The Long-term Nutritional Status in Stroke Patients and its Predictive Factors

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Background: Malnutrition is common in the first few months after stroke and contributes to a poor overall outcome. We analyzed long-term weight changes and their predictive factors. *Methods:* A total of 71 first-ever stroke patients were included in the study and examined (1) their weight on admission to the acute stroke unit (usual weight [UW]), on admission to the rehabilitation unit, on discharge from the rehabilitation unit, and then 1 year or more after the stroke (median time: 2.5 years), (2) the presence of malnutrition after stroke, and (3) possible predictive factors, namely, sociodemographic factors, clinical characteristics (concerning the stroke, the patient's current neurologic status and the presence of diabetes mellitus and depression), and the present nutritional state (including eating difficulties, anorexia, and changes in food intake and food preferences). *Results:* Body weight fell (4.0 kg) during the patients' stay in the stroke unit, increased moderately in the rehabilitation unit (2.0 kg), and returned to the UW by the long-term measurement. However, at the last observation, 40.1% of the patients weighed markedly less than their UW, 38.0% weighed markedly more, and 21.1% were relatively stable. Predictors of weight change were a change in preferences for sweet food products and a change in food intake. Malnutrition was frequent (47.9%) and associated with reduced food intake, residence in an institution, and diabetes mellitus. *Conclusions:* Malnutrition was highly prevalent, with an important role of change in food intake and food preferences, which could result from brain lesions and specific regimens. Living in an institution needs consideration, as its negative effects can be prevented. **Key Words:** Stroke prognosis—weight change—malnutrition—predictive factors.

Introduction

On admission to the acute stroke unit, between 8% and 20% of stroke patients are found to be already suffering from malnutrition.[1-7] The prevalence of malnutrition rises during the first weeks of hospitalization and affects up to 35%-50% of patients.[8-12] Malnutrition is an indicator of a poor outcome at 3-6 months after stroke,[3,9,13-18] and low albumin levels at admission have been identified as an independent predictor of poor outcome and higher mortality in the long term.[19]

A few studies have focused on weight changes more than 6 months after a stroke. Continuous weight loss has been reported in 2 studies,[20,21] whereas a third study reported on a gradual reduction in the initial malnutrition after admitting to a rehabilitation unit.[22] In one study,[21] eating disablement was an indicator of poor quality of life. In another study,[20] weight loss greater than 3 kg (relative to the usual weight [UW]) was observed in 66% of patients at 16 months after stroke; haemorrhagic stroke, depression, and persistent eating difficulties were found to be predictive/explanatory factors. Furthermore, this

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weight loss did not depend on the severity of neurologic impairment.

Taken as a whole, these data suggest that malnutrition is frequent, has several causes, and can contribute to a poor outcome. However, the long-term changes over time in malnutrition at 1 year or more after stroke and the relative impacts of individual and environmental factors have yet to be characterized in detail. Furthermore, the role of eating habits and food preferences has not been investigated.

The objective of the present study was thus to analyze the long-term changes over time in nutritional status (ie, more than 1 year after stroke) and identify factors that are predictive of weight changes and malnutrition after stroke.

Methods

The present study was performed between February 2009 and March 2010 in the neurologic rehabilitation units at Lille University Hospital and La Bassée and Villeneuve d'Ascq general hospitals. Adult patients (age: 20-80 years; time since stroke: 1-5 years) receiving regular follow-up after initial admission to a rehabilitation unit for first-ever stroke were eligible for inclusion. Exclusion criteria were a history of neurologic or psychiatric illness before stroke and severe aphasia (a Boston Diagnostic Aphasia Examination[23] severity score ≤3) or amnesia (with disorientation) that could impair completion of the study questionnaire. The patients provided their written, informed consent to participation. This observational study was performed in compliance with the principles of the Declaration of Helsinki, and the study procedures were approved by the French Data Protection Authority (Commission nationale de l'informatique et des libertés).

The study questionnaires were always presented to the patient. When possible, they were presented in the presence of the accompanying person to avoid possible errors. Information was confronted with the medical records during the initial hospital stay. The first concern was sociodemographic information that included age, gender, education level (coded from 0-4), residential status (coded as institution = 0, own home = 1), the presence of other people in the place of residence (absence = 0, presence = 1), and income (from <€800/month = 0 to >€2700/month = 3).

The following medical information was gathered: (1) type of stroke (infarction = 0, hemorrhage = 1) and time since stroke; (2) current neurologic status (modified Rankin Scale [MRS]: score [0-5]),[24] daily physical activity level (0-15),[25] oral treatments with possible cognitive consequences [antiepileptics, benzodiazepine, and serotonin reuptake inhibitors] [absent = 0, present = 1]); and (3) comorbidities (diabetes mellitus [absent = 0, present = 1], sadness [from never = 0 to most of time = 3], and depression (absent = 0, present = 1) according to the Mini Geriatric Depression Scale[26]).

Current nutritional status was evaluated using the Mini Nutritional Assessment Short Form,[27] together with additional questions about eating difficulties (from unaided and without difficulty = 0 to needing help = 2), dental status (from excellent = 0 to very poor = 4), swallowing disorders (absent = 0, present for either solids or liquids = 1, and present for both = 2), diet texture (from normal = 0 to liquid given by gastrostomy = 4), anorexia according to the Simplified Nutritional Appetite Questionnaire (from absent = 0 to severe = 2),[28] dietary habits (presence = 1 or absence = 0 of meat/fish and vegetables/fruits in usual meals), the number of meals per day (1-4), enjoyment of food intake (present = 1, absent = 0), perceived changes in the amount of food eaten from the time of stroke onset and changes in preferences for sweet and fatty food products (reduced = −1, similar = 0, and increased = 1), important soft drink intake (≤3 glasses per day = 0, >3 glasses per day = 1), alcohol consumption (total number of glasses of beer, wine, and other alcoholic drinks per week), and binge eating (compulsive eating with uncontrolled food intake: present = 1, absent = 0).

A blood sample taken on the day of the questionnaire was assayed for serum proteins, albumin, creatinine, cholesterol (total, low-density lipoprotein, and high-density lipoprotein), triglycerides, glucose, glycosylated hemoglobin, and hemoglobin.

The body mass index (BMI) and weight were evaluated retrospectively (from the medical observation) on admission to the stroke unit (representing the UW), admission to the rehabilitation unit 2-3 weeks later, discharge from the rehabilitation unit (3-5 months after stroke), and prospectively at the long-term examination (1-5 years after stroke, yielding the long-term weight [LTW]). The percentage LTW change after stroke was calculated as $100 \times (\text{LTW} - \text{UW})/\text{UW}$.

In accordance with the criteria published by the French National Health Authority (*Haute Autorité de Santé*),[29] moderate malnutrition was defined as weight loss of 10% or more, BMI less than 21 kg/m^2, and/or a serum albumin level less than 35 g/L and a Mini Nutritional Assessment Short Form score less than 11, and severe malnutrition was defined as weight loss more than 15%, BMI less than 18 kg/m^2, and/or a serum albumin level less than 30 g/L. The absence of malnutrition, moderate malnutrition, and severe malnutrition were scored as 0, 1, and 2, respectively.

Statistical analysis was performed using SPSS software (version 15.0; IBM Corporation, Chicago IL). Analyses of variance were performed after a rank transformation of the data. The Wilcoxon test with a Tukey correction was used for post hoc comparisons. We analyzed relationships between the change over time in weight and malnutrition and possible explanatory factors by first using the