

# Advances in Pressure Relief Systems

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The key to successful pressure sore prevention is accurate risk assessment and the provision of an appropriate surface. It is widely accepted that the primary requirement is to redistribute pressure away from the site or potential site of tissue damage.

A value of 32mmHg or less is generally considered the limit of pressure which tissue can withstand. This limit varies between individuals and is linked to other important factors, for example level of mobility, nutritional status. Ek et al (1) found that skin blood flow can cease in hemiplegic patients when external pressures of only 11mmHg are applied. External pressures as low as 20mmHg have been seen to occlude capillaries in geriatric patients but in others blood flow has continued at pressures of 120mmHg(2).

This highlights the need for a comprehensive initial assessment of each individual as well as continuing assessment.

## Methods of Reducing Pressure

Repositioning patients frequently to avoid prolonged contact with the surface supporting the body is time-consuming, expensive, potentially hazardous for patient and nurse, and labor intensive. It can also be painful and distressing for the patient.

As a result, many pressure-relieving and redistributing devices have been produced over the last 10 years. These fall broadly into two groups:

### Low air loss

Pressure-redistribution devices - where the surface of the device conforms to the contours of the body to spread the load over a larger surface area thus reducing average pressures (Fig. 3)

### Alternating

Pressure-relieving devices - where pressure is systematically relieved by electrically operated alternating pressure systems (Fig. 2). The patient experiences periods of high pressure in certain areas alternating with periods of low pressure. The high pressure periods, during which pressures were found to exceed 32mmHg in a study by Swain et al

(3, 4, 5), will cause capillary occlusion. The physiological effect of intermittent high pressure has not been explored. However, many patients complain of discomfort when the air cells inflate and deflate which may result in non-compliance.

## Seating

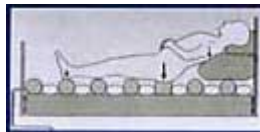
The need for specialized seating is often overlooked either through ignorance or limited budgets. Ideally, pressure relief systems should be provided on a 24 hour basis and patients should always be supplied with a specialist mattress and appropriate seating (6). Optimum positioning when seated is essential. Incorrect height, width and depth of the chair, as well as arm rests and floor rests which do not support the limbs sufficiently can all lead to pressure sore development.

## Microsolo 900 Transport mattress/cushion system

The Microsolo 900T is powered low air loss mattress and cushion system. It is marketed as a multi-surface modality to supply relief for patients from tissue damage when either lying or seated. The system provides consistent, dynamic therapy on a variety of surfaces. The Microsolo 900T uses the Archimedes Linker algorithm which measures the patient's weight and body contour and imprints the data into RAM (Random Access Memory). There is no need for time-consuming and often inaccurate manual setting of pressures. The data are used to automatically respond to any changes in position or movement every 11 seconds to provide optimum support.



Alternating pressure 1  
Figure 1



Alternating pressure 2  
Figure 2



Constant low pressure  
device  
Figure3

This is achieved simply by the algorithm turning on the pumps or operating the release valves for a computed time. The action then stops and the mattress pressure allowed to equalize. The pressure is measured and a new pump/deflate action determined. By this method, the target pressure can be achieved quickly and the mattress/cushion will never 'bottom-out'.

## System design

The system consists of a lightweight air control unit which hooks on to the bed or chair, an air mattress replacement and wheelchair seating system, with the following features:

- The air control unit contains a 12 volt DC battery reserve which lasts up to four hours so that air therapy continues during transport or during power failure.
- The low friction mattress and cushion cover is waterproof, vapour permeable, loose, easy to remove and has a wipe-clean surface.
- After switching on the mattress will take approximately 13 minutes to inflate enough to place a patient on the surface.
- The 'set comfort' control allows for easy adjustment and will ensure therapeutic pressures are maintained.
- When patients are transferred between bed and chair the mattress/chair control adjusts the timing cycle.

In case of malfunction, there is both an audible alarm and visual alarm which can be manually disarmed for 30 minutes by pressing the alarm button. The CPR pull is easy to identify and when operated deflates the mattress within seconds.

Alternatively, the system may be put into hard mode to provide a firm static surface for resuscitation. It also protects patients from tissue damage at a time when they are particularly vulnerable.

If the mattress is damaged, the single air sacs can be replaced easily and cheaply. The recommended weight limit is 350lbs (25 stone) but, in laboratory conditions and in practice, weights of up to 600lbs have been tolerated over time. An additional feature soon to be added is an integral weighing facility.

**There are four modes of system operation:**

- Normal cycle (float)
- Pulsating ten minute cycle
- Pulsating 20 minute cycle
- Pulsating 30 minute cycle
- Hard mode (pre-set to 50mmHg) for patient transfer or management.

## Pressures

The pressures recorded in an independent study on the Microsolo 900T are shown in Tables 1 and 2.

**Table 1. Average pressures recorded on a Microsolo 900T mattress (n = 10).**

Position	Pressures (mmHg)	Standard Deviation
Scapula	11	3.9
Sacrum	12	5.3
Heel	7	6.9
Trochanter	25	7.4

**Table 2. Average pressures recorded on a Microsolo 900T Cushion (n = 10).**

Position	Pressures (mmHg)	Standard Deviation
Right ischial tuberosity	31	6.4
Left ischial tuberosity	31	5.4
Sacrum	29	6.3

Pressures are constantly kept below capillary closing pressure when patients are seated or lying. The system is therefore suitable for use with patients assessed as high to very high risk for pressure sore development.

## Advantages

### Advantages of the low air loss surface include:

- Pressure relief
- Stimulation of the local circulation
- Reduced skin surface humidity
- Low friction surface

**Overall advantages of the system include:**

- Portability
- Continuity of therapy
- Comfort
- Storage of the bed is unnecessary

**Conclusion**

The Microsolo 900T has been widely used in the US for some time. The system is currently undergoing clinical evaluations to examine its efficacy, ease of use, patient and nurse acceptability and reliability.

**References**

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