An Aggressive Medical-Nutritional Approach to the Management of Refractory Pressure Sores

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Ageing is associated with significant changes in body composition: bone mass, lean mass, and water content all decrease, while fat mass increases. The basal metabolic rate, which is closely related to physical activity, is the principal component of total energy expenditure. Reduced basal metabolic rate in older persons reflects the loss of muscle mass resulting in decreased strength and functionality.

Acute and/or chronic diseases (often resulting from multiple pathologies) with related limitations in physical, psychological, mental, cognitive and/or social functions would contribute to loss of independence resulting in immobility. These factors compromise nutrient and fluid intake and increase the risk of under-nutrition and pressure ulcers by 74%, particularly in institutionalised and hospitalised elders. Pressure ulcers are caused by a local breakdown of soft tissue as a result of compression between a bony prominence and external surface. The severity is classified by the depth of tissue damage as stage I through stage IV. Pressure sores are associated with an increased mortality and decreased quality of life, and their absence is now regarded as an indicator for quality of patient care. On the other hand, pressure ulcers incur considerable costs associated with treatment and increased length of stay of the patient in the hospital.

Older adults are at high risk of developing pressure ulcers. 70-73% of those who develop pressure ulcers are over 65 year-old. The incidences of pressure ulcers in hospitalised elder patients and in the outpatient setting are 8.8% & 1.61% respectively. The incidence in nursing homes in Hong Kong is 25.16 %.

Malnutrition is one of the important factors for pressure ulcer development in the hospital, nursing home and also home care settings. Subjects with malnutrition have an adjusted odds ratio of 2.6 of having pressure ulcers in acute care facilities and 2.0 for residential aged care facilities. Severe pressure ulcers in terms of stage and number are associated with increases in the severity of malnutrition. The relationship has also been observed in animal models where severe protein energy malnutrition increases infection in wounds, decreases collagen deposition and reduces tensile strength in the wound healing process.

Physicians should always pay attention to the occurrence of malnutrition in an elderly patient especially in the presence of pressure sore; and offer aggressive treatment. A common mnemonic to remember the aetiology in geriatric patients is MEALS ON WHEELS referring to Table 1. However, the diagnosis of malnutrition remains in a high index of suspicion and the recognition of underlying multiple contributing factors, which should be optimised.

A clinical evaluation of malnutrition includes:
1) Dietary history and weight changes
2) Anthropometric measures
3) Biochemical index
4) Physical examination

Specific tools for screening and assessment may include:
1) Malnutrition Universal Tool (MUST),
2) Mini-Nutritional Assessment-Short Form (MNA-SF),
3) Subjective Global Assessment (SGA)
4) Short nutritional assessment questionnaire (SNAQ)

Recent guidelines from the Japan Society of Pressure Ulcers and also the European Pressure Ulcer Advisory support the role of nutrition in the pressure ulcer healing. The majority of sick elderly patients require at least 1.0-1.2 g/dl protein/kg per day and 20-30 kcal/Kg per day of non-protein energy. Some literature suggested that a slightly higher protein amount (1.5g/kg per day) should be considered in a malnourished elder to improve nitrogen balance and restore lean body mass. Restoration of body cell mass and wound healing are more difficult in elders, preventative nutritional support with adequate intake of energy; protein and micronutrients should be considered in every elderly patient.

Nutritional support, mostly in the form of high protein oral nutritional supplements, can significantly reduce pressure ulcer incidence by 25% in at-risk patients compared with standard care. Enteral Nutrition (EN, including oral and enteral routes) should always be the first choice. However, age-associated changes in the gastrointestinal tract which impair nutrient absorption, particularly during a critical illness; in patients who are unable to receive EN (e.g., uncontrollable diarrhoea, high-output fistulae, gut failure); or when EN alone cannot meet the energy and nutritional requirements (e.g. when tube feeding is poorly tolerated, the patient simply dislikes the taste of EN, or the patient cannot follow the instruction due to cognitive deficits or delirium); Parenteral Nutrition (PN) or in combination to the enteral route as Dual Nutritional Augmentation (DNA) can be recommended. Traditional Total Parenteral Nutrition (TPN) has the problems of inconvenience due to the insertion of a central catheter and the frequent associated mechanical and septic complications. Peripheral Parenteral Nutrition (PPN)
using an accessible subcutaneous vein can offer a safe, efficient and useful route for intravenous nutrition. A dual regime of EN and PPN may facilitate the healing of high grade pressure sores, despite traditional wound care such as wound dressing, antibiotic treatment and debridement having been offered in our experience. However further studies need to be conducted to confirm this effect.

Other amino acid, metabolites of amino acid, vitamin and minerals may also facilitate the wound healing process.

Glutamine enhances nitrogen metabolism and immune response. It is an important fuel source for rapidly dividing cells that is rapidly depleted in hypercatabolic patients. It functions as a fuel source for fibroblasts and epithelial cells required in the healing process.

Arginine is considered conditionally essential during critical illness because it is utilised more quickly. It functions as a substrate for protein synthesis, which is required for collagen deposition, cell proliferation, vasodilatation, immunity and T lymphocyte function and it enhances a positive nitrogen balance.

Beta-hydroxy-beta-methylbutyrate (HMB) is the metabolite of leucine. HMB helps to decrease protein breakdown.

Vitamin C is mandatory for enzymatic hydroxylation of collagen and secretion of procollagen. Vitamin C supplementation as 1000mg ascorbic acid for 1 month accelerates the healing rate and reduces the pressure ulcer area, probably by increasing leukocyte ascorbic acid concentrations compared with the placebo group. However, current evidence doses not support the routine use of vitamin C supplement in the absence of scurvy in patients with pressure ulcer.

The multidisciplinary team approach is of utmost importance in the caring of nutritional support provision in patients having severe pressure sores. The team includes physicians, orthopedic surgeons, geriatric/ wound care nurses, dietitians and preferably to have the support from pharmacists. The team requires screening of nutritional deficits, assessment the stage of pressure sore & correlations with the treatments, estimation of the amount of nutritional supplements, in particular to peri-operative wound debridement stage and identification of the most appropriate feeding route modality. Other party involvements such as catering and senior management is also vital for the success of nutritional support division. The need of on-going monitoring, evaluation and adjustment of the mode and content of nutritional supplement could be ideally achieved by excellent communication between different disciplines. The ideal nutritional chain is illustrated in figure 2.

We illustrate with a patient as followings: A 59 year-old gentleman has a background medical history of tuberculous meningitis resulting in paraplegia. He suffered from chronic pressure sores. He required repeated debridements in 1999 through 2005, and a posterior thigh flap for the pressure sore before that, in additional to traditional methods of wound dressing and antibiotic use. On presentation to us, his pressure sore was recorded (figure 1a). After 38 days of dual route of supplement, his pressure sore improved (figure 1b).

**Conclusion**

Adequate dietary assessment of dietary intake and aggressive nutritional therapy by a multidisciplinary professional team is important for pressure ulcer management. The team approach comprises the physician, orthopedic surgeon, geriatric/ wound care nurse, and the dietitian. Each discipline has a unique role in pressure sore management. They are equally important at all stages of the journey of wound healing. A dual oral and peripheral parenteral regime accelerates the healing of high grade pressure sores refractory to the traditional method of treatment. Each individual case needs to be examined and the indications for nutritional and surgical treatment tailored accordingly.
Table 1: Mnemonic "Meals on Wheels"

<table>
<thead>
<tr>
<th>Medications (e.g. Digoxin, Theophylline, Fluoxetine)</th>
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<tbody>
<tr>
<td>Emotional cause (Depression)</td>
</tr>
<tr>
<td>Alcoholism</td>
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<tr>
<td>Late life paraoxia</td>
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<tr>
<td>Swallowing problem (Dysphagia)</td>
</tr>
<tr>
<td>Oral problems</td>
</tr>
<tr>
<td>Nosocomial infections (Tuberculosis, Clostridium difficile, Helicobacter pylori)</td>
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<tr>
<td>Wandering (Dementia)</td>
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<tr>
<td>Hyperthyroidism, Hyperparathyroidism, Hypoadrenalism</td>
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<tr>
<td>Enteral Problems (Malsorption)</td>
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<tr>
<td>Eating Problems (instability to self feed)</td>
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<tr>
<td>Low salt, Low fat diet</td>
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<tr>
<td>Shopping and social problem</td>
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</tbody>
</table>

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References