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Original Article

Enteral tube feeding in adults with cystic fibrosis; patient choice and impact on long term outcomes☆,☆☆

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Abstract

Background: Enteral tube feeding (ETF) has been evaluated in paediatric and mixed child and adult populations with cystic fibrosis, demonstrating positive outcomes from 6 months to 2 years post insertion. No studies have examined the longer term nutritional and clinical outcomes in an exclusively adult population with cystic fibrosis or compared the outcomes for those who meet standard criteria and opt to undertake or decline ETF.
Methods: Twenty three out of 380 patients attending the Leeds Regional Adult CF unit fulfilled the standard criteria for commencing ETF (CF Trust, 2002) between 2004 and 2008. Weight, BMI, FEV_1, FVC, CFRD, and number of intravenous antibiotic treatment days were collected at 1 year pre baseline, at baseline, and at 1, 2, and 3 years post baseline for all these patients whether they accepted or declined ETF.
Results: Seventeen of the 23 patients agreed to accept a programme of ETF, two of whom died within the first year of ETF. In the remaining patients ($n = 15$), weight increased by 19.5% from baseline ($p < 0.001$), BMI increased to within the normal range and lung function stabilised. There was no reduction in the requirement for intravenous antibiotic treatment. The six patients who declined ETF had a decline in lung function and no weight gain.
Conclusion: Supplemental enteral tube feeding improves clinical outcomes when administered over 3 years, resulting in significant weight gain, a normal BMI and stabilisation of lung function. It does not reduce intravenous antibiotic treatment days. In contrast those patients eligible for, but who declined ETF, showed a deterioration in lung function and a failure to gain weight and to achieve normal BMI status.

Keywords: Cystic fibrosis; Adult; Enteral tube feeding; Outcome

1. Introduction

The positive impact of optimal nutritional status on clinical outcome and survival in cystic fibrosis is established [1,2]. Recognition of its importance has resulted in inclusion of specialist dietitians in the multidisciplinary care team and continuing improvements in nutritional status. National registry data show a median body mass index of 21.8 kg/m^2 [3] and 22.0 kg/m^2 [4] for adult patients.

Despite these advances in nutritional support 21–25% of adults remain underweight, women more than men [5,6]. The interdependence of nutritional status and lung function is apparent in both the UK CF Trust Annual data report (2010) [3] and the CF Foundation Patient Registry (2011) [4]. Patients with a BMI <19 kg/m^2, had lower lung function (FEV_1 25–60%) compared to those with a BMI >19 kg/m^2 (FEV_1 60–90%). However, 40% of adult respondents in a national survey reported problems in gaining or maintaining their weight [7]. Improvement

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in nutritional status for vulnerable sub-groups of the population is therefore an important objective.

Specific standards for the escalation of nutritional intervention guide nutritional support strategies. These recommendations advise that ETF should be considered when dietary manipulation and oral supplements have failed [8,9] and when BMI is <19 kg/m^2, or when there has been acute weight loss of 5% over a 2 month period [9]. ETF may be required in end stage disease to enable patients to achieve adequate nutritional status, an important criterion for acceptance onto lung transplantation programmes.

Whilst a number of studies have demonstrated the nutritional advantages of supplemental enteral tube feeding, these have been conducted in either paediatric populations [10–13] or mixed child and adult populations [14,15], with follow-up limited to up to 2.5 years after tube insertion. There are no studies that examine nutritional and clinical outcomes in exclusively adult populations, nor are there any studies that examine the longer term clinical impact for those patients eligible for ETF who accept or decline treatment.

The aims of this study were two-fold: firstly to examine our adherence to the guidelines for initiation of ETF, and secondly to determine the nutritional and clinical impact of up to three years of ETF.

2. Method

2.1. Participants

Electronic case records for 380 patients attending the Adult Cystic Fibrosis unit, Leeds UK, were retrospectively examined to identify all patients who fulfilled the criteria for commencement of ETF (CF Trust, 2002) between January 2004 and May 2008. All patients had pancreatic insufficiency and were treated with pancreatic enzyme replacement therapy.

The standard criteria used to identify participants were the presence of a BMI <19 kg/m^2, and/or 5% acute weight loss over a 2 month period with a failure of oral nutritional supplements to adequately improve nutritional status (CF Trust, 2002).

2.2. Measures

Age, gender, genetic mutation, presence of meconium ileus, presence of gastro-oesophageal reflux, respiratory pathogen status, the mode and reason for commencing ETF, and the time taken to accept ETF once standard criteria had been met were recorded for each participant. Anthropometric and respiratory parameters including weight (kg), height (m), BMI (kg/m^2), forced expiratory volume in 1 second (FEV_1 % predicted) and forced vital capacity (FVC % predicted) were noted at one year time intervals from 1 year prior to starting ETF, at baseline, and at one year intervals for up to 3 years. The number of days of intravenous antibiotic treatment in the year before starting ETF and in each succeeding year of the study was documented.

Weight change was calculated by comparing weight at each time point to baseline weight and then calculating the percentage weight change achieved. Similarly this was undertaken for change in lung function.

Participants were classified into 3 categories according to weight change from baseline to 3 years. These were weight loss (any loss), weight maintenance (zero change) and weight gain (categorised into those gaining <1 kg/m^2, 1–3 kg/m^2 and >3 kg/m^2). The category of weight gain was documented at each of the time intervals from year 1 to year 3. Data were also recorded to demonstrate the proportion of patients achieving a BMI of 20 kg/m^2.

The presence of cystic fibrosis related diabetes (CFRD), complications of ETF, and mortality were documented annually. We also examined the relationship between baseline lung function and % weight change at 1 and 3 years, applying a cut-off of 45% FEV_1 (% predicted) at 3 years, to examine whether longer term nutritional gain is achieved at lower levels of lung function. The cut-off value of 45% FEV_1 (% predicted) was chosen according to the mean value reported in previous studies in CF, above and below which there is an association with clinical outcome in ETF [11,22]. Mortality data were analysed to compare any differences in presentation of patients who died with those who survived.

In those patients who declined ETF the same measures were recorded at the point where the standard criteria for starting ETF were met and at annual intervals for 3 years.

All patients consumed a polymeric 2 kcal/ml enteral tube feed, providing 20–60% of daily energy intake as an overnight enteral tube feed, allowing free dietary intake during the day.

2.3. Exclusion criteria

Exclusion criteria were classified as the presence of pancreatic sufficiency, pregnancy or lung transplantation during the 3 year follow-up period.

2.4. Ethical approval

Ethical approval was stated as not required by Leeds East Medical Ethics committee (2009) for this retrospective case note review.

2.5. Statistical analysis

Data were analysed for normal distribution. Descriptive statistics were used to evaluate the demographical characteristics for all patients opting to undertake or decline enteral tube feeding. Unpaired *t*-tests (2 tailed) were used to compare anthropometric data and lung function between those who opted to undertake or decline ETF. Pearson's Chi^2 test was used to compare proportions between the two groups.

Any mortality data were then excluded from the analysis and analysed separately. In participants surviving to 3 years, longitudinal effects of enteral tube feeding upon weight gain, BMI, pulmonary function (FEV_1 and FVC) and days of intravenous antibiotic treatment in each treatment group were evaluated using ANOVA (repeat measures) to explore the differences over time between the two groups over the 3 year time period and paired *t*-tests (1 tailed) for comparison between successive years. The percentage of patients achieving standard norms for nutritional