

Invited commentary

Malnutrition in hospital: the case of the stroke patient

Cerebrovascular disease is common, the incidence in the UK being 1–2 per 1000, it consumes considerable health-care resources and it is a disaster for the patient. There is an important relationship between diet, nutritional status and cerebrovascular disease. Dietary excess is associated with obesity, diabetes and hypertension. These disorders promote the development of vascular disease, and there is current debate about the relative importance of micronutrient deficiency in the pathogenesis of this condition (Kritchevsky *et al.* 1995).

Nutritional factors are important in the development of cerebrovascular disease, and a cerebrovascular accident (stroke) may have an important influence on the nutritional status of the patient. A stroke can cause undernutrition due to perceptual impairment, anorexia, swallowing disorders, or limb weakness, all of which reduce the desire or the ability to eat. Unless these problems are recognized and managed effectively they lead to nutritional depletion.

Nutritional depletion has serious implications for the patient. With the normal processes of adaptation to starvation in which ketogenesis reduces the need for gluconeogenesis, the average healthy adult will survive until 30–40% of body weight is lost, usually after 60–70 days (Allison, 1995). However, death from starvation will occur earlier in patients with pre-existing nutritional depletion, and in those with intercurrent illness in whom an acute-phase response leads to cytokine-mediated tissue wasting. Furthermore, specific micronutrient deficiencies may also occur earlier; for example, neurological manifestations of thiamin deficiency in the patient with a history of alcohol abuse. Although few patients are allowed to starve to death, serious malnutrition is common, and patients with an acute stroke are at particular risk from the effects of this process. Inadequate nutrition is a cause of mental apathy (Keys *et al.* 1950), which will reduce the willingness of the patient to cooperate with their treatment. Muscle weakness and increased muscle fatiguability are early features of starvation (Jeejeebhoy, 1988). This may impede mobilization. Respiratory muscles are also involved (Arora & Rochester, 1982), and the reduction in the hypoxic ventilatory drive which occurs with starvation (Doekel *et al.* 1976), combined with the propensity to pneumonia on account of immobility and the effect of nutrient depletion on the immune system (Animashaun & Heatley, 1994), are significant risk factors for hypoxaemia which could jeopardize the viability of compromised neurological tissue. The effects of nutritional depletion have been shown to affect the outcome adversely in various clinical settings, including the recovery from fracture of the neck of femur (Bastow *et al.* 1983; Delmi *et al.* 1990), recovery from surgery (Windsor & Hill, 1988), and in critically-ill patients (Giner *et al.* 1996). The length of hospital stay is increased in nutritionally-depleted patients (Booth & Morgan, 1995).

The paper by Gariballa and co-workers in this issue of the Journal (Gariballa *et al.* 1998) addresses the subject of nutritional depletion in 201 patients who were admitted to hospital after suffering from an acute stroke. Nutritional status was measured by anthropometric measurements (BMI, arm-muscle circumference, and skinfold thicknesses) and serum albumin. The authors concluded that undernutrition was common in this population: 31% had BMI <20, 49% and 12% respectively had triceps skinfold thickness and mid-arm circumference below the 25th centile, and 19% had serum albumin levels <35 g/l. The incidence of malnutrition in this population is similar to that obtained in previous studies of hospital admissions which defined malnutrition on the basis of anthropometric measurements (Willard *et al.* 1980; Bastow *et al.* 1983; Zador & Truswell, 1987; Larsson *et al.* 1990; Cederholm *et al.* 1993; McWhirter & Pennington, 1994). A recent study of 500 patients, 100 consecutive admissions to five common specialities, demonstrated an overall incidence of malnutrition of 40%, including 43% of admissions to the Care of the Elderly unit. A deterioration in the nutritional indices occurred in 65% of the 112 patients of the 500 who remained in hospital for more than 1 week (McWhirter & Pennington, 1994). Thus nutritional depletion is common during hospital stay, even in patients without such disabilities. Not surprisingly, Gariballa *et al.* (1998) report declining nutritional indices in patients who remained in hospital at 2 and 4 weeks.

Despite what is known about the adverse effects of starvation, multiple logistic regression analysis showed that only the serum albumin measurement on admission revealed significant association with outcome in these patients with acute stroke. Many would argue that albumin concentration is not a useful nutritional marker. In patients with anorexia nervosa, albumin concentrations are maintained until the terminal phase of their illness; conversely, in the well-nourished patient who develops a severe infection the serum albumin concentrations fall due to increased vascular permeability under the influence of cytokines. Albumin is often an indicator of illness rather than nutritional status (Anderson & Wochers, 1982). The failure to demonstrate a relationship between anthropometric indices and outcome in this study does not indicate that nutritional status and diet are unimportant for these patients. Rather it is a reflection of the fact that we do not possess clinically reliable bedside measurements of nutritional status, and of the difficulty in the interpretation of outcome in stroke patients.

Anthropometry measures structure. Patients who are overweight may suffer a prolonged period of starvation before anthropometric measurements record nutrient depletion. There is evidence that functional impairment precedes structural change in the context of starvation. Muscle

weakness can be demonstrated after 5 days of fasting, and is certainly established after 2 weeks (Lenmarken *et al.* 1986; Jeejeebhoy, 1988). The increased incidence of pneumonia in post-operative patients, who were not malnourished but fasted for 5 days in the post-operative period, compared with the study group, who received immediate post-operative enteral nutrition, suggests that even temporary nutrient withdrawal from the intestinal tract may lead to a reduction in the efficacy of the immune system (Beier-Holgerson & Boesby, 1996). The only readily-available functional measurements of organ function as indicators of nutritional status, including techniques for measuring muscle power such as dynamometry and pulmonary function tests, are not suitable for the stroke patients.

Outcome measures are difficult to interpret in the stroke patient. Many patients who develop a stroke have serious coexisting disease which is the cause of death. Hospital discharge is dependent on many factors including family support and social isolation, and the suitability of the patient's accommodation in relation to their disability. Although there is reason to suppose that the failure to provide these patients with nutrition will adversely affect their recovery, there are important ethical considerations. Patients who have suffered from a devastating stroke will derive no benefit from nutritional support. The recognition of the potential for recovery, and thus the need for support, in the early phases of the disease can be difficult. Withdrawal of treatment in patients who are deriving no benefit is equally difficult. Furthermore, artificial nutrition support is often managed poorly (McWhirter *et al.* 1995). Under these circumstances any potential benefit from nutritional treatment will not be achieved, and treatment-associated complications may harm the patient.

The paper by Gariballa and colleagues highlights the problem of potential malnutrition in patients with stroke, and the fact that nutritional status may decline during the hospital stay in these patients. There is a need to determine the clinical significance of this observation in relation to outcome, and to assess the benefits of nutrition support. Meaningful information is only likely to be derived from large multicentre studies. Until the results of such studies are known, nutritional screening and nutritional support of patients thus identified as suffering from malnutrition and patients who are unable to eat may be expected to optimize outcome in acute stroke patients in whom the potential for meaningful recovery is anticipated.

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