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STUDY ON THE EFFECT OF ALTERNATING MATTRESSES AND REPOSITIONING ON THE INCIDENCE OF PRESSURE ULCERS: AN RCT

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Introduction

Pressure ulcers are a common problem. Effective preventive measures are necessary. Previous research shows that repositioning every 4 hours on a visco-elastic polyurethane mattress reduces the incidence of pressure ulcers to a greater extent than changing position every two or three hours on a non-pressure-reducing mattress (Defloor, 2000a). However, repositioning is very labour-intensive. It is not known whether the incidence of pressure ulcers drops when alternating mattresses are used.

Aim of the study

The aim of this study was to examine whether alternating mattresses are more effective than or equally effective as visco-elastic polyurethane mattresses combined with repositioning every four hours.

Study question

Is the incidence of pressure ulcers in the alternating group different than in the repositioning group?

Population and methodology

Sample

The study was carried out between May 2000 and August 2002 in 19 surgical, medical and geriatric nursing units of seven Flemish hospitals. Each nursing unit took part in the study for a period of 20 weeks. Altogether there were four study periods, in which five nursing units took part per period. All patients over the age of 18 who were expected to be hospitalised for at least three days were asked to take part in the study. Patients with a stage three or four pressure ulcer, weighing over 140 kg and patients who could not be turned for medical reasons were excluded. Patients were included if they were regarded as risk patients for the development of pressure ulcers. Two standardised methods of risk determination were used to determine the risk of pressure ulcers. Firstly, risk patients were identified on the basis of the Braden scale (score < 17). The Braden scale was chosen because it is the scale most often tested for its predictive validity. Secondly, risk patients were identified on the basis of the presence of non-blanchable erythema (stage 1 pressure ulcer) (Vanderwee K et al., 2003). Patients were allocated to one of the two methods by randomisation.

On the basis of an incidence of pressure ulcers (stage 2 and higher) of 12% in general hospitals (Bours et al., 1998), a sample size of 223 patients was calculated per group in order to detect a difference in incidence of 7% between the experimental and control groups ($\alpha=0.05$; power=0.80).

Intervention

Patients at risk were allocated in a randomised manner to a prevention protocol: in the experimental group patients were placed on an alternating mattress (Alpha-X-Cell®, Huntleigh Healthcare, UK). No repositioning took place. In the control group, patients were placed on a visco-elastic polyurethane mattress (Tempur®, Sweden) combined with

repositioning every four hours. The following repositioning schedule was used: semi-Fowler 30°, lateral 30° right, semi-Fowler 30°, lateral 30° left (Defloor, 2000b). The principle of floating heels was applied in both the experimental group and the control group (Defloor et al., 2002). An ordinary pillow was used for this purpose. Sitting was standardised in both groups. An air cushion (Airtech®, Huntleigh Healthcare, UK) was used. Patients had to stand up every two hours, alone or with assistance. If the seat could tip backwards, the legs were placed on a footrest. If the seat could not tip backwards, the feet were placed on the ground.

Data collection

The nurses scored the presence of pressure ulcers daily. The EPUAP system (European Pressure Ulcer Advisory Panel) was used to classify the pressure ulcers. A transparent pressure disk (Derre, 1998) was used to distinguish blanchable and non-blanchable erythema in a standardised manner. A stage 2 pressure ulcer or higher was identified as a pressure ulcer lesion (Schoonhoven et al., 2002). A Braden scale was filled in for all patients every three days. Unannounced reliability tests were carried out once a week by two researchers, operating independently of each other.

Initial results

A total of 504 patients were included in the study. The median age was 82 years (IQR: 77-82 years), the median duration of admission was 21 days (IQR: 22-36) and the mean Braden score on admission was 15 (SD: 3.03). Of the patients included, 255 (50.6%) were allocated by randomisation to the alternating group and 249 (49.4%) to the repositioning group. The two groups did not differ significantly with regard to age, sex, duration of admission, medical speciality and Braden score.

In the repositioning group, 18.4% (n=47) of patients developed a pressure ulcer lesion (stage 2 or higher) and in the alternating group 16.9% (n=42). There was no statistically significant difference between the two groups ($p=0.726$, Fisher's exact test). Correction was made for the variables of speciality, duration of admission, risk determination and learning effect (first and second halves of the study period) by logistic regression. None of these variables had a statistically significant effect on the incidence of pressure ulcer lesions. The difference between the alternating group and repositioning group was not significant (Wald $\chi^2=1.076$, $p=0.3$). If the total group is divided according to the method of risk determination, firstly non-blanchable erythema and secondly Braden score, the differences between the repositioning group and the alternating group in the two risk-determination groups are not significant.

There was a statistically significant difference in the location of the pressure ulcer lesions between the two groups ($\chi^2=6.67$; $df=2$; $p=0.036$). There were significantly more patients in the repositioning group with heel pressure ulcers than in the alternating group (Wald $\chi^2=8.588$; $df=1$; $p=0.011$). There was no difference in the severity of the pressure ulcer lesions between the two groups ($p=0.369$, Fisher's exact test).

The time it took for a pressure ulcer lesion to develop was significantly longer in the alternating group than in the repositioning group (Mann-Whitney $U=739.5$; $p=0.041$).

Patients on an alternating mattress developed a lesion after about eight days (IQE: 3-14.5) and patients in the repositioning group after about four days (IQR: 3-8). However, the result is of borderline significance.

Discussion and conclusions

The initial results of the study support the hypothesis that repositioning on a visco-elastic polyurethane mattress is just as effective as using an alternating mattress. Nor did the severity of the pressure-ulcer lesions differ in the two groups.

However, there were significantly fewer heel pressure ulcer lesions in the alternating group than in the repositioning group. It can be asked whether the principle of floating heels was correctly applied. A possible explanation for the lower percentage in the alternating group is that when patients pushed their cushions away their heels ended up between the air cells of the alternating mattress, so that the heels remained pressure-free. More in-depth analysis of

the data is still under way at present.

Implications for top quality in nursing and midwifery

Redevelopment of a better technique for floating heels ought to allow the incidence of heel pressure ulcers to be further reduced.

Alternating mattresses and visco-elastic mattresses combined with repositioning are found to be just as effective in the prevention of pressure ulcers. Which preventive methods are to be chosen is determined by the preference of the patient, nursing team and policy. Cost price, work load and comfort are decisive factors in this decision-making process.

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