Benefits of an oral nutritional supplement on pressure ulcer healing in long-term care residents

- **Objective:** To investigate the effects of an oral nutritional supplement (ONS) plus standard care on the healing of pressure ulcers in long-term nursing home residents in addition to standard care. The ONS (Cubitan, Nutricia Advanced Medical Nutrition) was high in energy and protein, and enriched with arginine, vitamin C and zinc.

- **Method:** A total of 245 patients with grade II–IV pressure ulcers were enrolled into this open study at 61 long-term-care facilities, which reflect the nursing-home population of Luxembourg and Belgium. Residents received the ONS daily for nine weeks, along with their normal diet or enteral feed and standard pressure care. Pressure ulcer area (mm²) and condition were assessed after three and nine weeks. Data were analysed using ANOVA and expressed as mean ± SD.

- **Results:** The patients’ age was 82.2 ± 10.1 years. Sixty-seven patients (27%) had been previously treated with the ONS. The majority of pressure ulcers were located at the sacrum (54%) and heel (32%). The average intake of the 200ml ONS was 2.3 ± 0.56 servings daily, which corresponds to 46g protein, 6.9g arginine, 575mg vitamin C, 87mg vitamin E and 21mg zinc. After nine weeks’ nutritional support, the average pressure ulcer area reduced significantly from 1580 ± 3743mm² to 743 ± 1809mm², which is a reduction of 53% (p<0.0001). Complete wound closure occurred after three and nine weeks in 7% and 20% of the pressure ulcers respectively. The amount of exudation (assessed subjectively) also decreased after specialisation nutritional support (p<0.0001).

- **Conclusion:** A high-protein ONS enriched with arginine, vitamin C, vitamin E and zinc, when used with standard pressure ulcer care, significantly reduced the mean pressure ulcer area of long-term nursing home residents.

- **Declaration of interest:** This study was supported by Nutricia Belgium.

---

Undnutrition and protein-energy malnutrition are commonly observed in elderly patients living in nursing and residential care homes and in those admitted to hospital.\(^1\,^2\,^3\) A combination of immobility, loss of lean body mass and challenges to the immune system increases the risk of pressure ulceration by 74%.\(^4\) Common causes of malnutrition in elderly people include decreased appetite, dependence on help for eating, impaired cognition and/or communication, poor positioning, frequent acute illnesses causing gastrointestinal losses, decreased thirst response, psychosocial factors such as isolation and depression, a monotonous diet, higher nutrient requirements, along with the demands of age, illness and impairment.\(^4\) Malnutrition in turn increases the risk of pressure ulceration and delays healing.\(^4\)

Malnourished patients at-risk of or with pressure ulcers often have problems fulfilling their nutritional needs with a normal food intake. Providing an oral nutritional supplement (ONS) in addition to regular food intake is a logical way of replenishing shortages of macro- and micronutrients and supplying extra nutrients to preserve skin tissue, strengthen tissue resistance and promote tissue repair.\(^5\,^6\,^7\,^8\)

Several international guidelines have advised on the role of nutrition, including supplementation, in pressure ulcer care.\(^9\,^10\) Nevertheless, nutritional supplementation is not yet an integral part of pressure ulcer care,\(^11\) which usually comprises wound cleansing and debridement, dressing application, use of pressure-redistributing support surfaces and patient repositioning. Few clinical trials have reported the efficacy of an ONS on pressure ulcer healing, while only a few small studies have investigated practitioners’ experiences of using ONS as part of pressure ulcer care.\(^12\,^13\)

This study aimed to investigate the effects of a specific ONS (Cubitan, Nutricia Advanced Medical Nutrition, the Netherlands) designed for the dietary management of pressure ulcers and chronic wounds. It is high in energy and protein, and enriched with arginine and nutrients believed to be important in the management of pressure ulcers and chronic wounds.
the wound-healing process. Protein deficiency blunts the fibroblastic response and impairs neoangiogenesis, collagen synthesis and wound remodelling. Arginine appears to effect microvascular and perfusion changes as a precursor to the synthesis of nitric oxide. It enhances collagen production by producing proline, which is a common amino acid involved in protein synthesis and a major component of collagen. The ONS is also enriched with vitamins E, C and zinc, which also promote pressure ulcer healing.

**Method**

**Participants**

Patients with European Pressure Ulcer Advisory Panel (EPUAP) grade II–IV pressure ulcers living in 61 long-term care facilities in Belgium and Luxembourg were enrolled into this open multicentre trial between June and December 2006. There were no exclusion criteria. The sample therefore reflected the nursing-home population in Belgium and Luxembourg.

The patients received the ONS (Cubitan) daily for nine weeks, along with standard pressure ulcer care (as outlined above). The recommended dose was three servings a day, to be taken in addition to their normal diet or enteral feed. According to the manufacturer, each 200ml ONS serving provides 250kcal/20g protein, 3g arginine, 250mg vitamin C, 38mg zinc and perfusion changes as a precursor to the synthesis of nitric oxide. It enhances collagen production by producing proline, which is a common amino acid involved in protein synthesis and a major component of collagen.

**Data collection**

Pressure ulcer area was calculated by measuring the lesion’s width and length with a ruler to the nearest millimetre. The condition and location of the pressure ulcer were assessed using a standardised questionnaire at baseline and at three and nine weeks. The same protocol and scoring systems were used for patients with cognitive impairment/dementia. None were forced to drink the ONS. There was also space for additional comments on concordance, and patients were given an opportunity to self-report their level concordance.

At the end of the nine-week intervention period each practitioner specified whether or not they would continue using the ONS as part of their pressure ulcer management strategy in their long-term care facility.

**Statistical analysis**

Data are expressed as mean ± SD. Data were statistically analysed using ANOVA. Pressure ulcer data were log-transformed using a mixed-effects model to compare changes in pressure ulcer area over time. SGS Life Science Services – Clinical Research (Biersges-Wavre, Belgium) performed the data entry, verification and statistical analysis.

<table>
<thead>
<tr>
<th>Table 1. Patient and wound characteristics at baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of patients</td>
</tr>
<tr>
<td>Age (years)</td>
</tr>
<tr>
<td>Female/male</td>
</tr>
<tr>
<td>Body weight (kg)</td>
</tr>
<tr>
<td>Comorbidities:</td>
</tr>
<tr>
<td>- diabetes mellitus</td>
</tr>
<tr>
<td>- cerebrovascular accident</td>
</tr>
<tr>
<td>- dementia</td>
</tr>
<tr>
<td>- multiple diagnoses</td>
</tr>
<tr>
<td>Mobility (%):</td>
</tr>
<tr>
<td>- wheelchair and/or chair-bound</td>
</tr>
<tr>
<td>- walking with assistance</td>
</tr>
<tr>
<td>- mobile</td>
</tr>
<tr>
<td>Average pressure ulcer area at baseline (mm²)</td>
</tr>
<tr>
<td>Ulcer grade (%):</td>
</tr>
<tr>
<td>- grade II</td>
</tr>
<tr>
<td>- grade III</td>
</tr>
<tr>
<td>- grade IV</td>
</tr>
<tr>
<td>- not reported</td>
</tr>
<tr>
<td>Ulcer location (%):</td>
</tr>
<tr>
<td>- sacrum</td>
</tr>
<tr>
<td>- heel</td>
</tr>
<tr>
<td>- lower limb</td>
</tr>
<tr>
<td>- hip</td>
</tr>
<tr>
<td>- other</td>
</tr>
<tr>
<td>- not reported</td>
</tr>
</tbody>
</table>

Data are presented as mean ± SD, unless otherwise indicated
* Data not reported of 29 patients
† Some patients had more than one comorbidity

**References**

2. Luhmann, N.A., Hallens, R.J., Dassen, T. Pressure ulcers in German nursing homes and acute care hospitals: prevalence, frequency, and ulcer characteristics. Ostomy Wound Manage 2006; 52: 2, 20-33.
Results

A total of 245 patients were included. Baseline patient and wound characteristics are given in Table 1. The mean age was 82.2 ± 10.1 years and body weight was 61.3 ± 15.5kg.

The large majority of patients was immobile — that is, they were wheelchair users or chair-bound, spending regular periods resting in bed (78%), or could only walk with assistance (17%). The study population was extremely frail, with 40 patients (16%) dying during the study period. Just over half (51%) had dementia.

Most patients had grade IV ulcers (38%), followed by very similar percentages for grades II and III (25% and 26% respectively). The majority of ulcers were located on the sacrum (54%), followed by the heel (32%) and lower limb (6%).

Sixty-seven patients (27%) had been previously treated with the ONS, although specific details were not elicited.

During the study period, the average intake of the ONS recorded was 2.3 ± 0.56 servings per day, which is indicative of good concordance. This is substantiated by the fact that eight out of 10 patients did not complain about being prescribed three servings per day. In addition, 86 patients (35%) indicated excellent self-reported concordance and 115 patients (47%) very good concordance; the remaining 44 patients reported insufficient (10%) and poor concordance (8%).

An average intake of 2.3 servings of the ONS per day corresponded to 575kcal, 46g protein, 6.9g arginine, 575mg vitamin C, 87mg vitamin E and 21mg zinc.

After three weeks, the average pressure ulcer area had significantly reduced from 1580 ± 3743mm² to 1103 ± 2999mm² (p<0.0001).

After nine weeks, it was 743 ± 1809mm², which is a significant reduction of 53% when compared with baseline (p<0.0001; Fig 1).

Post-hoc analysis demonstrated that the 178 patients who had not previously received ONS showed a mean 60% reduction in pressure ulcer area after nine weeks.

Complete wound closure occurred after three and nine weeks in 16 (7%) and 49 (20%) of the pressure ulcers respectively. Figs 2 and 3 illustrate an example of a reduction in pressure ulcer area of a grade III and a grade IV ulcer.

Exudate levels also decreased following use of the nutritional intervention (p<0.0001; Mantel-Haenszel test). At baseline, they were reported as mild, moderate and severe in 54 (33%), 61 (25%) and 32 (13%) of the pressure ulcers respectively, while after nine weeks this had reduced to 81 (22%), 34 (14%) and 10 (4%) respectively.

At the end of the intervention period, 9/10 practitioners said they would continue using the ONS.

Discussion

This study showed that nine weeks of oral nutritional supplementation resulted in a significant reduction in pressure ulcer area in residents of long-term care facilities in Belgium and Luxembourg. This was accompanied by an improvement in the condition of the pressure ulcer. In addition, following the


Fig 3. A example of a grade IV pressure ulcer in a patient at baseline (a), visit 2 (b) and visit 3 (c)

With thanks to SGS Life Science Services – Clinical Research (Belgium) for providing the data management and statistical analysis. We would also like to thank Dr Carin Verduyn for critically reviewing the manuscript.

However, all of these studies had small sample sizes and short durations, reducing the generalisability of the results.

The present study has several limitations, principally that it is an open multicentre trial and not randomised or placebo-controlled. It was not controlled because we wanted to recruit a large sample that would reflect the nursing home population in Belgium and Luxembourg. We also had ethical concerns about offering a placebo to malnourished frail elderly patients. Other study limitations relate to its methodology: inter-rater reliability between centres could not be assured, exudate levels were not measured objectively, and ruler rather than planimetry was used to measure the pressure ulcer area.

However, the study strengths include:

- A much larger sample size than previous studies on the effects of nutrition on pressure ulcer healing
- The nine-week study period reflects the amount of time required, based on empirical evidence, for pressure ulcers to heal fully
- The study assessed both patient concordance and practitioners’ acceptance of the ONS.

Nine out of 10 practitioners said they would continue using the ONS as part of their pressure ulcer care regimen. Such endorsement is vital if the use of nutritional supplementation is to be integrated into pressure ulcer care. This is supported by a recent cross-sectional study of patients with pressure ulcers in 363 hospitals, nursing homes and residential care homes in the Netherlands, Germany and the UK, which showed that nutritional screening was conducted significantly more frequently in institutions with nutritional guidelines in place (p=0.001).

We hope the present study will increase awareness that supplementation of regular food intake with an ONS can help promote pressure ulcer healing. However, further evidence from more rigorous studies, as well as more case reports of patients’ and practitioners’ experiences, are needed to support this.

Pressure ulcers represent a major source of morbidity and reduced quality of life for patients and carers. Moreover, the associated pain, desolation and care burden not only have a devastating impact on patients but also consume extra nursing time and health-care resources.

Conclusion

Patient concordance with ONS is vital for the implementation of effective nutritional care as part of pressure ulcer management. In the present study, not only did the ONS help promote healing but it was also well tolerated by the frail long-term care residents, resulting in high levels of concordance. Practitioners also judged it positively. Further studies are needed to determine whether this ONS is a cost-effective, well-tolerated therapeutic intervention in pressure ulcer care.