



## Comparison of Fasciotomy Wound Closures Using Single against Double incision, and Traditional Dressing Changes against Vacuum-Assisted Closure Device In diabetic and non-traumatic cellulites of lower limbs

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### ABSTRACT

*Fasciotomy done on patient with cellulites can be major contributors not only due to the long stay but also difficult reconstructive surgical challenges. In order to avoid later complications the incised wound once relieved of its compartment pressure should be closed as early as possible to decrease the morbidity and late rehabilitation*

*Using single incisions either on the medial or lateral side of leg thence opening the compartment of the lateral, superficial posterior, or medial, and deep posterior in a single incision by going through the facial compartment is as good as using multiple incisions on cellulites of lower limbs. Skin grafting often leads to the morbidity and scarring of the donors as well as on the wound site. Hence primary closure of the wound gives as aesthetic and more functional out come with less morbidity for the patients. But can be difficult to achieve secondary to oedema, skin retraction and skin edge necrosis. Our objectives are comparison over using single to double incision used to relieve the compartment pressure secondly time to definite closure and finally traditionally wet to dry dressings and vacuum assisted closure device [VAC]*

**Materials & Methods:** *our studies we have selected 84 patients with acute non traumatic cellulites of lower limbs various kinds were included at R.L. Jalappa Hospital & Research Centre, Sri Devaraj Urs Medical College, were randomly assigned into three groups, the study group consisting of 28 patients who were treated with vacuum assisted dressing [ Group [A], and 28 patient with both wet assisted cum vacuum dressing [Group B] and 28 patients into control group who were treated with conventional dressing [Group C] after initial debridement the study group was treated with VAC therapy where a negative pressure of 125 mm*

**Results:** *In relation to Sex:-Group A males constituted 64.1% females:-35.9%, in Group B 46% and 28 % and in Group C 49% to 35% respectively. Mean age in Group A,B. and C .Mean  $\pm$  SD , 84.39  $\pm$  12.29, 84.29  $\pm$  11.24 , 84.50  $\pm$  11.73  $\pm$  SD respectively [Samples are age matched with P=0.609] Mode of onset of cellulites in three groups studied 1]spontaneous ,in A, B,C, GROUPS 42.% . 35.7% 11% 35.7% and traumatic were. 32.1%.28.5%,25.0% respectively.[ P=0.584, Not significant]Associated co-morbidities .in A, ,B,C GROUPS nil .in all groups and diabetics constitutes 32.1%, 28.5%and 25% respectively [P=0.554, Not significant]. Involvement of right leg, 60.7%,50%,42.9%and left leg.39.3%,50%and 57%, respectively*

[P=0.554, Not significant], Discharge in three groups studied a) Purulent, =92.9%, 82.1%, 78.6% b) Serous =7.1%, 17.9%, 21.4% respectively [P=0.127, Not significant] Mode of closure in all groups, above 1] knee amputations. A, B, were nil, and in group C=1, [p=.000] 2] Epithelisation, A. Group= 7.1% B= 25% C=17.8% [p=0.003], 3] Flap cover in A=3.6% in B&C=nil [P=0.005] 4]. secondary suturing:- in A=46.4%, B=14% & in C=7.1% [p=.000.034] 5]. S.S.G:- Group A=42.8% in B= 60.8%. in C=71.4 [p=0.039] . Time to heal in days in group A. B and C, Mean  $\pm$  SD=27.89  $\pm$  12.49, 30.11  $\pm$  14.87 and 39.11  $\pm$  18.87 [ p= Mean time to heal in days is significantly less in Vacuum with P=0.001] Duration of stay in the hospital Mean  $\pm$  SD in Group A= 23.14  $\pm$  10.55 in. B=25.12  $\pm$  11.00 and in group=28.07  $\pm$  11.0 Mean duration of hospital stay in days is significantly less in Vacuum group with p=0.001 . Granulation tissue: An evaluation at day 1 and Before closure in Group A= pink granulation was 85.1% [ p=0.001] in B=50% and in C=42 %

**Conclusion:** VAC dressing is effective and better than standard methods of wound care It hastens healing process by rendering the free of inflammatory fluid and reduces the bacterial load from the wound by creating sub-atmospheric pressure there by creating an anaerobic environment so all aerobic and facultative aerobic bacterial infections subsides , accelerates granulation tissue deposition by increases neo angiogenesis re epitheliazation wound remodeling when VAC. Dressing done It provides better pain control and resulted in better patient satisfaction. and when using single incision instead of multiple incision in cellulites of lower limb gives more aesthetic closure and easy to apply VAC THERAPY

### Key Points

1. Controlled levels of negative pressure value of 125mmHg accelerates debridement there by promotes wound healing.
2. This procedure was adopted for non-traumatic cellulitis patients. Prior to surgical closures, grafting or reconstructing procedures.
3. The vac treatment is marginally higher in cost wise but scores over favourably with other<sup>9,10</sup>

### Introduction

This is a study and review included consecutive series over 3 years period. This series included 84 patients selected for fasciotomy due to cellulites of the lower limb, patients was given single long longitudinal incision on the medial side alone thence opening the lateral and the posterior compartment via the fascia between the medial and the lateral compartment, out of which 28 patients received only normal saline wet to dry dressing and 28 patients received both combination type of dressings that is wet to dry and VAC. assisted therapy and the rest 28 patients received exclusively VAC. Assisted therapy alone<sup>6</sup>. In comparing all the wounds there was a statistically significant higher rate of primary closure, required small piece of skin grafting in single incision and VAC. assisted therapy when compared to and saline to wet dressings. Above all the stay and the cost on medication was reduced by 50% to the patient.<sup>5</sup>

### Materials & Methods

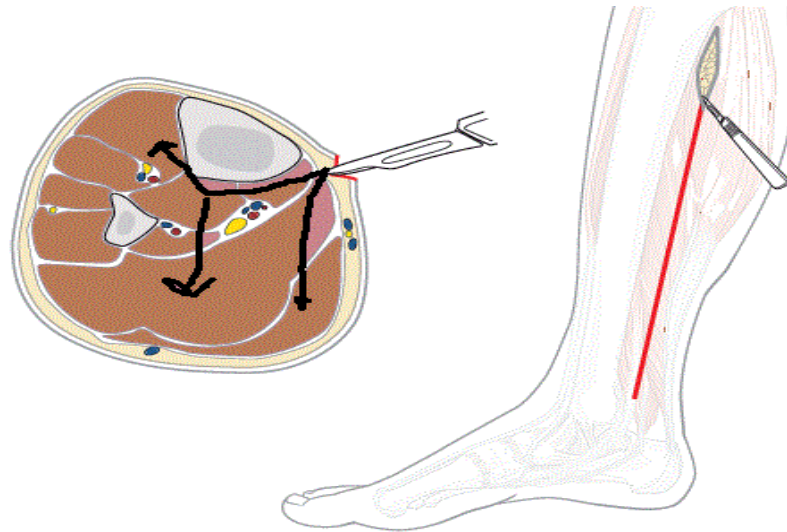
In our studies we have selected 84 patients with acute non traumatic cellulites of lower limbs various kinds were included at R.L. Jalappa Hospital & Research Centre, Sri Devaraj Urs Medical College, were randomly assigned into three groups, the study group consisting of 28 patients who were treated with vacuum assisted dressing [ Group A], and 28 patient with both wet assisted cum vacuum dressing [Group B] and 28 patients into control group who were treated with conventional dressing [Group C] after initial debridement the study group was treated with VAC therapy where a negative pressure of 125 mm

### Discussion

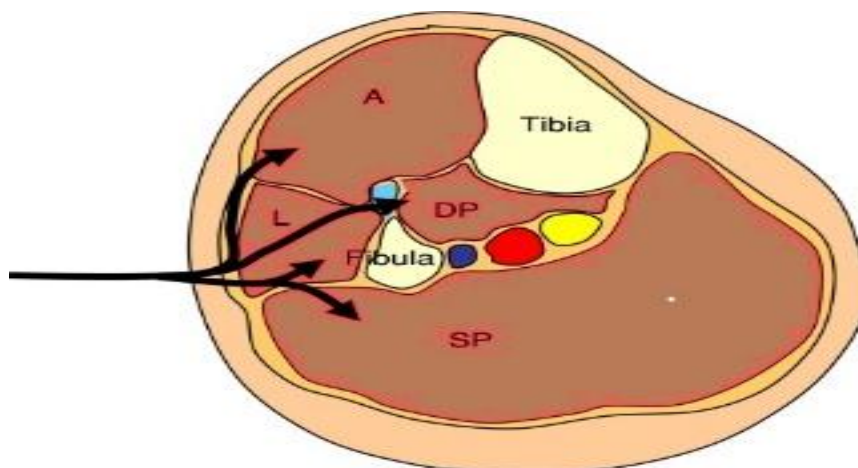
This study has shown that use of single incision and with the advent of VAC therapy for fasciotomy wound closure results are higher rate of primary closure versus traditional wet to dry dressing .in addition the time to primary closure of the wound or time to skin grafting is shorter when VAC was contemplated. The VAC employed

decreases hospitalization time, allows early rehabilitation,<sup>7</sup> and cost and patients satisfaction. And using single incision either in medial or

lateral side of leg is as good as using double incision to release the tissue compartment pressure.



**Fig 1** Shows. Anatomical cross section showing the medial approach and the long single incision used in our set up



**Fig. 2** Shows. Anatomical cross section of the lower limb. The lateral approach uses one longitudinal incision as preferred. L = lateral compartment; A = anterior compartment; DP = deep posterior compartment; SP = superficial posterior compartment.



Fig.3



Fig.4



Fig.5



Fig.6.

All Figures 3 to 6, showing only single incision was used on the medial side of leg .They mainstay of treatment in cellulites is surgical debridement which aim at removal of all necrotic tissues followed by regular wet moist dressing <sup>3</sup>this method is inexpensive and easily availability disadvantage being non selective in debridement and the patient undergoes repeated painful dressings.<sup>8</sup>

We have subjected the wound to sub atmospheric pressures which will accelerate the process of wound healing <sup>4</sup>Vacuum assisted dressings. Topical negative pressure therapy is a recent advancement in wound management in which wound is subjected to a controlled negative pressure through a vacuum device. It promotes wound healing by removing slough and exudates thereby decreases bacterial growth increases in perfusion leading to formation of granulation tissues<sup>1,2</sup> .



**Fig. 7:-** Using wall suction apparatus or vacuum suction bottles as shown in the picture fig. 6 &7 and creating negative pressure had effective results than wet and saline dressings but had practical problems in terms of delivery, control and maintenance of required negative pressure<sup>7</sup> this is a crude way of applying negative pressure.



**Figure 8 and 9: -** VAC device. Negative suction pressure being maintained at 125 mm of hg This problem was overcome when we used the equipment VAC as shown in the figure. 8 & 9 above. The heart of the system is a microprocessor-controlled vacuum unit that is capable of providing controlled levels of continuous or intermittent sub-atmospheric pressure ranging from 25 to 200 mmHg. This resulted in effective cleaning and removal dead necrotic tissue and conditioning of the wound with marked proliferation of granulation tissue in 3 to 4 days.[n =28] in Group A is average of. 0.023cm<sup>2</sup> and in Group B= is 0.056 cm<sup>2</sup>.Group= C 0.092 cm<sup>2</sup> accordingly<sup>9,10</sup>



Fig. 10,



Fig.11



Fig. 12



Fig.13.

Figures 10 to 13 shows the process of healing in VAC assisted dressing ended in secondary sutures and only small SSG was used. Giving an aesthetic look.

**Results**

In relation to Sex:-Group A males constituted 64.1% females:-35.9%,in Group B 46%and 28 % and in Group C 49% to 35% respectively. Mean age in Group A.B. and C .Mean ± SD , 84.39 ± 12.29, 84.29+\_11.24 , 84.50 ± 11.73 ± SD respectively [Samples are age matched with P=0.609] Mode of onset of cellulites in three groups studied 1]spontaneous ,in A, B,C, GROUPS 42.% .11% 35.7% and traumatic were. 32.1%.28.5%,25.0% respectively.[ P=0.584, Not significant]Associated co-morbidities .in A, ,B,C GROUPS nil .in all groups and diabetics constitutes 32.1%, 28.5%and 25% respectively [P=0.554, Not significant]. Involvement of right leg, 60.7%,50%,42.9%and left leg.39.3%,50%and 57%, respectively [P=0.554, Not significant], Discharge in three groups studied a] Purulent,=92.9,%82.1%,78.6% b]Serous =7.1%, 17.9,21.4% respectively [P=0.127, Not

significant] Mode of closure in all groups, above1] knee amputations. A,B, were nil, and in group C=1,[p=.000] 2]Epithelisation , A. Group= 7.1% B= 25% C=17..8%[p=003],3] Flap cover in A=3.6% in B&C=nil[P=0.005] 4].secondary suturing:- in A=46.4% ,B=14%& in C=7.1% {p=.000.034} 5].S.S.G:- Group A=42.8% in B= 60.8%.in C=71.4[p=0.039]. Time to heal in days in group A. B and C, Mean ± SD=27.89 ± 12.49, 30.11 ± 14.87 and 39.11 ± 18.87[ p= Mean time to heal in days is significantly less in Vacuum with P=0.001] Duration of stay in the hospital Mean ± SD in Group A= 23.14 ± 10.55 in. B=25.12+\_11.00 and in group=28.07 ± 11.0 Mean duration of hospital stay in days is significantly less in Vacuum group with p=0.001 .Granulation tissue: An evaluation at day 1 and Before closure in Group A= pink granulation was 85.1% [ p=0.001] in B=50% and in C=42 %

**Table 1:** Sex distribution of the three groups studied

| Sex    | VACCUM |       | VACUUM<br>With wet dressings |      | CONTROL |       | TOTAL |      |
|--------|--------|-------|------------------------------|------|---------|-------|-------|------|
|        | N0     | %     | N0                           | %    | No      | %     | No    | %    |
| Male   | 18     | 64.3  | 16                           | 54   | 15      | 53.6  | 49    | 58.3 |
| Female | 10     | 35.7  | 12                           | 46   | 13      | 46.4  | 35    | 41.7 |
| Total  | 28     | 100.0 | 28                           | 100. | 28      | 100.0 | 84    | 100  |

**Table 2:** Age distribution of patients studied

| Age in years | VACUUM        |       | Vacuum with<br>wet dressings |      | Control       |      |
|--------------|---------------|-------|------------------------------|------|---------------|------|
|              | No            | %     | No                           | %    | No            | %    |
| ≤30          | 2             | 7.1   | 2                            | 7.1  | 1             | 3.6  |
| 31 – 40      | 2             | 7.1   | 1                            | 3.6  | 2             | 7.1  |
| 41 – 50      | 1             | 3.6   | 5                            | 17.9 | 5             | 17.9 |
| 51 – 60      | 14            | 50.0  | 10                           | 36.0 | 11            | 39.3 |
| 61 – 70      | 5             | 17.9  | 5                            | 17.9 | 6             | 21.4 |
| >70          | 4             | 14.3  | 5                            | 17.9 | 3             | 10.7 |
| Total        | 28            | 100.0 | 28                           | 100  | 28            | 1    |
| Mean ± SD    | 84.39 ± 12.29 |       | 84.29+_11.24                 |      | 84.50 ± 11.73 |      |

Samples are age matched with P=0.609

**Table 3** Mode of onset of cellulites in three groups studied

| Mode of Onset | VACUUM |      | Vacuum with wet dressings |      | CONTROL |      |
|---------------|--------|------|---------------------------|------|---------|------|
|               | No     | %    | No                        | %    | No      | %    |
| Spontaneous   | 12     | 42.9 | 11                        | 11   | 10      | 35.7 |
| Trauma        | 16     | 57.1 | 17                        | 60.7 | 18      | 64.3 |
| Total         | 28     | 100  | 28                        | 100  | 28      | 100  |

P=0.584, Not significant

**Table 4:** Associated co-morbidities in two groups

| Co-morbidities | VACUUM |      | Vacuum with wet dressings |      | CONTROL |      |
|----------------|--------|------|---------------------------|------|---------|------|
|                | No     | %    | No                        | %    | No      | %    |
| Nil.           | 19     | 67.9 | 20                        | 71.4 | 21      | 75.0 |
| Diabetic       | 9      | 32.1 | 8                         | 28.5 | 7       | 25.0 |
|                | 28     | 100  | 28                        | 100  | 28      | 100  |

P=0.554, Not significant

**Table 5:** leg involved by the in three groups studied

| Leg involved | VACUUM |      | Vacuum with wet dressings |     | CONTROL |      |
|--------------|--------|------|---------------------------|-----|---------|------|
|              | No     | %    | No                        | %   | No      | %    |
| Left         | 17     | 60.7 | 14                        | 50. | 12      | 42.9 |
| Right        | 11     | 39.3 | 14                        | 50  | 16      | 57.1 |
| Total        | 28     | 100  | 28                        | 100 | 28      | 100  |

P=0.181, Not significant

**Table 6:** Discharge in THREE groups studied

| Discharge | VACUUM |      | Vacuum with wet dressings |      | CONTROL |      |
|-----------|--------|------|---------------------------|------|---------|------|
|           | No     | %    | No                        | %    | No      | %    |
| Purulent  | 26     | 92.9 | 23                        | 82.1 | 22      | 78.6 |
| Serous    | 2      | 7.1  | 5                         | 17.9 | 6       | 21.4 |
| Total     | 28     | 100  | 28                        | 100  | 28      | 100  |

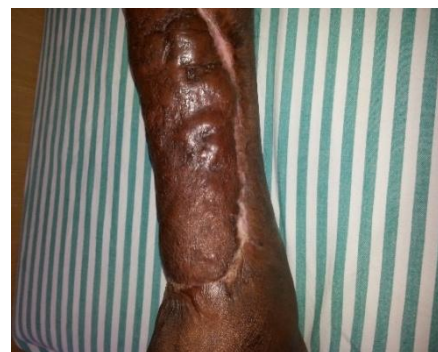
P=0.127, Not significant

**Table 7:** Mode of Closure

|                    |    |      |    |      |    |      |       |
|--------------------|----|------|----|------|----|------|-------|
| Flap cover         | 1  | 3.6  | 0  | 0    | 0  | 0    | 0.005 |
| Secondary suturing | 13 | 46.4 | 4  | 14.2 | 2  | 7.1  | 0.034 |
| SSG                | 12 | 42.8 | 17 | 60.8 | 20 | 71.4 | 0.039 |
| Total              | 28 | 100  | 28 | 100  | 28 | 100  | -     |



**Fig 14.**Shows secondary sutures in group using VAC assisted dressing.



**Fig 15.**Showing SSG .in Group C giving an ugly look.

**Table 8** shows time to heal

| Time to heal (days) | VACUUM        |      | Vacuum with wet dressings |      | CONTROL       |      |
|---------------------|---------------|------|---------------------------|------|---------------|------|
|                     | No            | %    | No                        | %    | No            | %    |
| ≤20                 | 11            | 39.3 | 8                         | 28.5 | 2             | 7.1  |
| 21-30               | 9             | 32.1 | 8                         | 28.5 | 9             | 32.1 |
| 31-50               | 6             | 21.5 | 8                         | 28.5 | 10            | 35.8 |
| >50                 | 2             | 7.1  | 4                         | 14.5 | 7             | 25.0 |
| Total               | 28            | 100  | 28                        | 100  | 28            | 100  |
| Mean ± SD           | 27.89 ± 12.49 |      | 30.11 ± 14.87             |      | 39.11 ± 18.87 |      |

Mean time to heal in days is significantly less in Vacuum with P=0.001

**Table 09** showing duration of stay in the hospital

| Duration of hospital stay (days) | VACUUM            |      | Vacuum with wet dressings |      | CONTROL           |      |
|----------------------------------|-------------------|------|---------------------------|------|-------------------|------|
|                                  | No                | %    | No                        | %    | No                | %    |
| 1-7                              | 1                 | 3.6  | 0                         | 0    | 0                 | 0    |
| 8-14                             | 2                 | 7.1  | 2                         | 7.1  | 2.1               | 7.1  |
| 15-30                            | 22                | 78.6 | 20                        | 71.4 | 19                | 67.9 |
| 31-60                            | 3                 | 10.7 | 5                         | 17.8 | 6                 | 21.4 |
| >60                              | 0                 | 0    | 1                         | 3.6  | 1                 | 3.6  |
| Total                            | 28                | 100  | 28                        | 100  | 28                | 100  |
| Mean $\pm$ SD                    | 23.14 $\pm$ 10.55 |      | 25.12 $\pm$ 11.00         |      | 28.07 $\pm$ 11.08 |      |

Mean duration of hospital stay in days is significantly less in Vacuum group with  $p=0.001$

**Table 10:** Granulation tissue: An evaluation at day 1 and Before closure

| Granulation tissue        | Day 1 (n=28) |     | Before closure (n=28) |      | % change |
|---------------------------|--------------|-----|-----------------------|------|----------|
|                           | No           | %   | No                    | %    |          |
| VACUUM                    |              |     |                       |      |          |
| □ Pale                    | 28           | 100 | 4                     | 14.3 | -85.7    |
| □ Pink                    | 0            | 0.0 | 24                    | 85.7 | +85.7    |
| Vacuum with wet dressings |              |     |                       |      |          |
| □ Pale                    | 28           | 100 | 14                    | 50   | -50      |
| □ Pink                    | 0            | 0.0 | 14                    | 50   | 50       |
| CONTROL                   |              |     |                       |      |          |
| □ Pale                    | 28           | 100 | 16                    | 57.1 | -57.1    |
| □ Pink                    | 0            | 0.0 | 12                    | 42.9 | +42.9    |
| P value                   | 1.000        |     | <0.001                |      |          |

### Conclusion

VAC dressing ineffective and better than standard methods of wound care It hastens healing process by rendering the free of inflammatory fluid and reduces the bacterial load from the wound by creating sub-atmospheric pressure there by creating an anaerobic environment so all aerobic and facultative aerobic bacterial infections subsides ,accelerates granulation tissue deposition by increases neo angiogenesis re epitheliazation wound remodeling when VAC. Dressing done It provides better pain control and resulted in better patient satisfaction. and when using single incision instead of multiple incision in cellulites of lower limb gives more aesthetic closure and easy to apply VAC assisted dressing.

### Conflict of interest

Author does not have any conflict of interest.

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