# A randomised clinical trial using different turning intervals as prevention of pressure ulcers

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## 1 Lying Postures

**Objectives**

to determine the lying posture with lowest interface pressure
to determine the pressure reducing effect of a visco-elastic mattress

**Method**

interface pressure measurement
62 healthy volunteers
10 positions
*4 supine positions with 0°-30°-60° -90° elevation of the head, semi-Fowler position, 3 lateral positions with a 30° and a 90° rotation, 2 prone positions*
mattresses
*standard hospital mattress*
*visco-elastic mattress Tempur-Pedic (Fagerdala, Sweden)*

**Results**

**Supine Postures**

| | |
|---|---|
| supine 0° | *39.5 ± 7.0 mmHg* |
| supine 30° | *38.4 ± 9.4 mmHg* |
| supine 60° | *37.4 ± 5.6 mmHg* |
| supine 90° | *48.4 ± 9.9 mmHg* |
| semi-Fowler 30° | *30.3 ± 5.5 mmHg* |

**Lateral Postures**

| | |
|---|---|
| 90° shoulder free | *56.4 ± 13.2 mmHg* |
| 90° lying on shoulder | *58.7 ± 11.9 mmHg* |
| 30° | *51.4 ± 15.4 mmHg* |

**Prone Postures**

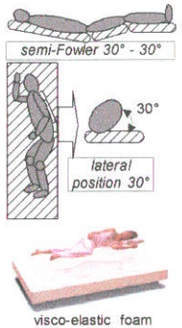
| | |
|---|---|
| hands under the head | *33.0 ± 9.3 mmHg* |
| arms next to the body | *34.8 ± 9.6 mmHg* |

**Lowest interface pressure**

| | |
|---|---|
| semi-Fowler 30° | *(p<0.001)* |
| lateral postion 30° | *(p<0.001)* |

**Visco-elastic mattress**

20 to 30% pressure reduction *(p<0.001)*






visco-elastic foam *Tempur-Pedic (Fagerdala,Sweden)*

## 3 Sitting Postures

**Objectives**

to determine the sitting posture and cushion with lowest interface pressure

**Method**

interface pressure measurement
56 healthy volunteers
7 postures
*sitting upright or back in an armchair with the feet on the ground or with the lower legs on a footrest, slid down, slouched at an angle of 15°, sitting upright on a chair*
4 cushions
*visco-elastic foam cushions (2), air cushion (1), water cushion (1)*

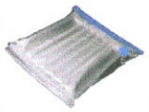
**Results**

**Postures**

| | |
|---|---|
| sitting back | |
| *feet on the ground* | *39.0 ± 6.2 mmHg* |
| *feet on a footrest* | *37.9 ± 5.8 mmHg* |
| sitting upright | |
| *feet on the ground* | *40.7 ± 6.5 mmHg* |
| *feet on a footrest* | *43.8 ± 7.2 mmHg* |
| upright on a chair | *51.4 ± 13.4 mmHg* |
| slid down | *55.3 ± 10.0 mmHg* |
| slouched | *51.3 ± 11.9 mmHg* |

**Lowest interface pressure**

sitting back with feet on the ground
+ air cushion (Repose,Frontier, Great Britain) *35.3 ± 4.3 mmHg (p<0.001)*

## 2 Cushions

**Objectives**

to determine the pressure reducing effect of seating cushions used in patients sitting up in a hospital armchair

**Method**

interface pressure measurement
20 healthy volunteers
29 cushions :
- *gel cushions (6)*
- *gel/foam cushions (5)*
- *hollow fibre cushions (4)*
- *water cushion (1)*
- *foam cushions (9)*
- *air cushions (4)*

**Results**

**No pressure reducing effects**

| | |
|---|---|
| gel cushions | *(+ 0.9 mmHg ± 6.3 mmHg) (p=0.55)* |
| gel/foam cushions | *(- 1.3 mmHg ± 5.7 mmHg) (p=0.33)* |

**Limited pressure reducing effects**

| | |
|---|---|
| hollow fibre cushions | *(- 4.0 mmHg ± 7.1 mmHg) (p<0.05)* |

**Good pressure reducing effects**

| | |
|---|---|
| water cushions | *(- 6.1 mmHg ± 7.6 mmHg) (p<0.01)* |
| foam cushions | *(- 6.0 mmHg ± 6.9 mmHg) (p<0.01)* |
| air cushions | *(- 6.9 mmHg ± 4.8 mmHg) (p<0.01)* |

**Lowest interface pressure**

foam cushion Tempur-Pedic (Fagerdala, Sweden) *(- 9.0 mmHg ± 5.9 mmHg) (p<0.01)*
air cushion Repose (Frontier, Great Britain) *(- 8.9 mmHg ± 6.6 mmHg) (p<0.01)*

## 4 Frequency of Turning

**Objectives**

to evaluate the effect of different turning intervals and the use of a pressure-reducing mattress on the development of pressure ulcers in geriatric high-risk patients

**Methods**

**design:** randomized controlled trial
**subjects:** 831 geriatric nursing home patients (Norton score < 12 or Braden score <17)
**intervention:**
* 4 experimental groups
*group A: turning every 2 hours on a standard hospital mattress (n=65),*
*group B: turning every 3 hours on a standard hospital mattress (n=65)*
*group C: turning every 4 hours on a visco-elastic foam mattress (Tempur-Pedic, Fagerdala, Sweden) (n=67)*
*group D: turning every 6 hours on a visco-elastic foam mattress (Tempur-Pedic, Fagerdala, Sweden) (n=65).*
all experimental groups: lying: alternating a semi-Fowler position with a lateral 30° position
sitting: the backrest was tilted back and the legs were put on a footrest an air cushion (Repose, Frontier, Great Britain)
* control group (n=576) received standard preventive care.
**length of observation:** 28 days

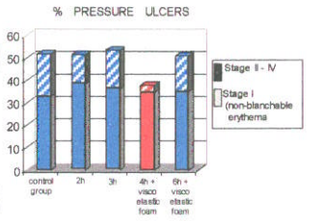
**Results**

761 patients completed the study.

**Incidence of non-blanchable erythema (pressure ulcer stage I)**

| | |
|---|---|
| 38.1 % | group A (turning every 2 hours on a standard hospital mattress) |
| 37.9 % | group B (turning every 3 hours on a standard hospital mattress) |
| 36.4 % | group C (turning every 4 hours on a visco-elastic foam mattress) |
| 36.5 % | group D (turning every 6 hours on a visco-elastic foam mattress) |
| 34.8 % | control group |

*statistically not different (Log Rank test=2.27, df=4, p=0.69)*




**Incidence of pressure ulcer lesions (pressure ulcer stage II to IV)**

| | |
|---|---|
| 14.3 % | group A (turning every 2 hours on a standard hospital mattress) |
| 24.1% | group B (turning every 3 hours on a standard hospital mattress) |
| 3% | group C (turning every 4 hours on a visco-elastic foam mattress) |
| 15.9% | group D (turning every 6 hours on a visco-elastic foam mattress) |
| 20.0% | control group |

*statistically different (Log Rank test=14.87, df=4, p=0.005)*

**Conclusions**

turning has no preventive effect on the development of stage I pressure ulcer (non-blanchable erythema).

turning has a preventive effect on the development of stage II - IV pressure ulcer **turning every 4 hours on a visco-elastic mattress is a more effective and less labour-intensive method than the traditional 2- or 3-h turning scheme.**

1. Defloor, T. The effect of position and mattress on interface pressure. Applied Nursing Research, In Press.
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3. Defloor, T., & Grypdonck, M.H.F. (1999). Sitting posture and prevention of pressure ulcers. Applied Nursing Research, 12(3), 136-142.

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