

THE COMPARISON OF TOTAL CONTACT CASTING WITH CONVENTIONAL DRESSING FOR WOUND HEALING IN PATIENTS WITH DIABETIC FOOT ULCER

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Received : 17/12/2022
Received in revised form : 15/01/2023
Accepted : 27/01/2023

Keywords:
Total contact casting, Neuropathic ulcer.

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DOI: 10.47009/jamp.2022.5.1.178

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2023; 5 (1); 861-865



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Abstract

Background: In individuals with diabetic plantar ulcer, the total contact cast (TCC) is an efficient strategy to lower plantar pressure and thereby aids in wound healing. In order to manage neuropathic diabetic plantar ulcers, this study compared total contact casting (TCC) with traditional dressing treatment. **Aims and Objectives:** To test the safety and efficacy of total contact cast dressing in management of neuropathic plantar ulcer in comparison to conventional dressing in terms of wound healing. **Materials and Methods:** 100 patients with diabetic plantar ulcer who were admitted in the General Surgery department, Kanyakumari Medical College are included during the study period. Those patients who met the inclusion criteria and gave consent for both the procedures are randomly categorized into two groups. The results are tabulated and analysed. **Result:** The study which was conducted among 100 patients with diabetic plantar ulcers with a majority of the patients in the age group between 32 to 72 years of age and a mean age of 56.9. A male predominance was reported in the current study with 31 males comprising of 68% of the total study participants. The 76-100% granulation of tissue in our study was achieved in 39 patients at the six-week follow-up, showed a faster rate of granulation in the patients with TCC dressing with an average of 42 days when compared with the control group (84 days). **Conclusion:** Early-stage, neuropathic, non-ischemic diabetic foot ulcers can be effectively treated with TCC. TCC achieves unloading by transferring weight directly from the leg to the cast wall and allowing the heel to share the weight more proportionately. TCC offers a better and faster result than conventional dressing and reduces the chances of amputation. Total contact cast will remain the gold standard for the treatment of neuropathic foot ulcers due to its great efficacy and low risk of serious consequences.

INTRODUCTION

Diabetes-related lower extremity amputations are primarily caused by neuropathic ulcers. Regular dressings, frequent debridements, and little to no weight bearing on the affected foot are the traditional treatments for diabetic foot ulcers. This treatment's main component is intended to effectively lower pressure by means of offloading thereby healing these wounds. A variety of offloading tools are available, including walkers, offloading-shoes, orthoses and total contact casting (TCC). Total contact casts are below knee casts with

little padding that are cost effective and also promotes wound healing in an effective manner. TCC works by reducing oedema, immobilising the patient to aid in the healing of the soft tissues and bones, offloading or redistributing pressure, and allowing for protected weight bearing. It also protects against further injury and deformity. This study is aimed to compare the treatment of TCC with traditional dressing treatment (TD) in the management of diabetic plantar ulcers with respect to outcomes and complications

MATERIALS AND METHODS

Following approval from the ethical committee, 100 patients with diabetic plantar ulcers who were admitted to the general surgery wards of the Government Kanyakumari Medical College in Tamilnadu between April 2021 and September 2022 and who met the inclusion criteria of Wagner's grade I and II neuropathic plantar ulcer were included in the prospective randomised controlled trial. Patients with osteomyelitis, arterial ulcers and those with Wagner's grade 3 or above were excluded. The selected patients underwent screening for a period of one to two weeks to stabilize the wound and underwent appropriate medical and surgical lines of treatment like diabetic control, wound debridement, control of infection, correction of anaemia and other medical illnesses. After the initial screening period the eligible patients were divided randomly into test and control groups. Test group: Total contact casting was applied for the patients. Dressing was changed once a week and review was done weekly for 4 to 6 weeks. Control group: The conventional dressing was applied and it was changed when required and reviewed weekly for 4 to 6 weeks.

Reduction of Wound Size and Area:

Measured in Cm². The final parameters and wound characteristics of the two randomized groups were analysed and compared. Treatment of selected patients was done with bedside surgical debridement and a conventional topical antiseptic is applied when needed.



Statistical Analysis

Data presented as mean, standard deviation, percentage and frequency. Continual variables were compared using Independent sample t test. Pearson chi-square test was used for comparison of Categorical variables. Significance defined by P values less than 0.05 using a two-tailed test. Data analysis performed using IBM-SPSS version 21.0 (IBM-SPSS Science Inc., Chicago, IL)

Age Distribution

Most of the patients are within the age group of 37 to 72 and the mean age of test group is 56.9 and that of control group is 55.1 and the p value is $p = 0.221$. Hence the age distribution is statistically similar between two groups.

RESULTS

Sex Distribution

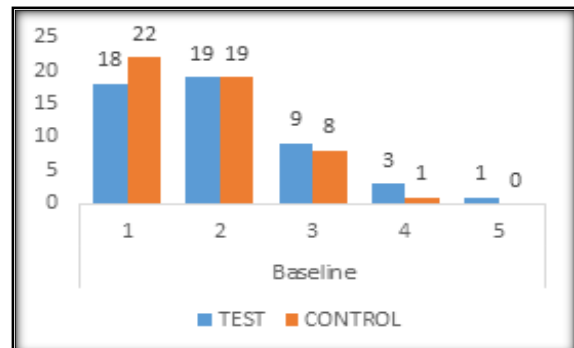


Figure 1:

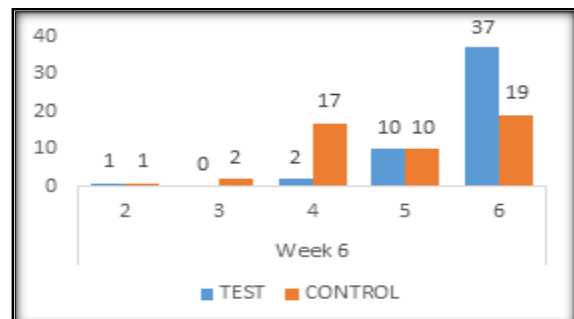


Figure 2: Distribution of necrotic tissue at week 3 between groups

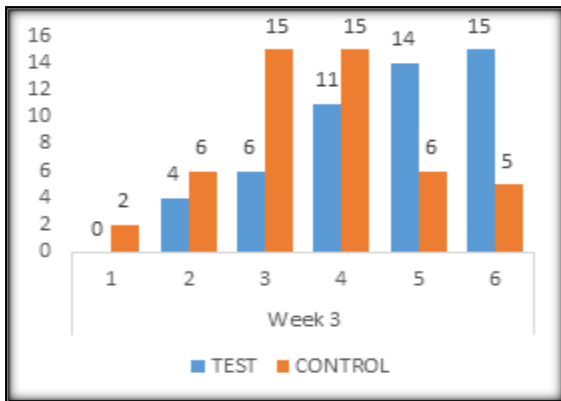


Figure 3: Distribution of necrotic tissue at week 6 between groups

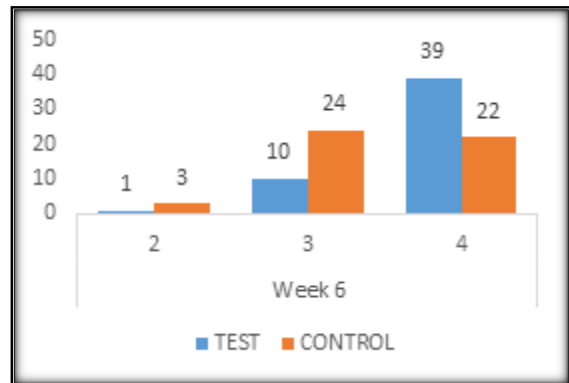


Figure 6: Distribution of granulation of tissue at week 6 between groups

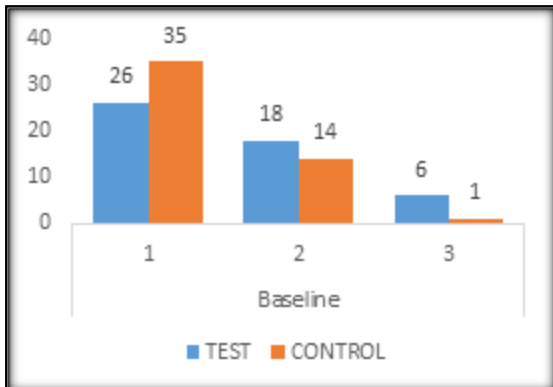


Figure 4: Distribution of granulation of tissue at baseline between groups

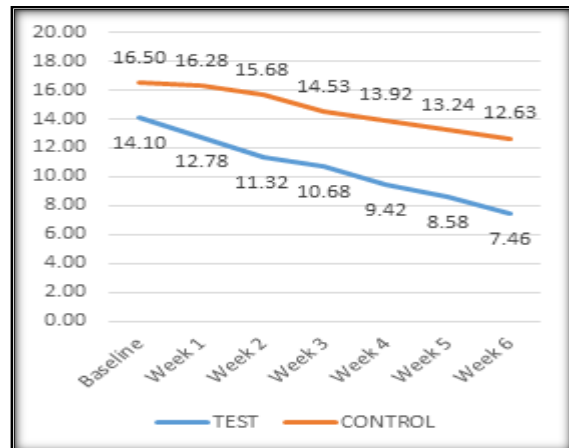


Figure 7: Distribution of Wound surface area between groups

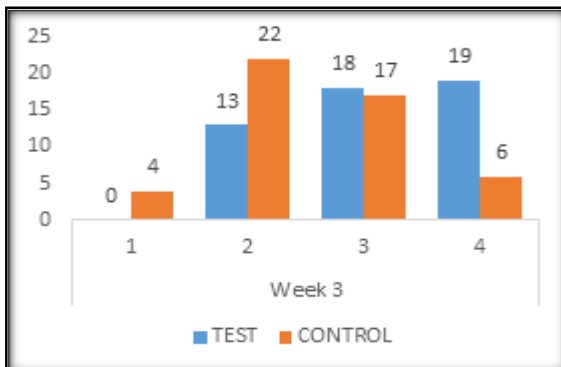


Figure 5: Distribution of granulation of tissue at week 3 between groups

Table 1: Distribution of granulation of tissue at week 3 between groups

		GROUP				P value
		TEST		CONTROL		
		Count	Column N %	Count	Column N %	
SEX	F	19	38.0%	17	34.0%	0.677
	M	31	62.0%	33	66.0%	

Presence of Necrotic Tissue or Slough:

Table 2: Cross tabulation of necrotic tissue at baseline between groups

NECROTIC TISSUE		GROUP				P value
		TEST		CONTROL		
		Count	Column N %	Count	Column N %	
Baseline	1	18	36.0%	22	44.0%	0.652
	2	19	38.0%	19	38.0%	
	3	9	18.0%	8	16.0%	
	4	3	6.0%	1	2.0%	
	5	1	2.0%	0	0.0%	

Table 3: Cross tabulation of necrotic tissue at baseline between groups

Necrotic Tissue		Group				P value
		Test		Control		
		Count	Column N %	Count	Column N %	
Week 3	1	0	0.0%	2	4.1%	0.01

	2	4	8.0%	6	12.2%
	3	6	12.0%	15	30.6%
	4	11	22.0%	15	30.6%
	5	14	28.0%	6	12.2%
	6	15	30.0%	5	10.2%

Table 4: Cross tabulation of necrotic tissue at week 6 between groups

Necrotic Tissue	Group					P value
	Test			Control		
	Count	Column N %	Count	Column N %		
Week 6	2	1	2.0%	1	2.0%	0.001
	3	0	0.0%	2	4.1%	
	4	2	4.0%	17	34.7%	
	5	10	20.0%	10	20.4%	
	6	37	74.0%	19	38.8%	
	2	1	2.0%	1	2.0%	

Presence of Granulation Tissue:

Table 5: Cross tabulation of granulation of tissue at baseline between groups

Granulation Tissue	Group					P value
	Test			Control		
	Count	Column N %	Count	Column N %		
Baseline	1	26	52.0%	35	70.0%	0.067
	2	18	36.0%	14	28.0%	
	3	6	12.0%	1	2.0%	

Table 6: Cross tabulation of granulation of tissue at baseline between groups

Granulation Tissue	Group					P value
	Test			Control		
	Count	Column N %	Count	Column N %		
Week 3	1	0	0.0%	4	8.2%	0.004
	2	13	26.0%	22	44.9%	
	3	18	36.0%	17	34.7%	
	4	19	38.0%	6	12.2%	

Table 7: Cross tabulation of granulation of tissue at week 6 between groups

Granulation Tissue	Group					P value
	Test			Control		
	Count	Column N %	Count	Column N %		
Week 6	2	1	2.0%	3	6.1%	0.003
	3	10	20.0%	24	49.0%	
	4	39	78.0%	22	44.9%	

Wound surface Area:

Table 8: Comparison of Wound surface area between groups

Wound Surface Area (Cm2)	Group				P value
	Test		Control		
	Mean	Standard Deviation	Mean	Standard Deviation	
Baseline	14.10	11.25	16.50	12.31	0.315
Week 1	12.78	9.97	16.28	12.58	0.126
Week 2	11.32	8.88	15.68	13.24	0.028
Week 3	10.68	8.11	14.53	11.24	0.044
Week 4	9.42	8.50	13.92	11.15	0.026
Week 5	8.58	8.30	13.24	11.16	0.02
Week 6	7.46	7.80	12.63	11.24	0.009

DISCUSSION

The management of diabetic foot ulcers involves a crucial method of pressure reduction which has proven to be beneficial in patients. The total contact cast is one of the standard treatments of care due to

its ability to reduce significant pressure on the region of the ulcer along with providing mobility and increasing patient compliance. Literature has suggested that orthotics use in patients results in poor compliance due to its portability which results in low compliance for such methods. However, TCC

has proven to be an effective method due to its fixation characteristics and restricts the additional movement which provides rapid healing of ulcers.^[1] The current study was conducted among 100 patients with diabetic plantar ulcers with a majority of the patients in the age group between 32 to 72 years of age and a mean age of 56.9. A male predominance was reported in the current study with 31 males comprising of 68% of the total study participants. The test group and control group were assessed for 4 to 6 weeks after applying the TCC and conventional dressing respectively. However, no significant difference was reported at the baseline measurement of the necrotic tissue. The first week of follow-up and assessment revealed a significant difference in the healing of the necrotic tissue (p-value = 0.014). Similarly, the findings of our study also report a significant difference between the test and control group till the 6th week of follow-up which signifies that the healing stage was achieved much faster in the test group comprising of TCC dressing. During the comparison at the sixth-week follow-up the incidence of necrotic tissue between 51-75% was only seen in 1 patient, followed by 11-25% in 2 patients, 0-10% of necrotic tissue in 10 patients, and no presentation of necrotic tissue in 37 patients. When compared with the conventional dressing 19 patients were reported to be healed and presented with no necrotic tissue. Further to this similar results were also seen in the granulation of tissue (the healing stage) in the sixth-week follow-up revealing that 39 patients were presented with 76-100% of granulation, followed by 26-75% of granulation in 10 patients and <25% of granulation in one patient; the comparison with the control group revealed 22 patients with 76-100% of granulation tissue, 24 patients with 26-75% of the granulation and <25% in three patients with a significant difference between the two groups (p-value = 0.003) respectively. Our study observation reports that the TCC required fewer days for wound healing between 1-6 weeks in a higher number of patients however the conventional dressing reported a low prevalence of complete healing of wounds. Similar findings of wound healing with TCC were reported by Pradip et al, where TCC required 48 ± 7 days was required for completed healing when compared with the conventional dressing mean healing days of 58 ± 9 days.^[1] A faster rate of healing of ulcers was also reported by Ali et al, with a mean duration of 57.45 ± 29.64 days with a significant difference (p-value <0.0001) in a majority of the patients with neuropathy diabetic foot ulcers of Wagner's grade 2 located on the forefoot and midsole region.^[2] The 76-100% granulation of tissue in our study was achieved in 39 patients at the six-week follow-up which was similar to the study findings of Armstrong et al, who reported a faster rate of granulation in the patients with TCC dressing with an average of 42 days when

compared with the control group (84 days).^[3] The effectiveness of TCC can be postulated by the interruption in the chain of pathogenesis which produces ulceration and induces modification in the histology of ulcers. In addition, studies have reported that TCC yields better results in patients with foot deformity and ulceration due to mechanical derangement caused due to diabetic neuropathy. The findings of Sahu et al reported that TCC was able to heal the ulcer stage within 48 days when compared with the conventional dressing which required 58 days respectively.^[4] The successive use of TCC was also reported by Mueller et al, among forty patients with diabetic plantar ulcers where 19 of 21 ulcers in the TCC group were healed in 42 days when compared with the conventional dressing which required 65 days respectively. However, the study also reported that TCC required careful application, a close follow-up of patients, and patient compliance for minimizing the risk of complications.^[5] TCC is one of the beneficial methods to promote faster healing of ulcers and potentially reduce the risk of re-amputation when compared with the standard treatment

CONCLUSION

Early-stage, neuropathic, non-ischemic diabetic foot ulcers can be effectively treated with TCC. TCC achieves unloading by transferring weight directly from the leg to the cast wall and allowing the heel to share the weight more proportionately. TCC offers a better and faster result than conventional dressing and reduces the chances of amputation. Total contact cast will remain the gold standard for the treatment of neuropathic foot ulcers due to its great efficacy and low risk of serious consequences.

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