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# Compression Therapy in the Management of Cellulitis: A Comparative Study

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**Abstract:** Cellulitis is a common condition causing significant morbidity. Conventional treatment has been mainly by the use of antibiotics, limb elevation and analgesics. There is no consensus on the role of compression therapy in the management of cellulitis. This study was a comparative study of patients who presented with cellulitis at Kenyatta National Hospital. The study was set to determine the effect of compression therapy as an adjunct in the treatment of limb lower limb cellulitis. The study period was between May 2014 and May 2015. Patients were randomly assigned into two groups through a computer generated program. Group A patients were managed with antibiotics, limb elevation, analgesia and elastic compression therapy. Group B patients were managed with elevation, antibiotics and analgesia. The antibiotic used was amoxycyclavulinic acid while the analgesic was paracetamol and diclofenac. The parameters assessed were oedema resolution, pain, tenderness and length of hospital stay. A total of eighty patients with cellulitis were recruited in both groups with each arm having 40 patients. Group A patients who were managed with compression therapy had greater reduction in pain, tenderness and oedema as compared to group B patients. The length of hospital stay was 10.2 days in group A and 13.4 days in group B. Elastic compression therapy as demonstrated in this study is beneficial in the management of cellulitis. It results in faster resolution of cellulitis with reduction in the length of hospital stay and with no increase in complications.

**Keywords:** Cellulitis, Compression Therapy, Outcome

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## 1. Introduction

Cellulitis refers to the infection of the subcutaneous tissues and the dermis. When not appropriately managed it can result in morbidities including necrotizing fasciitis and septicemia [1]. The mainstay of management has been by the use of antibiotics, limb elevation and analgesics [1]. Compression therapy either dynamic or static has not been routinely used in the management of cellulitis. [1, 2] However its role in the treatment of lymphoedema and venous ulcer is well established. [3] Compression therapy is aimed at improving tissue perfusion at the cellular level by reducing the interstitial fluids and thus enabling better oxygen and nutrients delivery to the cells hence rapid healing of the wounds [3, 4]. Compression therapy has demonstrated faster healing of venous ulcers and reduction of oedema. [3, 4]. Its role in the treatment of cellulitis is still debatable. [1, 2] In

this study we aimed to establish if compression therapy could be beneficial in the management of patients with cellulitis.

## 2. Methods

### Objective

To determine the effect of compression therapy as an adjunct in the treatment of limb cellulitis.

This was a comparative study of patients who presented with cellulitis at the Kenyatta National Hospital within the study duration of one year between May 2014 and May 2015. The study was approved by the local ethics and research committee. Consent was sought from the patients to participate in the study. Patients with cellulitis with no ulceration or features of septicemia were recruited. They were randomly assigned into two groups through a computer generated software. Variables determined were pain, tenderness, oedema resolution, White blood cells count, length of hospital stay

and complications.

At the point of entry in the study patients had their blood taken for white blood cell count. This was repeated after two days. Patients had pain assessment done using the pain visual analogue scale and tenderness using the tenderness evaluation study for the first four days following admission. Pain was graded into mild, moderate or severe using this scale. Tenderness was grade as; grade 1; feels pain on palpation, grade 2; feels pain and winces on palpation, grade 3; feels pain winces and withdraws limb on palpation, grade 4; doesn't allow palpation due to fear of severe pain. The limb had its measurement taken at a constant point from the nearby bony prominence. This measurements were repeated after three days and on the sixth day. The oedema extent was taken as the difference in girth between the affected limb and the normal limb. All patients were started on intravenous amoxycloxacilanic acid at a recommended dose for weight. The analgesics given for the patients was a combination of paracetamol and diclofenac acid orally.

Group A patients had compression with elastic pressure garment that was done with an overlap of about 50 percent over soft pad dressings (figure 1, 2). Prior to the placements of the stockings the limb girth measurements were taken. The compression garments were left on until the third day after which the limb girth measurement were taken again and on the 6<sup>th</sup> day.

### 3. Results

A total of 80 patients with cellulitis who made the inclusion criteria were recruited with 40 patients in each group. The male to female ratio for group A patients was 2:1 while in group B was 3:2. The mean age for the patients in group A was 39.8 and 37.5 years in group B. There was no significance differences in the causation of cellulitis in both groups with majority of the patients reporting trauma as the initiator of cellulitis. (Group A, 62.5 and group B 67.5 percent). Diabetes mellitus accounted for 20 percent of patients in group A and 25 percent in group B.

Majority of the patients in both groups presented with moderate to severe pains at the time of admission (figure 3). There was more reduction in pain severity in patients in group A both on the 2<sup>nd</sup> and 4<sup>th</sup> day of assessment as compared to the patients in group B. (table 1). 45 percent of the patients in group A had oedema reduction of more than 50 percent on day 3 and 95 percent on day 6 as compared to 27.5 percent and 85 percent respectively among group B patients. (Table 2)

Majority of patients in both groups presented with grade 2 tenderness. (figure 4) There was significant reduction in tenderness in patients in group A as compared to group B on day 2 and 4. (table 3)

All patients had elevated white blood cells count at the time of admission. There was no statistical difference in both groups for the number of patients whose white blood cell counts returned to normal levels both on day 2 and 4. The length of hospital stay in group A patients was 10. 6 days while in group B patients 13. 2 days. This was statistically significant. 5 patients in group A had superficial ulcerations compared to 4 patients in group B. (This was not statistically significant) 3 patients in group A and 4 Group B formed abscesses that were drained. this was not statistically significant).



Figure 1. Soft pad applied on the limb with cellulitis.



Figure 2. Elastic compression dressing applied over the limb with cellulitis.

Table 1. Evaluation of pain on day 2 and day 4. Group A patients had greater reductions in pain compared to group B patients.

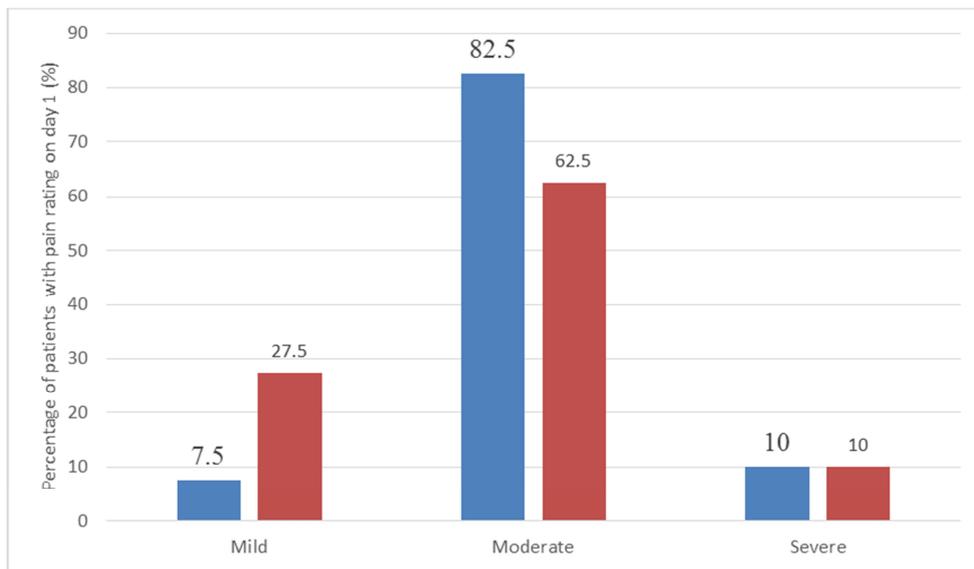
	Group A	Group B	Chisquare	P value
Pain assessment on day 2				
>50% change	33(82.5)	23(57.5)	6	0.015
<50% change	7(17.5)	17(42.5)		
Pain assessment on day 4				
>50% change	37(92.5)	26(65.0)	9	0.003
<50% change	3(7.5)	14(35.0)		

**Table 2.** Evaluation of edema on day 2 and day 6, group A patients had more reduction in oedema compared to group B patients.

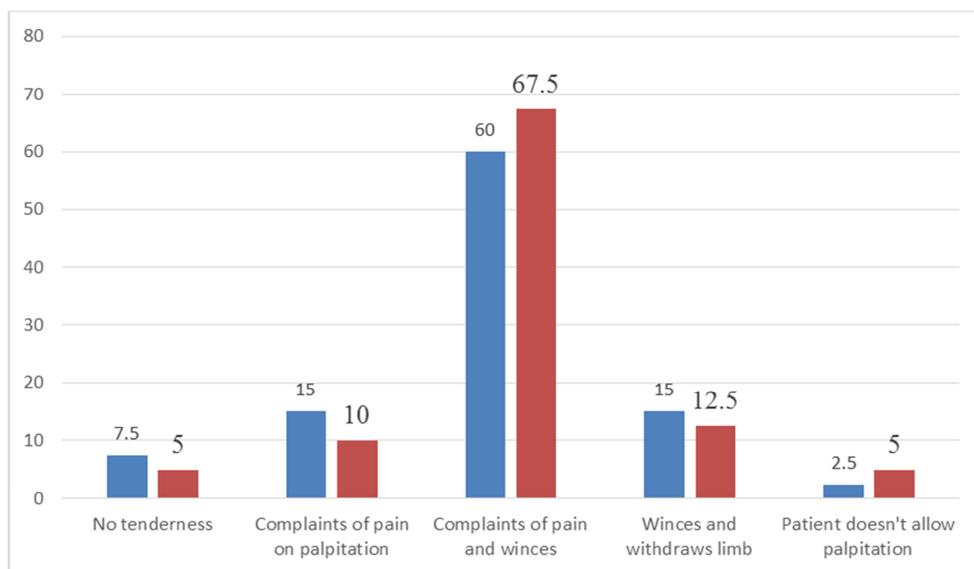
	Group A	Group B	Chi square	P value
Edema assessment on day 3				
<50% change	22(55)	29(72.5)	2	0.016
>50% change	18(45)	11(27.5)		
Edema assessment on day6				
<50% change	2(5.0)	6(15.0)	2.2	0.0136
>50% change	38(95.0)	34(85.0)		

**Table 3.** Evaluation of tenderness score in patientson days 2 and4.

	Cellulitis management		Chi square	P value
	Group A	Group B		
Tenderness assessment on day 2				
>50% change	38(95.0)	30(75.0)	6.3	0.012
<50% change	2(5.0)	10(25.0)		
Tenderness assessment on day 4				
>50% change	39(97.5)	33(82.5)	5.0	0.025
<50% change	1(2.5)	7(17.5)		



**Figure 3.** Baseline pain presentation on day 1, group A left, Group B, right.



**Figure 4.** Tenderness in patients in group A(left) and group B(right) at the time of admission.

## 4. Discussion

Cellulitis is a bacterial infection of the subcutaneous tissue. The commonest organisms are staph aureas and streptococcus pyogenes [1, 2]. The infections are associated with an intense inflammation resulting in marked swelling, pain and tenderness. The oedema reduces tissue perfusion resulting in decreased delivery of oxygen, nutrients and antibiotics. Despite the fact that oedema seems to prolong cellulitis and thus result in bad outcome, most of the treatment interventions have only focused on provision of antibiotics and pain management with minimal focus on the management of oedema other than limb elevation. [1, 2]. Compression therapy has actually been discouraged; sighting the theoretical risk of bacterial translocation to the blood stream. [1, 2] It has also been thought that applying compression stockings in the acute setting will be painful to the patient and should therefore only be applied once the acute phase of the illness is over [1]. The findings of this study contradict the above held notions.

Patients who were managed on compression had a better and faster relief from pain. They also experienced less tenderness. These findings have also been noted in other conditions where compression therapy has been utilized [4-8]. Patients on compression therapy with conditions such as venous ulcers have reported less pain compared to those who were not. [5-7] The scientific basis of this seems to be related to the fact that compression therapy increases shear stress in the microcirculation resulting in the release of the anti-inflammatory cytokines and antithrombotic from the endothelial cells [9]. Among the anti-inflammatory cytokines elevated in patients with compression therapy is the IL-1Ra. [10] Pro-inflammatory cytokines. Metalloproteinases has also been shown to be decreased in patients with compression therapy [10]. Compression therapy therefore seems to influence the inflammatory response by down regulating the pro-inflammatory cytokines and up regulating the anti-inflammatory cytokines and thus less pain, tenderness and oedema.

The reduction in the length of hospital stay is probably related to the rapid elimination of oedema in the patients who were managed with compression dressings. Oedema has been shown to have deleterious effects not only on healing of the wounds but also in predisposition to infection. [11, 12] It reduces tissue perfusion and thus reduces delivery of nutrients, oxygen and antibiotics. Lymphoedema fluid has high protein concentration which encourages bacterial proliferation and growth. [11, 12] Oedema has also been noted to inactivate normal skin antimicrobial properties resulting in increased propensity for skin infections. [11] While elevation of the limb tends to assist in the reduction of oedema this is largely a passive process resulting in fluid shifts based on the pressure difference. For it to work the entire limb must be elevated above the level of the heart which may be impractical in some patients. Compression therapy on the other hand increases the interstitial pressures and thus reduces the exudates from the

capillaries while encouraging venous return.

All the patients had an elevated white blood cell counts at the time of admission. There was however no statistical difference in the return to normal levels between the two groups. Leucocytes count is however unlikely to be a sensitive nor specific marker of cellulitis progression. C reactive protein or procalcitonin would have been better markers and should probably be used in future studies.

## 5. Conclusion

This study demonstrates that elastic compression therapy is of benefit in the management of uncomplicated cellulitis. It results in reduction in pain, tenderness as well as oedema with an overall effect of reduction in the length of hospital stay. There is no increase in complications. Elastic compression therapy should thus be encouraged in the routine management of uncomplicated cellulitis.

## Conflict of Interest Statement

All the authors do not have any possible conflicts of interest.

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