

## A pilot Clinical Evaluation of an alternating pressure air cushion

By

### **David Gray**

Clinical Nurse Specialist  
Department of Tissue Viability  
Aberdeen Royal Infirmary  
Grampian University Hospitals Trusts  
Aberdeen  
AB9 2ZB

### **Sylvia Hampton**

Research and Tissue Viability Nurse  
Eastbourne Hospitals NHS Trust  
Eastbourne

### **Julie Skipp**

Tissue Viability Nurse  
Northern Birmingham Community Trusts  
Birmingham

### **Introduction**

Alternating Pressure Air Mattresses (APAMs) are widely used throughout the UK and are accepted as part of pressure sore prevention protocols. In recent years, a number of Alternating Pressure Air Mattresses (APAMs) have been marketed within the UK. Information on the clinical efficacy of these products is limited.

Donald and Clark (1993) published their observations of a new alternating pressure cushion in the healing of pressure sores. These authors concluded that healing of sores in the research subjects was not impeded by sitting in the cushion for long periods. It was also concluded that the subjects were able to participate in social activities and that they found the cushion generally acceptable.

A comparative Evaluation Special Issue, Wheel Chairs Cushions Static and Dynamic was published by the Medial Devices Agency in 1997.

Within this evaluation interface pressure measurements were carried out on a group of healthy volunteers and the results of various cushions compared. These results are difficult to translate in to possible clinical outcomes as a link between interface pressures and subsequent pressure sore development has not been established. (Clark 1994, Cullum et al 1996).

While there is little clinical evidence to support the use of pressure reducing cushions in pressure sore prevention (Gerhart 1987, Gray 1992). There is also evidence to support the use of pressure air mattresses, with their use being widespread throughout the UK. Given the acceptance of APAMs and the established use of static pressure reducing cushions it is surprising that APACs are so poorly researched and less widely used.

This raises the question, if a patient requires an alternating surface to prevent pressure damage when lying down, should they not have a cushion with a similar mode of action while sitting up? Many patients who are provided with an APAM may not have access to a pressure reducing cushion, where they do it is likely to be a static one. So why then do these patients not all develop pressure sores during this time. The answer may lie in the amount of times the patient is left sitting out of bed, Gebhart and Bliss (1993) recommend that the elderly are not left sitting for longer than two hours at a time. It is clear that static cushions are considered beneficial in preventing pressure sores

but further research is required to identify the clinical situations where APACs may be appropriate. Further research is also required to consider the role of APACs in the treatment of pressure sores.

## Methodology

Fifteen Transair cushions were distributed to three research sites across the UK, Eastbourne, Birmingham and Aberdeen. Of the three sites two were hospitals sites and the other community. Subjects were recruited to the evaluation having been assessed using the local protocols and identified as requiring a pressure reducing cushion. Cushions were supplied for either wheelchair or static seat use. Two groups were observed during the evaluation on with skin intact on admission and the second with existing pressure sores.

Following the collection on the baseline data the subjects were reviewed after 5 and 10 days. Observations were made of their skin condition and any damage observed graded using the Torrance scale. Pressure sores present on admission to the trial were observed and any deterioration or improvement documented. Also at this time subjects were asked to assess the comfort provided by the cushion. This was achieved using a standardised question, 'which phrase best describes your seat cushion?'. The subjects were invited to choose from the following phrases; very uncomfortable, uncomfortable, adequate, comfortable, very comfortable.

## Equipment used

Transair cushions manufactured by Karomed Ltd, Stockport were used in all of the sites. The cushions were alternative pressure air cushions which utilise foam air technology. Foam is located within the air cells and this allows the air to circulate between the foam and the cover. It is thought that the presence of the foam in the cells supports the user as the air alternates between the cells. This reduces the potential for the patient to feel unstable due to the see saw effect.

All of the cushions were covered with a vapour permeable, multi stretch, washable cover. The cushions are operated by a pump unit which can be battery or mains powered.

## RESULTS

### Group 1 – skin intact on admission

Twenty subjects were recruited to this group, 15 females and 5 males with a mean age of 80 years. All of the subjects were assessed using the Waterlow scoring system with a mean score of 20 (Range 8 – 34). All of the subjects spent long periods out of bed on the seat cushion. Skin assessment revealed that 3 subjects developed non-blanching hyperaemia which was not observed to develop further and lead to skin loss. A further 3 subjects developed superficial ulceration (Torrance Grade 2) and the remainder maintained intact skin (Fig 1). In terms of comfort perception 17 subjects (85%) described the cushions as adequate – very comfortable, with 2 subjects describing the cushion as uncomfortable and one unable to comment (Fig 2).

### Discussion of Group 1

A small group of twenty subjects were recruited to this study. It is clear from the Waterlow scores, age and the amount of time spent sitting out of bed that these subjects could be considered at high risk of pressure sore development. Within this group 3 (15%) developed superficial pressure sores, it

is difficult to develop this finding further as no data on the mattress provided or associated care was collected. In view of the fact that only superficial sores were developed in a small number of subjects this result is encouraging.

The acceptability of the cushion was evaluated by the question and visual rating scale described earlier. This method indicated that there was a high level of acceptance of the product with 17 (85%) of the subjects describing the cushions as adequate, comfortable or very comfortable. Two subjects described their cushion as uncomfortable and one was unable to comment. These response rates are in keeping with results obtained when using this method in mattress evaluations (Gray and Campbell 1994, Gray, Campbell and Cooper 1998).

## **Group 2 – established pressure sores**

Six subjects were recruited to this group, 3 males and 3 females with a mean age of 80 years and a mean Waterlow score of 21 (range 16-23). All had existing pressure sores graded 2-4 using the Torrance graded system. Within this group none of the sores were observed to deteriorate with 2 improving and 4 remaining static. Perceptions of comfort were generally positive with 4 describing the cushion as comfortable, 1 very comfortable and 1 uncomfortable.

All of the subjects spent long periods sitting on the cushions each day with 4 spending over 6 hours per day on the cushion and 2 spending 3-5 hours per day. Further information can be obtained from figures 3 and 4.

## **Discussion of group 2**

All but one of group 2 had deep pressure sores on admission to the trial and all spent long periods sitting on their cushion each day. Despite this and their associated high risk of pressure sore development none of the sores were deemed to have deteriorated, with 2 improving.

It is obviously important that the users of this type of product find it acceptable given the long periods they are expected to spend sitting each day. From the results, we can observe that the majority of subjects found the cushion acceptable with only one finding it adequate.

Clearly the results are limited by the small numbers in the sample group but they provide sufficiently positive results to support a larger trial in the future.

## **Conclusion**

This evaluation was intended as a pilot study prior to larger trial and has provided some useful information as to the clinical efficacy of this alternating air pressure cushion.

To confirm these findings two larger trials are required. Firstly, a trial to confirm the role of these cushions as part of a pressure sore prevention programme would be beneficial.

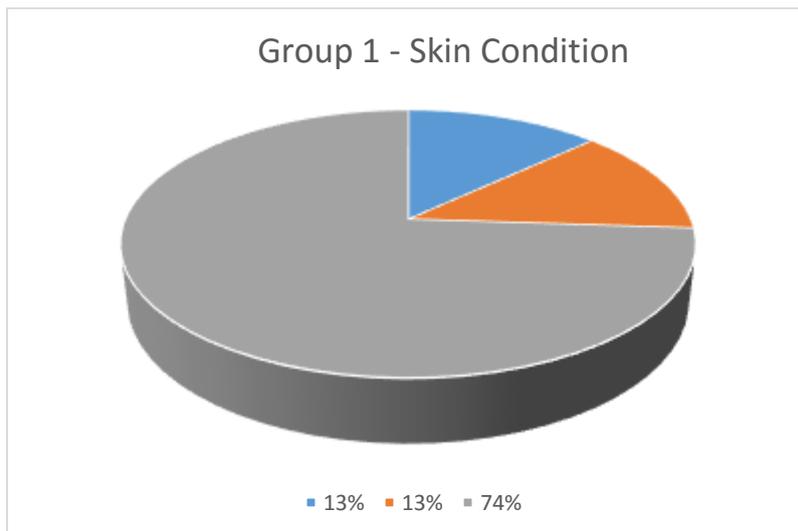
Secondly, further investigation into the role of APACs as an adjunct to pressure sore healing.

## **References**

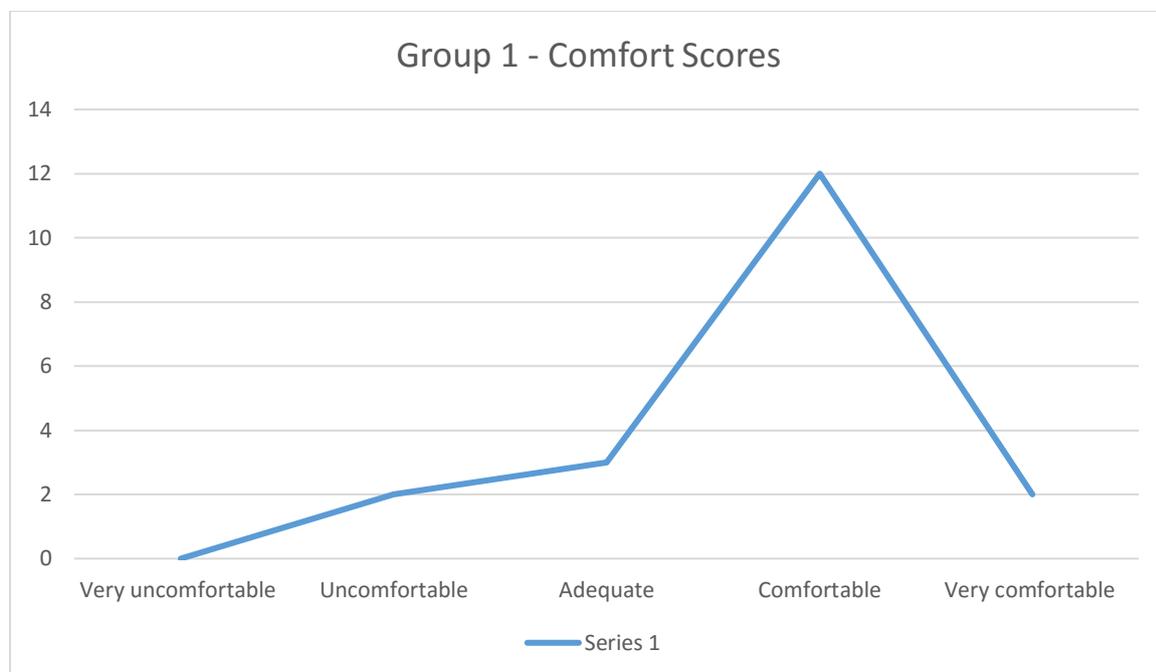
1. Clark M, Problems associated with the measurement of interface (or contact) pressure, Journal of Tissue Viability 1994; vol 4 no 2, p37-42

2. Cullum N et al, The Prevention and Treatment of Pressure Sores, The Effective Health Crew Bulletin October 1995 vol 2 no.1
3. Donald I, Clark M, Initial Clinical Observations of the Role of a New Alternating Pressure Cushion in the Healing of Established Pressure Sores, Journal of Tissue Viability 1993; vol 3 no.3, p74-76
4. Devine B.L, Alternating Pressure Air Mattresses in the Management of Established Pressure Sores, Journal of Tissue Viability; 1995, vol 5 no.4, p94-98
5. Exton-Smith A.N, Wedgewood J, Overstall P.W., Wallis G, Use of the Airwave System to Prevent Pressure Sores in Hospital, Lancet 1982; 2: p1288-1290
6. Gebhardt K, Pressure Points, Nursing Times, 1987; 83:28, p.34-37
7. Gebhardt K, Bliss M. Preventing Pressure Sores in Orthopaedic Patients – is Prolonged Chair Nursing Detrimental? Journal of Tissue Viability. 1994; vol 4 no. 2 p51 – 54
8. Gray D G. A Tissue Viability Study. Journal of Tissue Viability 1992; Vol 2 no.3 p96-98
9. Gray D G., Campbell MA. Randomised Clinical Trial of Two Foam Mattresses, Journal of Tissue Viability 1994; vol 4, no 4 p128-132
10. Gray D G., Campbell MA, Cooper PJ, A study of the performance of a Pressure Mattress after Three Years of Use, Journal of Tissue Viability 1998; vol 8, no 3 p10-13
11. Hitch S, NHS Executive Nursing Directorate, Strategy for major clinical guidelines prevention and treatment of pressure sores, a literature review, Journal of Tissue Viability 1995; vol 5, no 1 p3-11
12. Medical Devices Agency, Wheelchair Cushions Static and Dynamic, A Comparative Evaluation Special Issue, PS4 April 1997 HMSO

**Figure 1.**



**Figure 2.**



**Figure 3.**

Group 2, subjects with established sores									
Grade of sore	Site	Sex	Age	Waterlow score	Body Mass Index	Diagnosis	Sore condition	Comfort assessment	Hours spent sitting
2	Sacrum	Female	86	24	34	Cardiac failure	Improved	Adequate	3-5
3	Sacrum	Female	78	23	22	Not recorded	Static	Very Comfortable	3-5
3	Sacrum	Male	85	21	28	Diabetic	Improved	Comfortable	6 or more
3	Sacrum	Male	67	16	28	Parkinson's	Static	Comfortable	6 or more
3	Sacrum	Male	86	19	23	Diabetic	Static	Comfortable	6 or more
4	Sacrum	Female	73	23	31	Stroke	Static	Comfortable	6 or more

**Figure 4.**

