progression of physiologic events unfolds. In acute wounds, there is a precise balance between production and degradation of molecules such as collagen; in chronic wounds this balance is lost .Wounds that do not heal within three months are often considered chronic. A chronic wound by definition is a wound that does not heal in an orderly set of stages and in a predictable amount of time the way most wounds do and seems to be detained in one or more of the phases of wound healing.

Recent advances in wound healing technologies have suggested that limited access dressings have a significant positive impact on the process of wound healing. In view of this a study was done to analyze the effect of limited access dressings in the healing of chronic wounds.

AIMS AND OBJECTIVES

To compare the efficacy limited access dressing with that of control group using conventional moist would dressings, in healing of chronic ulcers, in terms of:

- Number of days required for healing ,
- Rate of granulation tissue formation ,
- Bacteriology of the wound,
- Graft survival as percentage of ulcer



Figure 10: Maggot Therapy Stages.

LAD application

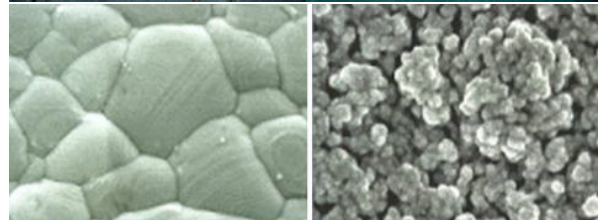
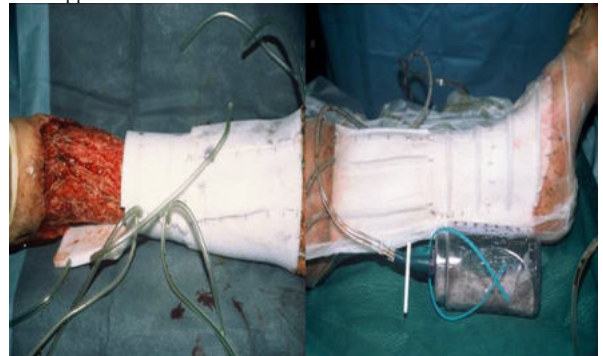


Figure 12: Magnification of Nanocrystalline; Silver (<1 micron)

Figure 13: Magnification of normal silver

MATERIALS AND METHODS

This study was a prospective comparison study of 120 patients with chronic ulcers who were admitted to the Department of General Surgery at Hitech Medical College Hospital. The study was done for a

period of 2 years from september 2022 to september 2024.

METHOD OF COLLECTION OF DATA:

Sampling and Sampling Technique:

A total of 120 patients were selected using purposive sampling technique. They were further divided into case and control groups consisting of 60 patients each based on the willingness for undergoing limited access dressing. Those who are not willing were subjected to conventional moist dressing and formed the control group. Care was taken such that both groups will have a comparable distribution of patients with regard to age as well as etiology of ulcers.

The inclusion criteria and exclusion criteria were as follows:-

Inclusion Criteria:

- Patients with age between 15-75 yrs,
- All types of chronic wounds irrespective of etiology,
- Wound size < 10% of Total Body Surface Area,
- Patients giving consent for topical negative pressure dressings,

Exclusion Criteria:

- Wounds > 10% TBSA,
- Presence of osteomyelitis,
- Presence of fistulas to organs or body cavities,
- Exposure of arteries or veins in the ulcers with bleeding,
- Malignant ulcers,
- Dry gangrene ,
- Chemonecrosis,
- Radionecrosis,
- Vaculitis.

All patients underwent detailed clinical examination and relevant investigations. Ulcers were thoroughly debrided. Ulcer dimensions as well as surface area were assessed before dressing only ulcers less than 10% of TBSA were included in the study.

The patients were followed up regularly in both test and control groups.

The control group were subjected to twice daily dressing by conventional methods; where as the test group were subjected to limited access dressing and were left undisturbed for a period of 5 days following application of the dressing to allow the ulcer to granulate.

The ulcers in both the groups were inspected after removal of dressing.

Comparison was made on the basis of following parameters:

- Type of granulation tissue formation ,
- Presence or absence of slough ,
- Presence or absence of discharge.

Both the groups were subjected to split thickness skin grafting when they granulated fully and on culture no growth was seen. The ulcers were reassessed at the end of 5 post operative day for skin graft take up.

APPLICATION of LAD

The limited access wound dressing is a combination of composite synthetic hydrocolloid sheet dressing with vacuum assisted wound closedured systems. The technique involves the following steps :-

Through debridement and removal of all devitalized tissue..

- A perforated drain tube like the Ryle's tube is placed on top of the wound bed and other end is brought out subcutaneously a little away from main wound.
- Hydrocolloid sheet is cut to size of the wound and applied over the drain tube
- The wound with the surrounding normal skin covered with adhesive semipermeable transparent membrane (Opsite). A good air seal ensured around the wound.
- Distal end of drain tube connected to a device which provides a negative pressure suction in the range of -25 to -200 mm of Hg achieved by wall suction apparatus, computerized devices or simple suction drain devices. Suction applied continuously or intermittently based on amount of wound discharge.
- Once vacuum applied, the hydrocolloid sheet collapses into the wound bed.
- The wound fluid removed from the wound bed by suction.
- The negative pressure maintained for a minimum 10days and for maximum of 14 days. Once adequate granulation tissue is formed

the dressing should be removed and definitive wound closure is achieved by partial or full thickness grafts, flaps or suturing.

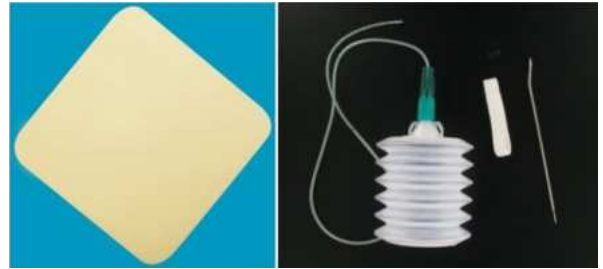


Figure 15: Hydro Colloid Sheet

Figure 16: Suction Drain



Figure 17: Wall Suction Apparatus

Figure 18: VAC instrument

Statistical Analysis

Both the groups of ulcers included in this study had comparable age and sex distribution as seen in above depicted graphs. The mean rate of granulation tissue formation for study group was 98.3% and that of control group was 54%. The results were analyzed by chi-square test where $c = 97.7$; $p = 0.000$ which is highly significant.

In study group 56 out of 60 patients where subjects split thickness, skin grafting within 18 days of commencement of therapy, where as control group, all the patients were taken for skin grafting after 30 days or more. Data was analyzed by Fisher Exact test where p value = 0.000 was considered highly significant.

The percentage of graft taken up was more than 95% in 55 out of 60 patients in study group, where as in control group percentage graft taken up was in the range of 75-85% in 56 out of 60 patients. This data was analyzed by Fischer's exact test where p value = 0.000 which is highly significant.

RESULTS

Patient Distribution

In our study 120 patients were chosen and further divided into a study group consisting of 60 patients who were designated to receive the limited access dressings and a control group consisting of 60 patients who were designated to receive the conventional dressings after elimination of all statistically significant bias.

Table 4: Patient Distribution

GROUP	NUMBER
CONVENTIONAL	60
LIMITED ACCESS DRESSINGS	60

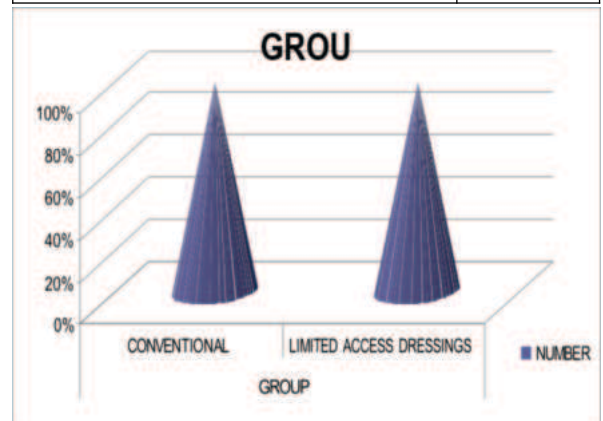


Figure 19: Patient Distribution

Etiology Of Ulcers

When we studied the etiology for ulcers, in our study of 120 patients, most of the patients had ulcer as a result of complication of diabetes mellitus (56 patients, 47 %), followed by decubitus ulcer with 8 patients as the second most common etiology in chronic non healing ulcer. Trauma, snake bite and ulcers due to peripheral vascular disease were the other causes of chronic ulcer.

Table 5: Etiology Of Ulcer

ETIOLOGY	Patients
DIABETES MELLITUS	56
PRESSURE SORE	8
TRAUMATIC	6
SNAKE BITE	10
PVD	16
OTHERS	24

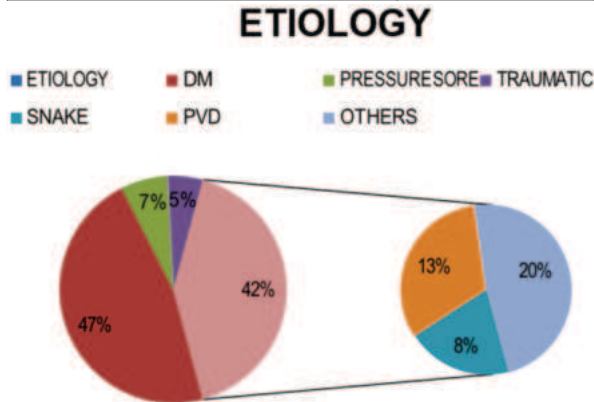


Figure 20: Etiology Wise Distribution Of Ulcer

Sex Wise Distribution

In our study which consisted of 120 patients with chronic ulcers majority of the patients did males constitute 85 patients and minority females with 35 patients.

Table 6: Sex Wise Distribution

SEX	NUMBER
FEMALE	35
MALE	85

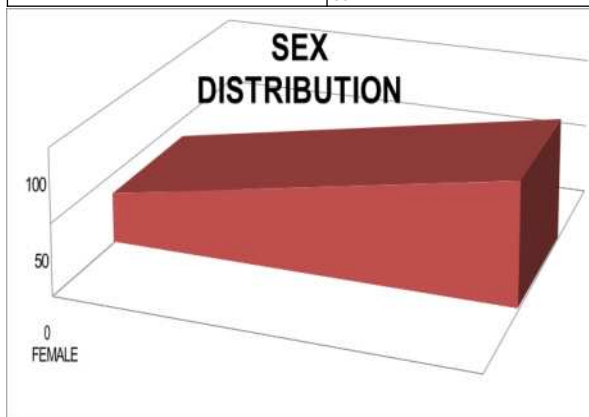


Figure 21: Sex Wise Distribution

Age Wise Distribution

Of the 120 patients with non healing ulcers in our study majority of the patients were in the age group 50-75yrs with 76 patients, followed by 25-50 yrs constituting 34 patients.

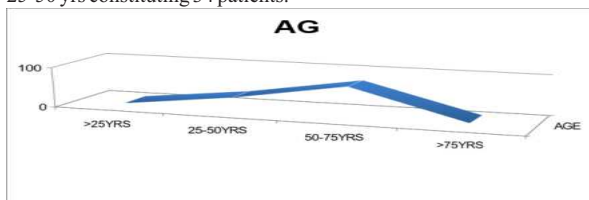


Figure 22: Age Wise Distribution

Table 7: Age Wise Distribution

AGE	>25YRS	25-50YRS	50-75YRS	>75YRS
Patients	5	34	76	5

CHARACTERISTICS OF THE ULCER

Slough on Day 0

Table 8: Slough On Day 0

	SLOUGH-DAY-0	PRESENT	MINIMAL	ABSENT
GROUP	CONVENTIONAL	60	0	0
	LIMITED ACCESS DRESSINGS	60	0	0

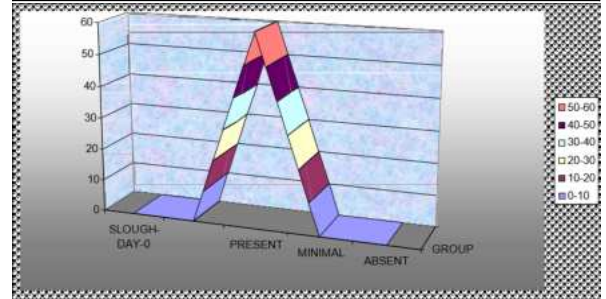


Figure 23: Slough On Day 0

Discharge On Day 5

Table 9: Discharge On Day 5

	DISCHARGE ON - DAY-5	PUS	SEROUS	SEROSANGUINOUS
GROUP	CONVENTIONAL	55	0	5
	LIMITED ACCESS DRESSINGS	41	18	1

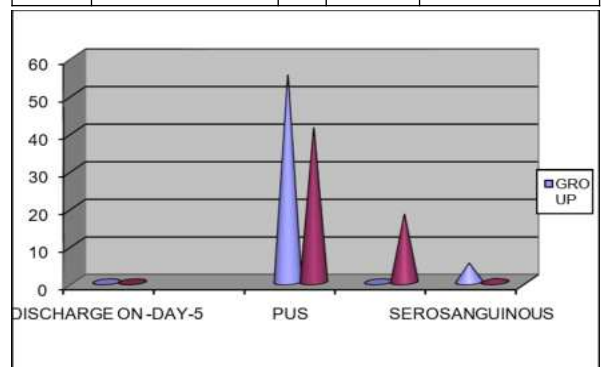


Figure 24: Discharge On Day 5

Table 10: Discharge Day 10

	DISCHARGE ON - DAY-10	PUS	SEROUS	SEROSANGUINOUS
GROUP	CONVENTIONAL	55	0	5
	LIMITED ACCESS DRESSINGS	0	1	59

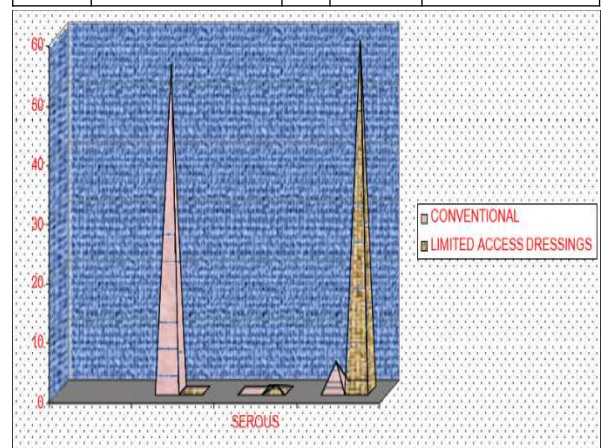


Figure 25: Discharge Day 10

Table 11: Slough On Day 0

	SLOUGH-DAY-0	PRESENT	MINIMAL	ABSENT
GROUP	CONVENTIONAL	60	0	0
	LIMITED ACCESS DRESSINGS	60	0	0

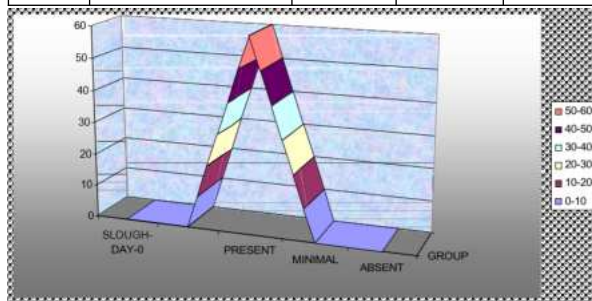


Figure 26: Slough on day 0

Slough On Day 5

Table 12: Slough On Day 5

	SLOUGH-DAY-5	PRESENT	MINIMAL	ABSENT
GROUP	CONVENTIONAL	60	0	0
	LIMITED ACCESS DRESSINGS	52	8	0

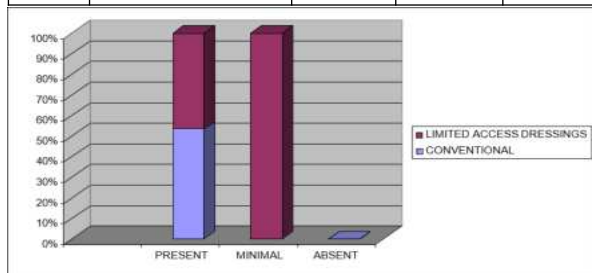


Figure 27: Slough on day 5Slough on day 10

Table 13: Slough On Day 10

	SLOUGH-DAY-10	PRESENT	MINIMAL	ABSENT	
GROUP	CONVENTIONAL	60	0	0	p = 0.000 highly significant
	LIMITED ACCESS DRESSINGS	0	8	52	

'p' = 0.000 as per Fisher exact test which is statistically highly significant

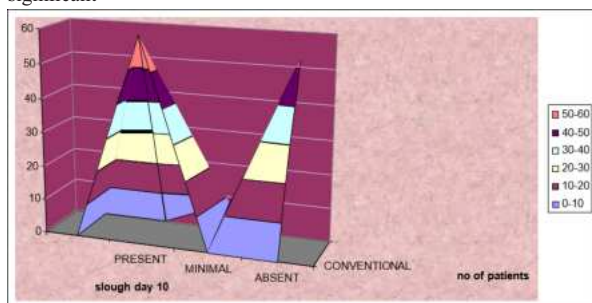


Figure 28: Slough On Day 10

Granulation Tissue Formation – Day 0

At the beginning of the study on day 0, both the study group who received the limited access dressings and control group who received the conventional dressings the colour of the granulation tissue was pale in colour.

Table 14: Granulation Tissue Formation – Day 0

	Granulation-Day-0	PALE	PINK	BEEFY RED
GROUP	CONVENTIONAL	60	0	0
	LIMITED ACCESS DRESSINGS	60	0	0

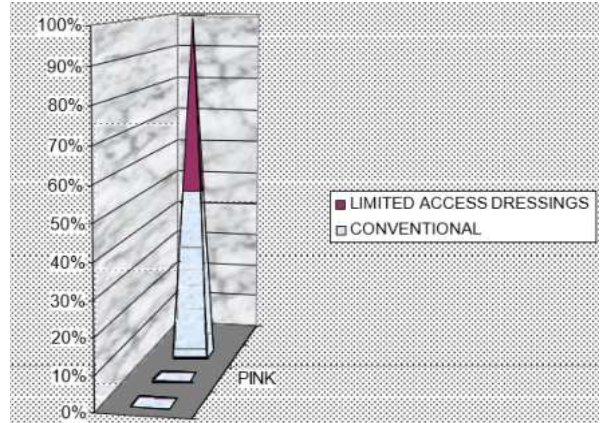


Figure 29: Granulation Tissue Formation – Day 0

Granulation Tissue Formation – Day 5

In our study, following the designated treatment plan as per the group assigned to the patients of the study, on evaluation of the granulation tissue on day 5 out of the 60 patients in the LAD group, 5 patients had pale, 28 patients had pink and 27 patients had beefy red granulation tissue as compared to the test that is the conventional dressing group in which out of the 60 patients, 59 patients had pale granulation and one patients had pink granulation tissue. On statistical analysis the c = 9707, and p = 0.000 is highly significant.

Table 15: Granulation Tissue Formation – Day 5

	GRANULATION-DAY- 5	PALE	PINK	BEEFY RED	
GROUP	CONVENTIONAL	59	1	0	p = 0.000 highly significant
	LIMITED ACCESS DRESSINGS	5	28	27	

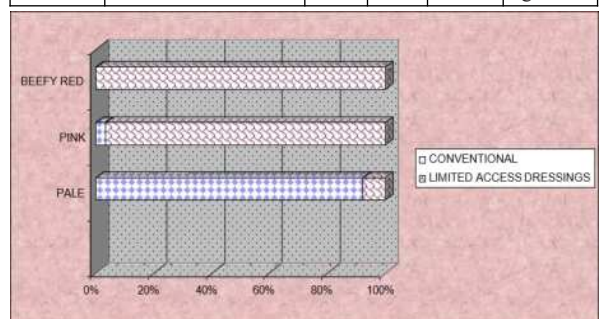


Figure 30: Granulation Tissue Formation – Day 5

Granulation Tissue Formation – Day 10

Table 16: Granulation Tissue Formation – Day 10

	GRANULATION-DAY-10	PALE	PINK	BEEFY RED
GROUP	CONVENTIONAL	59	1	0
	LIMITED ACCESS DRESSINGS	1	5	54

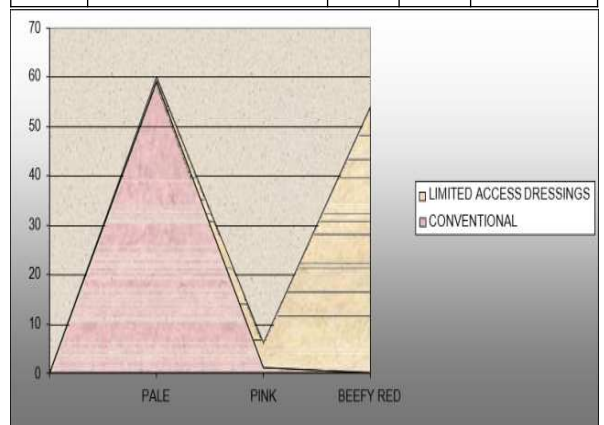


Figure 31: Granulation Tissue Formation – Day 10

Microbiological Evaluation OfThe Ulcer – Day 0

On the day - 0 that is the day when the therapy was initiated all the patients in both the study and the control groups had presence of organism in the culture.

Table 17: Microbiological Evaluation OfThe Ulcer – Day 0

	C/S -ORGANISM -DAY-0	PRESENT	ABSENT
GROUP	CONVENTIONAL	60	0
	LIMITED ACCESS DRESSINGS	60	0

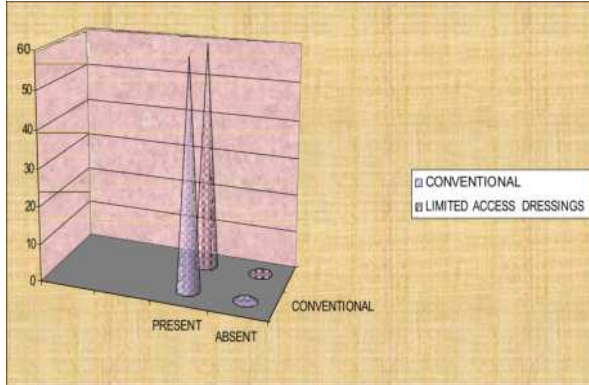


Figure 32: Microbiological Evaluation OfThe Ulcer – Day 0

Microbiological Evaluation OfThe Ulcer – Day 10

In our study, following the designated treatment plan as per the group assigned to the patients of the study, on evaluation pus culture on day 10, all the 60 patients in the LAD group all had a negative culture as compared to the conventional dressing group in which all the 60 patients had a positive culture.

Table 18: Microbiological Evaluation OfThe Ulcer – Day 10

	C/S -ORGANISM -DAY-10	PRESENT	ABSENT
GROUP	CONVENTIONAL	60	0
	LIMITED ACCESS DRESSINGS	0	60

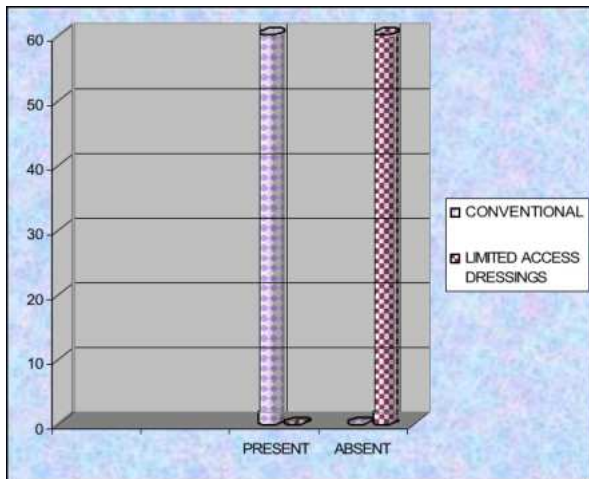


Figure 33: Microbiological Evaluation OfThe Ulcer – Day 10

Type Of Organism In Culture

In our study, on evaluation of the organism in the pus culture from the wounds in the LAD group of the 60 patients, 39 patients had polymicrobial infection, 6 patients had pseudomonas, 11 patients had staphylococcal and 4 patients had klebsiella. In the conventional group out of 60 patients, 33 patients had polymicrobial infections, 3 patients had pseudomonas, 21 patients had staphylococcal and 3 patients had klebsiella.

Table 19: Type Of Organism In Culture

C/S -ORGANISM TYPE	MIX	PSEUDO	STAPH	KLEB
CONVENTIONAL	33	3	21	3
LIMITED ACCESS DRESSINGS	39	6	11	4

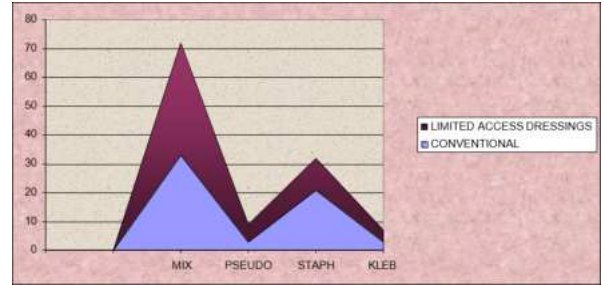


Figure 34: Type Of Organism In Cultureday Of Skin Grafting

In our study, following the designated treatment plan as per the group assigned to the patients of the test group who received limited access dressings' grafting was possible on latest by the 22 day, but the conventional group took more than 30 days for being ready for graft which itself increased the duration and cost of hospitalization. On statistical evaluation Fishers exact test $p = 0.000$ which is highly significant.

Table 20: Day Of Skin Grafting

	GRAFT -DONE	DAY-12	DAY-18	DAY-22	>30	
GROUP	CONVENTIONAL	0	0	0	60	$p = 0.000$ high significant
	LIMITED ACCESS DRESSINGS	11	45	4	0	

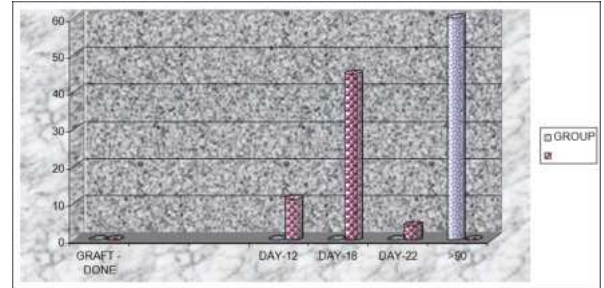


Figure 35: Day Of Skin Grafting

Take-up Of Graft

In our study, following the designated treatment plan as per the group assigned to the patients the graft take up was studied percentage wise .Of the test group who received limited access dressings graft take-up was more than 95 % in 55 patients but the conventional group the graft take-up for majority of patients(56)was between 75-85%.

Table 21:Take-up Of Graft (Percentage Wise)

	GRAFT -TAKE UP	> 95%	>85%	75-85%	55-65%
GROUP	CONVENTIONAL	0	0	56	4
	LIMITED ACCESS DRESSINGS	55	5	0	0

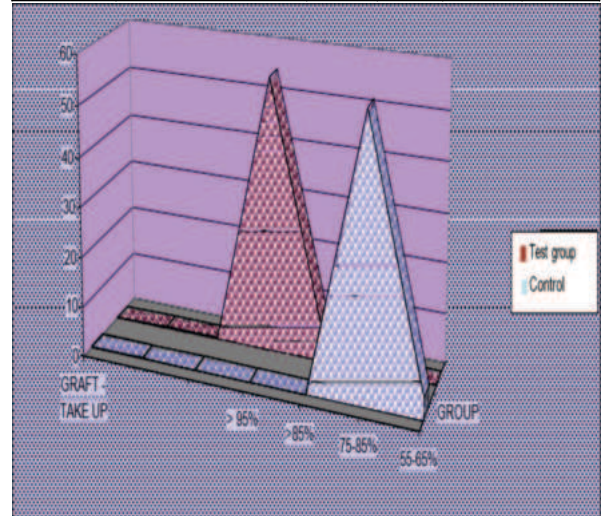


Figure 36: Take-up of graft (Percentage wise)



a Day 0 b



c Day - 5 d Day - 10d

Figure 37 (a – d): Decubitus ulcer over the right greater trochanteric area and its progression application of LAD.



Traumatic Ulcer with bone exposed Day 5 of LAD



Day - 10 of LAD After skin grafting

Figure 38 (a – d): Traumatic Ulcer With LAD Application And Its Progress



PVD with ulceration right fort LAD Application



Ulcer bed on Day - 10 Post - grafting

Figure 39 (a-d): Diabetic Ulcer And Its Progression After LAD Application



a Day - 0 b Day - 10



c Day - 0 d Day - 10

Figure 40 (a-d): Diabetic Foot And Its Response To LAD Therapy

DISCUSSION

No single dressing agent is suitable for the management of all types of wounds, or a single wound during different stages of the healing cycle. Successful wound management therefore, depends upon a flexible approach involving the selection and use of products based upon an understanding of the healing process and the knowledge of the properties of the various dressings. The process of dressing selection is determined by a number of factors which includes:

- Nature and location of the wound,
- The range of expertise,
- Available materials and finances.

The concept of moist wound dressings which came into vogue in the 1960s revolutionized wound care and have remained popular even today because they provide a convenient and cost-effective treatment option for those who deal with the management of chronic wounds.

In the early 1990s, the concept of topical negative pressure moist wound dressing was introduced into the field of chronic wound care. This type of dressing involved a combination of hydrocolloid dressings with topical negative pressure dressings. The concept of applying a sub-atmospheric pressure on wounds to accelerate the wound healing process came into practice in 1993, was first described by Fleischmann et al. The negative pressure environment is maintained by means of a semi-permeable occlusive coverage. Since the wound is occluded from the surrounding environment it is also called "**Limited Access Dressing (LAD)**". The fundamental principle behind topical negative pressure dressing is the application of sub-atmospheric pressures ranging from -25 to -200 mmHg at the wound bed.

A number of factors are found to be involved in delayed wound healing in chronic wounds, when conventional methods of wound dressings are used. These factors mainly include:

- Peripheral oedema and circulatory compromise at wound bed,
- Bacterial colonization,
- Retarded granulation tissue formation.

Limited access dressing application has been proved to be effective in improving granulation tissue formation and maturation. Studies conducted by Morykwas and colleagues, Falanga and Fabian et al have shown that the mechanical stress that is applied on tissues by negative pressure has a stimulatory action on granulation tissue.

In two other studies by Isago et al and Eginton et al it has been shown that the ulcer dimensions have been significantly reduced by topical negative pressure moist dressings. Page et al conducted a retrospective analysis of negative pressure wound therapy in open foot wounds with significant soft tissue defect and concluded that negative pressure wound therapy reduced the risk of complications, subsequent foot surgeries and hospital readmissions by 70% or more and that the length of hospital stay, rate of granulation formation and wound healing were faster with negative pressure wound.

Limitations Of The Study

- The most important limitation of the present study is its sample size.
- The gold standard in limited access dressing therapy is the vacuum-assisted closure V.A.C system. Because of its high cost, we have not used this device in our study.

CONCLUSION

In the limited access dressing group the following were better than the conventional dressing group: the rate of granulation tissue formation, overall graft survival, lesser postoperative complications and lesser duration of hospital stay.

Limited access dressing was found to be safe and can be considered as an option in the management of chronic non-healing wounds.

Limited access dressing can be added to the wide spectrum of treatment modalities available in the management of chronic wounds.

But further studies with a larger population will be needed in the future before limited access dressing can be added to the treatment modalities available in the management of chronic wounds.

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