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Enteral feeding in neurological disorders

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Abstract

Malnutrition and weight loss, due to suboptimal oral intake, are common in patients with neurological disorders, and associated with increased morbidity, disability and mortality. The nutritional management of neurological patients is crucial and enteral feeding is a commonly used intervention to provide nutritional support. This review presents the different methods of enteral tube feeding and discusses its practice and efficacy in terms of clinical outcomes in the context of motor neurone disease; Parkinson's disease; Alzheimer's disease and other dementias; and stroke.

Keywords

Neurological disorders, gastrostomy, enteral feeding, nutritional management

Introduction

Malnutrition

Malnutrition is a very common problem in patients with neurological disorders, such as stroke[1] motor neurone disease (MND);[2] Parkinson's disease (PD);[3] Alzheimer's disease and other dementias.[4] The cause of malnutrition in these patient groups is multifactorial, including suboptimal dietary intake (due to dysphagia, lack of appetite, reduced mobility, requirement for an unpalatable diet, sensory-specific satiety, reliance on others , and physical difficulties in preparing and consuming food); increased metabolism; physical exertion; and other co-morbidities affecting metabolic status.[5 6] The consequences of malnutrition can be severe, as multiple bodily functions are affected [7] and underlying diseases may be exacerbated.[5] For many patients a sustained decline in nutritional status leads to weight loss; fatigue; reduced muscle strength; metabolic/endocrine changes; impaired cardiovascular and respiratory function; shortened survival rates; increased susceptibility to, and delayed recovery from, infections; increased risk of pressure ulcers; and poor wound healing.[5 7] Alongside physical complications, malnutrition has also a detrimental psychological impact, and can lead to apathy, depression, anxiety and self-neglect.[7]

The management of nutritional status is, consequently, a major aspect of the multi-disciplinary care provided to patients with these disorders. Several approaches are available for the nutritional care of neurological patients.[8] Regular screening of nutritional status, dietary

advice, food fortification, introducing dietary variety and modification of texture, use of adaptive eating utensils, and oral nutritional support (ONS) are commonly employed strategies to help patients, who can safely swallow, to maintain an adequate dietary intake.[6 9 10] However, when disease symptoms critically impair oral intake, artificial nutrition support in the form of enteral tube feeding (ETF) or parenteral feeding becomes necessary. The focus of this review is primarily concerned with aspects of enteral tube feeding in patients with stroke, MND, AD and PD.

Enteral tube feeding

Enteral feeding via a tube can provide nutritional support in patients who cannot consume an adequate caloric intake or for whom oral intake is unsafe and contraindicated, e.g., due to unsafe swallow, but who have a functional gastrointestinal tract.[11 12] Several options of enteral tube feeding exist, allowing the delivery of liquid feeds to the stomach with the use of nasogastric tubes (NGT) or gastrostomy tubes; the latter being placed with endoscopical, radiological and surgical techniques.[13] A Cochrane review comparing gastrostomy feeding following endoscopic tube placement versus nasogastric feeding, for adults with swallowing difficulties, demonstrated that the latter were associated with a higher rate of intervention failure.[14]

Post-pyloric enteral access to the duodenum or jejunum is also possible, but technically challenging and less common, and is usually reserved for patients in whom gastric feeding is contraindicated, e.g., due to severe gastroesophageal reflux disease, gastrosparesis, altered anatomy, gastric outlet syndrome, gastric fistula, or high risk of aspiration pneumonia.[11 15 16] A Cochrane review comparing gastric versus post-pyloric tube feeding suggested a benefit for the latter in terms of delivering a greater amount of nutrients and in decreased pneumonia rates in severely ill patients; however, current evidence is limited.[17]

Nasogastric tube (NGT)

The placement of a small-bore nasogastric tube (5-8 French gauge) through the nasal cavity to the stomach is a relatively easy and quick way to achieve enteral feeding. It is commonly performed on the ward and remains the method of choice over a short-term period, i.e., 4-6 weeks.[18] Care has to be taken to check the correct placement to prevent delivery of feed into the lungs. NGT feeding is also not suitable for patients requiring long-term enteral feeding as tubes are associated with poor aesthetics; nasal discomfort; frequent gastroesophageal reflux; blockage; and can be accidentally pulled out or migrate causing aspiration.[19] The chances of the latter can be reduced by bridling.[20]

Gastrostomy insertion methods

Percutaneous endoscopic gastrostomy (PEG)

PEG is considered the gold standard for the placement of a gastrostomy tube, which is pulled down through the oesophagus, stomach and then the abdominal wall. Normally, it is a relatively easy and quick procedure, performed under endoscopic guidance using conscious sedation.[21] It allows the oral insertion of large-bore gastrostomy tubes (15-28 French gauge), which are

securely fixed with a bumper-retention system (see Figure 1); thus, minimising the risk of tube migration or blockage.[22] The use of non-invasive ventilation (NIV) during PEG for patients requiring respiratory support, is possible[23] but impractical in many cases, and thus less common, as it is technically challenging requiring the presence of more skills.

Radiologically inserted gastrostomy (RIG)

RIG, also known as percutaneous radiological gastrostomy (PRG), is a well-established alternative to PEG. It is performed under fluoroscopic guidance, using local anaesthesia, and involves the insertion of a gastrostomy tube into the stomach from the outside through an enlarged track in the abdominal wall (see Figure 1). RIG does not require endoscope use nor conscious sedation; and the use of NIV, for the respiratory support of patients who require it, is easier. However, with RIG, gastropexy is necessary and the tubes placed are usually relatively narrow (10-14 French gauge), with a balloon-retention system, making them prone to blockage, displacement and dislodgement.[24 25]

Per-oral image-guided gastrostomy (PIG)

PIG is a relatively new, modified technique for per-oral gastrostomy tube insertion under fluoroscopic guidance. It is a hybrid of PEG and RIG as it requires minimal conscious sedation or local anaesthesia; NIV use is possible if necessary; and allows the insertion and secure placement of robust large-bore tubes same with those used during PEG. However, PIG is a more complex procedure requiring more skills.[24 25]

Surgical gastrostomy

Surgical insertion of gastrostomy is not very common (especially in neurological patients) and is the method of last resort for patients in whom other methods of gastrostomy are unsuitable or have previously failed. It requires general anaesthesia, operating room and post-anaesthetic facilities.[19]

Parenteral feeding

Central parenteral nutrition (CPN), also known as total parenteral nutrition, is administered intravenously and is an alternative to enteral tube feeding; however, the latter remains the method of choice for patients with functioning gastrointestinal tracts.[26 27] CPN, can be used either for short or prolonged periods of time, and is indicated for patients with chronic gastrointestinal tract dysfunction or in whom the gastrointestinal tract is not accessible.[16 27] Long-term home parenteral nutrition (HPN) is usually delivered via a tunnelled central venous catheter or, alternatively, through an implantable port.[28] There is currently insufficient evidence to determine the efficacy of HPN in patients who are either severely malnourished or have highly catabolic disease processes.[12] Although NICE guidelines indicate that HPN should be considered for patients who are either malnourished or at high risk of malnutrition,[29] this is a very complex and expensive treatment requiring greater healthcare support from experienced nutritionist teams. Furthermore, HPN is associated with complications such as catheter-related sepsis and venous thrombosis; metabolic and vascular disorders; decreased patient quality of

life; and is also unsuitable for patients who cannot cope with the increased difficulties of maintaining their lines an infusions.[19 28]

Enteral feeding in motor neurone disease

MND causes progressive weakness and wasting of muscles controlling movement, breathing and swallowing due to a degeneration of motor neurones.[30] MND is the third commonest adult onset neurodegenerative disorder[31] with an incidence in the UK of 2.6 per 100,000 person-years in women and 3.9 per 100,000 person-years in men.[32]

Dysphagia can present relatively early on in the disease course in patients with bulbar onset symptoms and can affect at least two-thirds of all patients over the course of their illness.[10] Dysphagia is the single most important reason of reduced oral intake in patients with MND and, in an advanced stage, is associated with nutritional decline, dehydration, weight loss, choking and coughing on attempting to swallow, frequent aspiration, and prolonged and effortful mealtimes affecting both patients, and their informal carers.[10 33] Gastrostomy feeding is a well-established practice for the nutritional support of patients with advanced dysphagia[8 34] and is recommended by the American Academy of Neurology (AAN)[35] and the European Federation of Neurological Societies (EFNS).[36]

Practice in relation to choice of method and timing of gastrostomy insertion is diverse and largely based on consensus and expert opinion.[37] Factors that influence clinical decision-making include the availability of gastrostomy service; respiratory function of the patient; anatomical issues contraindicating the use of a specific method; overall patient clinical condition; previously failed gastrostomy insertion with a specific method; and clinician perception of post-insertion tube and patient management.[37] PEG, RIG and PIG are the main methods of gastrostomy insertion for patients with MND. There is a clear clinician preference to use the endoscopic procedure for patients with good respiratory function (FVC>50% of predicted) and who are predicted to tolerate endoscopy (i.e., able to lie flat and receive sedation). The radiological methods are preferred for patients with moderate to severe compromise of respiratory function (FVC<50% of predicted).[37 38]

A recent large UK-based prospective study of 345 patients with MND (ProGas) demonstrated that PEG, RIG and PIG were as safe as each other in relation to procedure risk. Overall mortality was independent of gastrostomy method but driven by disease progression; after adjustment for confounding variables (such as age at onset of MND, weight loss, functional decline rate, FVC and site of MND symptom onset) and treatment centre.[38] ProGas indicated that PEG is the optimum method of gastrostomy in patients with generally unimpaired respiratory function and PIG when respiratory function is significantly compromised. Both PEG and PIG methods allow the placement of robust large-bore tubes with significantly lower complications than those inserted with RIG. The complications for RIG-inserted, balloon-retention tubes were displacement (31%), leakage (21%), replacement (30%) and repeated gastrostomy (15%), compared to (1%), (10%), (3%), and (1%) for PEG or PIG-inserted bumper-

retention tubes, respectively. Avoidance of these complications is crucial for patients with MND who, with disease progression, become increasingly frail and disabled.[38] An alternative type of a RIG-inserted tube with an improved mushroom-cage retention system is also available which may have an improved complication rate.[39]

The effectiveness of gastrostomy feeding on disease outcome in relation to survival, nutritional status and quality of life is inconclusive. In terms of survival, no RCTs comparing gastrostomy feeding with continued oral feeding exist;[40] however, evidence from observational studies, albeit limited, demonstrate an advantage for enteral feeding.[41-44] Likewise, the existing evidence from observational studies suggesting that gastrostomy feeding leads to improved quality of life for patients with MND[41 45] is weak.[40] ProGas suggested that the effect of gastrostomy on patient quality of life was neutral; however, it revealed a significant increase in the strain of informal carers of patients.[38]

It is a commonly shared belief amongst Neurologists that gastrostomy can stabilise nutrition and hydration of patients with MND.[37] However, the effect of gastrostomy feeding on the nutritional status of patients with MND has not been rigorously studied.[40] A number of small prospective cohort and case-control studies had pointed towards a nutritional advantage of gastrostomy feeding compared to non-gastrostomy feeding.[41 46] On the other hand, ProGas revealed that at 3 months following gastrostomy, approximately 75% of the patients in its cohort continued to lose significant weight, or made gains of less than 1 kg, and in only 25% were significant gains of more than 1 kg made. The reasons behind this surprisingly poor nutritional outcome are unclear. It may be due to disease progression with muscle atrophy causing largely loss of fat free mass; patient factors such as feed tolerance; feeding logistics (e.g., personnel to assist with feed and lack of time to give feed); lack of knowledge regarding feeding in patients, carers or health care professions; or incorrect calculation of calorie requirements. There is a need to understand the nutritional management of patients with MND who are receiving enteral feeding and why at present enteral feeding in this patient group is not having the desired outcome. An interesting development in the area of nutritional management in ALS has been the increasing recognition of hypermetabolism in patients,[47] and that high calorie feeding may convey a survival benefit.[48 49]

Both AAN and EFNS recommend an individual approach in relation to timing of gastrostomy in patients with MND. AAN advises PEG insertion when there is significant dysphagia or weight loss and before FVC falls below 50% of predicted;[35] and EFNS when weight loss is greater than 10% from premorbid weight.[36] These are consensus recommendations rather than evidence based. In practice, current clinical decision-making in relation to when is best to offer gastrostomy to patients with MND, is based less on objective criteria such as falling BMI and weight loss, but more on patient-reported criteria such as extended, effortful and difficult mealtimes.[37] Patients are often understandably reluctant to undergo a gastrostomy insertion.[50] Psychological and psychosocial factors heavily influence their decision;[50 51] a key one being whether they are still deriving pleasure from oral intake, in

the presence of increasing swallowing and eating difficulties.[52] As a result of the psychological factors and uncertainties about the potential benefits of gastrostomy feeding, there is a tendency for gastrostomy insertion to occur at a relatively late stage of the disease.[53] However, results from recent prospective studies suggest that gastrostomy should be performed as early as possible[38 48]. Delay of gastrostomy until after weight loss of more than 10% is associated with shortened survival and conveys little benefit in terms of weight gain or stabilisation. Therefore, from a safety and efficacy perspective, it is recommended that gastrostomy is considered early at a threshold of 5% weight loss, compared to weight at diagnosis.[38]

Enteral feeding in Alzheimer's disease and other dementias

Alzheimer's disease (AD) is the most common adult onset neurodegenerative disorder[31] accounting for just over 60% of all cases of age-related dementia.[54] Other types of dementia include vascular dementia, mixed dementia, dementia with Lewy bodies, and fronto-temporal dementia.[31 54] Malnutrition and weight loss in AD and other dementias are multifactorial. Important factors include memory loss; difficulty in planning and carrying out everyday tasks; problems with language; confusion with time or place; hallucinations; fluctuations in mood or behaviour; sleep disorders; apathy; anorexia; depression; swallowing difficulties; gait impairments; and loss of independence[56]. Malnutrition is associated with aggravated cognitive decline; shortened survival; and reduced quality of life[4]. It is estimated that an 86% of all patients with advanced dementia experience feeding difficulties (e.g., due to dysphagia, physical inability to prepare meals, loss of appetite, refusal to eat). Assisted oral feeding and enteral tube feeding are the two main options for managing patients with persistent eating problems[57]. Assisted oral feeding may include hand feeding, verbal cueing, food texture modification and flavour enhancers, and eating encouraging environments[58]. A systematic review of observational studies concluded that there was insufficient evidence to support that assisted oral feeding is beneficial in terms of clinical outcomes[59]. However, these methods may be useful as a means of palliation, allowing patients to partake in the important function of eating and sharing meals, continue enjoying food, and socially interact with their carers[57].

The decision to initiate enteral feeding in patients with advanced dementia is challenging and controversial. A review of the clinical evidence on the effectiveness of enteral tube feeding in this patient group identified no direct data to suggest a benefit of this intervention in terms of extending survival; reducing the risk of aspiration pneumonia; reducing infection; and improving the functioning status[60]. Similarly, a Cochrane review of observational studies, in the absence of RCTs, acknowledged that there was insufficient evidence to suggest an advantage of enteral feeding compared to non-enteral feeding in terms of survival; quality of life; nutritional status; physical functioning; prevention and healing of pressure ulcers; and behavioural and psychiatric symptoms of dementia[61]. A recent large prospective cohort study of nursing home residents with advanced dementia, demonstrated that, after adjustment for potential selection and treatment effect bias, enteral tube feeding did not improve survival in this population. In addition, there was no difference between enteral tube insertion in an earlier

or a later stage in the course of the disease in relation to survival outcome[62]. The lack of evidence to suggest a positive correlation between enteral tube feeding was also recognised in two recent reviews of observational studies[63 64]. The risks of enteral feeding in patients with advanced dementia are related to procedural complications, post-insertion tube management (e.g., blockages and dislodgements), and the tendency of cognitively impaired patients to interfere with the tube (e.g., by pulling the tube out)[57].

Current NICE guidelines recommend that patients with dementia should receive specialist assessment and advice in relation to swallowing and feeding, highlighting the importance of patients being encouraged to keep up with an oral dietary intake for as long as possible. Short-term enteral tube feeding should be considered if the problems with eating are thought to be temporary. General use of enteral feeding in patients with severe dementia is not recommended if dysphagia or disinclination to eat is a manifestation of disease severity. Clinical decision-making in relation to withholding or withdrawing nutritional support should adhere to existing ethical and legal principles at all times.[65] The European Society of Parenteral and Enteral Nutrition (ESPEN) recommend an individual approach in the decision to initiate enteral feeding in patients with dementia, taking into account the general prognosis and patient wishes. Parenteral nutrition is only recommended in patients with mild or moderate dementia requiring short-term enteral feeding when tube placement is contraindicated or not tolerated. Artificial nutrition is not recommended in the terminal phase of life of patients with dementia[66].

Enteral feeding in Parkinson's disease (PD)

Parkinson's disease (PD) is the second most common adult onset neurodegenerative disorder,[31] with an incidence of 84 per 100,000 person-years for people aged over 50 years in the UK.[67]

Dysphagia is frequent in PD with an estimated 80% of all patients being affected over the course of the disease.[68] In the early stages dysphagia can be asymptomatic [69]; however, with disease progression it can pose serious clinical challenges. [70] Patients with advanced dysphagia are prone to choking (up to 50% report choking in attempts to swallow), [71] and aspiration, which increases the risk of pneumonia, a main cause of death in late-stage PD.[72] Dysphagia, together with increased physical, cognitive and psychological impairment as the disease progresses, contributes greatly to a reduced oral nutritional intake. This, in combination with gastrointestinal dysfunction and increased energy expenditure (e.g., due to involuntary movements and rigidity) can lead to malnutrition and weight loss;[73] with the latter being associated with poor clinical outcomes, increased morbidity and mortality.[74] Moreover, dysphagia can affect the pharmacological management of PD as it causes problems in the oral administration of medication, which in turn may exacerbate the disease.[3]

Currently, there is no evidence on the effectiveness of interventions, such as enteral feeding in PD, on the improvement of the nutritional status, quality of life or survival of patients with PD.[3] Guidance from the National Collaborating Centre for Chronic Conditions (NCC-CC), on

behalf of NICE, recommends an individual approach for the management of problems associated with eating and swallowing in patients with PD, with the aim to anticipate and prevent complications where possible. The consensus of the NCC-CC expert panel was that for the management of dysphagia, NGT can be used as a short-term solution to provide an alternative route of medication administration; and gastrostomy feeding can be used for the long-term nutritional support of patients with PD.[75]

Enteral feeding in stroke

Stroke is a serious life-threatening acute event with chronic neurological consequences. Although in the UK its incidence has declined between 1999 and 2008 by nearly 30%, it remains a main cause of morbidity, disability and mortality.[76] Following a stroke, patients experience a range of physical, cognitive and emotional problems, including mobility and balance impairment; pain; vision impairment; tiredness and fatigue; dysarthria; dysphagia; memory impairment; depression; anxiety; and behavioural changes.[77 78] Stroke patients who lose the ability to maintain a safe and adequate oral intake are at increased risk of nutritional decline, which is associated with increased mortality; longer hospitalisation; higher rates of pressure ulcers; and increased rates of urinary and respiratory tract infections.[1] Enteral feeding is commonly used in patients following a stroke in order to establish an alternative route of nutrition, hydration and medication.

The available evidence about the effectiveness of enteral feeding on patients following a stroke mainly focuses on the use of NGT and PEG feeding. There are currently no studies looking into the effect of other methods of initiating enteral feeding, e.g., RIG or PIG.[78] A large multi-centred randomised clinical trial, called Feed or Ordinary Diet (FOOD), examined the aspects of optimal timing and method of enteral feeding in patients following a stroke in relation to survival and clinical outcomes.[79] In terms of timing, the results suggested that early initiation (i.e., in <7 days) of enteral feeding was associated with a decreased risk of death at 6 months, compared to late initiation (i.e. in >7days); although, those who survived in the early initiation group were more likely to experience more severe disability.[79] A recent systematic Cochrane review of five RCTs (including the results from the FOOD trial), which compared PEG versus NGT feeding in patients following a stroke, demonstrated that PEG and NGT feeding were equivalent in terms of case fatality, dysphagia, weight and death or dependency at the end of the trial; institutionalisation; length of hospital stay; and chest infection or pneumonia. The results from the meta-analysis concluded, although with caution due to the heterogeneity of the studies, that there was no clear advantage of PEG over NGT feeding and that survival may be increased if enteral feeding is initiated earlier.[80]

In the UK, NICE guidelines recommend that following an acute stroke the decision to initiate a patient on enteral feeding should be taken within 24 hours of admission, only for those who cannot maintain a safe and adequate oral intake. NGT feeding is preferred but if patients cannot tolerate the nasogastric tube a nasal bridle tube or gastrostomy tube should be

alternatively considered. Assessment of nutrition and hydration should be performed on admission and frequently repeated for inpatients, by an expert team of healthcare professionals who should provide advice and support on an individual basis.[81]

Summary

The nutritional care of patients with neurological disorders such as stroke, MND, PD and dementia is important, as these patients are at an increased risk of nutritional decline, and subsequent increased morbidity, disability and mortality. Dysphagia is a common denominator in these disease groups hindering an adequate dietary intake. In the UK, enteral tube feeding is recommended, and commonly used (with the exception of patients with advanced dementia), as an alternative way to provide patients with nutrition, hydration and medication. However, the effectiveness of this intervention on nutrition, quality of life, survival and other disease-related outcomes is largely unproven for these diseases (with the exception of stroke where an advantage on survival has been indicated). Where disease-specific guidelines exist these are frequently based more on consensus among panels of healthcare professionals. As a result, the clinical decision-making for enteral feeding initiation is complex and often ethically challenging. In the absence of a robust evidence base, neurologists recommend what would be best for their patients, taking into account their clinical experience; patient condition and personal circumstances; and the wishes of patients, and family members who frequently act as proxy carers.

Enteral feeding is frequently recommended in the hope that it will stabilise nutrition and hydration; however, emerging evidence from the field of MND that gastrostomy insertion does not actually avert further weight loss in a large proportion of patients, is surprising and may have implications for clinical practice. The reasons behind this poor nutritional outcome are unclear and require further investigation. In terms of timing of enteral feeding, there is evidence from research on patients with MND, that delay of gastrostomy yields diminishing benefits in terms of survival and nutritional outcomes. Likewise, early initiation of enteral feeding in patients following a stroke has been associated with improved survival rates. In terms of the optimal method of enteral feeding, there is reliable evidence in stroke to suggest that NGT feeding has advantages over PEG feeding. In patients with MND, NGT feeding is not a viable choice in the long-term and gastrostomy feeding is preferred. For those having a gastrostomy tube large-bore bumper-retention tubes are optimal, in terms of post-insertion complications, compared to balloon-retention gastrostomy tubes; and consequently, the methods allowing placement of the former (i.e., via either PEG or PIG) should be favoured.

Despite the relative lack of evidence on its efficacy, enteral feeding remains a common intervention in patients with a number of neurological disorders. It seems unlikely that if enteral feeding as an intervention was introduced today, that it would gain such widespread acceptance, without a more robust evidence base. There is therefore now a need to understand the effect of

enteral feeding on key outcomes such as nutritional status, quality of life, disease course and carer burden.

Key points

- Patients with stroke, MND, PD, and AD are at an increased risk of malnutrition, and subsequent weight loss, which are associated with increased morbidity and mortality.
- Enteral feeding, via a nasogastric or gastrostomy tube, is commonly used in neurological patients with difficulties in maintaining an adequate oral dietary intake.
- The effectiveness of enteral tube feeding on nutrition, quality of life, survival and other disease-related outcomes remains largely unproven.
- Existing evidence in stroke and MND suggests that early initiation of enteral feeding is associated with improved outcomes.
- Existing evidence in MND suggests that PEG or PIG-inserted gastrostomy tubes are associated with easier tube management and less complications, compared to RIG-inserted gastrostomy tubes.
- The clinical decision to recommend enteral tube feeding is complex. Existing guidelines are mainly based on expert consensus rather than robust evidence. RCTs could provide definitive answers but in most cases would be unethical or impractical to perform. However, large prospective multi-centre studies could be useful and are needed.
- Enteral tube feeding remains a useful tool of alleviating feeding difficulties; however, other ways of palliation should also be considered, especially for late-stage patients.

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