



The use of a Pressure Sensing Device in a rural 'High Risk Foot Clinic'

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Introduction

Diabetic foot wounds can cost, on average, \$8000-\$10,000 per occasion, depending on complications and surgery (1, 2). Diabetic foot wounds are thought to develop through means of mechanical stress and excessive pressure (3). It has been well established that reducing the peak plantar pressure occurring to a wound site is a key factor in enabling healing (3, 4, 5). To achieve this reduction in peak pressures effective 'offloading' of the wound is paramount (6)

The Pressure Guardian

The 'Pressure Guardian' is a small compact pressure sensor device. This system includes a small module with Wi-Fi capabilities, a cable, sensor(s) and calibration device (8). The data recorded by the sensor is transmitted to an iPhone or iPad device, where it can then be analysed and formatted into a report. This device was loaned from Australian Orthotic Technologies.



Offloading

Interventions that are commonly used in clinical settings include total contact casts, cam-walkers, custom foot orthotics, prefabricated insoles, half shoes, semi compressed felt, customized footwear and poron (7).

Participants and Selection - Patients already attending the 'High Risk Foot' clinic were invited to take part in the study. Inclusion criteria was that the patient had diabetes and the presence of a neuropathic pressure wound to their foot.

Exclusion criteria was inadequate peripheral blood flow, presence of infection (clinical signs), and patients who were unable to ambulate without assistance. Adequate peripheral blood flow was determined by the presence of biphasic tibialis posterior pulses, and toe pressures (mmHg) of 55 or above (9).

Measurement and data - We conducted pressure recordings when the patient first arrived, after the wound treatment and offloading, and subsequently again if the offloading method was changed prior to the patient leaving. The data was recorded over a single 10 second period of walking. All of the pressure measurements were recorded in pounds per square inch (psi). The data gathered was examined to look for instances where the treatment was changed as a result of data provided by the Pressure Guardian. These are referred to in the results table as 'occasions of change'.

Results - On 4/14 occasions the Pressure Guardian directly lead to the clinician altering the treatment they provided on the day. These 'occasions of change' are represented by the GREEN shading under P3. There were 3 occasions where the Podiatrist had trialed an alternative offloading modality that was less successful than the previous. These occasions are colored in RED. On each of these occasions the Podiatrist reapplied the most effective of the 3 offloading methods.

Patient	Site	P1 (psi)	P2 (psi)	P3 (psi)	Pressure Reduction P1 to P2	Pressure Reduction P2 to P3
1	R/1st plantar MTP	58.08	31.40	30.88	45%	91%
2	R/1st plantar MTP	53.60	19.00	N/A	65%	
3	R/1st plantar medial IP	24.20	1.27	N/A	95%	
4	R/plantar medial navicular	12.20	1.18	N/A	92%	
5	R/1st plantar MTP	56.24	16.90	9.80	71%	86%
6	L/plantar cuboid	50.18	11.15	21.23	78%	57%
6b	L/plantar cuboid	54.81	22.67	17.81	58%	68%
7	L/5th plantar MTP	6.60	6.05	N/A	8%	
7b	L/5th plantar MTP	14.79	6.24	N/A	58%	
9	L/1st toe	5.21	3.14	3.80	4%	38%
10	L/medial calcaneus	1.05	2.52	10.22	-18%	-70%
11	R/plantar calcaneus	12.89	4.03	6.09	68%	53%
12	R/1st medial IP	10.68	2.61	N/A	75%	

Green shading indicates an occasion of change where the pressure was reduced by more than 50% from P1 to P2 or P2 to P3. Red shading indicates an occasion where the pressure was increased or the reduction was less than 50%.

Conclusion

For patient education, the ability to record and present the data in real time is a highly useful. We found that pressure sensing devices such as the 'Pressure Guardian' are an important and valuable tool for achieving optimal offloading of neuropathic foot wounds and thus wound healing. The device directly influenced clinical decision making with regards to wound offloading. References: Please email for a complete list of references used for this research and presentation. Note: The research data was not gathered at Bendigo Health.

