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Review

Nutrition therapy in the optimisation of health outcomes in adult patients with moderate to severe traumatic brain injury: Findings from a scoping review

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ABSTRACT

Introduction: Patients who have sustained traumatic brain injury (TBI) have increased nutritional requirements yet are often unable to eat normally, and adequate nutritional therapy is needed to optimise recovery. The aim of the current scoping review was to describe the existing evidence for improved outcomes with optimal nutrition therapy in adult patients with moderate to severe TBI, and to identify gaps in the literature to inform future research.
Methods: Using an exploratory scoping study approach, Medline, Cinahl, Embase, CENTRAL, the Neurotrauma reviews in the Global Evidence Mapping (GEM) Initiative, and Evidence Reviews in Acquired Brain Injury (ERABI) were searched from 2003 to 14 November 2013 using variations of the search terms 'traumatic brain injury' and 'nutrition'. Articles were included if they reported mortality, morbidity, or length of stay outcomes, and were classified according to the nature of nutrition intervention and study design.
Results: Twenty relevant articles were identified of which: 12 were original research articles; two were systematic reviews; one a meta-analysis; and five were narrative reviews. Of these, eleven explored timing of feed provision, eight explored route of administration of feeding, nine examined the provision of specific nutrients, and none examined feeding environment. Some explored more than one intervention. Three sets of guidelines which contain feeding recommendations were also identified.
Discussion: Inconsistency within nutrition intervention methods and outcome measures means that the present evidence base is inadequate for the construction of best practice guidelines for nutrition and TBI. Further research is necessary to elucidate the optimal nutrition therapy for adults with TBI with respect to the timing, route of administration, nutrient provision and feeding environment. A consensus on the ideal outcome measure and the most appropriate method and timing of its measurement is required as a foundation for this evidence base.

Contents

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Introduction

Traumatic brain injury (TBI), defined as an alteration in brain function or brain pathology resulting from an external force, is a pressing public health issue, with the World Health Organisation estimating that TBI will be the most prevalent cause of death and disability globally by 2020 [1–3]. An estimated 10 million cases of moderate to severe TBI (leading to mortality or hospitilisation), occur worldwide each year [3]. Interventions that aim to enhance and improve the speed and extent of recovery from head injury are needed.

Nutrition-based interventions have the potential to enhance recovery and was identified by the Brain Trauma Foundation in 2007 as a priority research area and one of the 15 key intervention types likely to influence outcomes in TBI patients [4]. *Nutrition support* is defined as the provision of additional nutrition via the parenteral (non-gastrointestinal route direct to the blood stream), or enteral route (via the nasal route using a nasogastric, nasoduodenal, or nasojejunal tube, or directly through the abdomen using a gastrostomy, gastrojejunostomy, or jejunostomy feeding tube) [5]. *Nutrition therapy*, which also includes the oral route, goes beyond nutrition support as a component of medical treatment aimed at maintaining or restoring optimal nutrition status and health [5]. In addition to the usual difficulties associated with the provision of nutrition therapy to critically-ill patients, optimal nutrition therapy in patients with moderate to severe TBI is made more complex by some unique physiological challenges.

Post-TBI, metabolic changes result in an increase in energy requirements that can vary between 87% and 200% above usual values, extending up to 30 days post-injury [6]. This hypermetabolic response is thought to result from an increased production of corticosteroids, counter-regulatory hormones such as epinephrine, norepinephrine and cortisol, and pro-inflammatory mediators and cytokines such as interleukin-1 (IL-1), IL-6, IL-12, tumour necrosis factor-alpha (TNF-α), and interferon-gamma [7–10]. Whether these inflammatory markers can be used diagnostically to predict the influence of specific interventions on long-term outcomes is yet to be determined, but markers that correlate with the severity of disease and demonstrate prognosis are being sought [8,11]. Hypermetabolism can lead to the hypercatabolism of macronutrients, resulting in negative nitrogen balance, and substantially increased energy and protein requirements [6,12,13]. Hypercatabolism coupled with immobility can lead to an increased risk of malnutrition in the severely ill [14]. Nutritional requirements are further elevated by wound healing in cases of TBI with multitrauma [15]. In one of the few studies on this topic, Krakau and colleagues demonstrated that approximately 68% of patients show signs of malnutrition within two months of head injury [16]. Dhandapani and colleagues showed that malnutrition has undesirable consequences with poor Glasgow Outcome Scale (GOS) at six months post-injury [17].

The difficulties in meeting increased nutrition requirements in TBI may be compounded further by dysphagia, gastrointestinal intolerance due to gastroparesis, fasting pre-surgery, and medication complications [6,18,19]. Post-traumatic amnesia, a state of altered consciousness associated with the recovery process, often results in inadvertent removal of feeding tubes and food refusal [12]. In many hospitals, nursing staff lack the capacity to provide the amount of assistance sufficient to ensure that the most difficult TBI patients get the nutrition they need [20,21].

Although it is clear that increased nutrition is required following TBI, it is less evident which aspects of nutrition therapy lead to better outcomes. A systematic review of publications between 1993 and 2003 [22] examined the evidence for effects of different timing, content, and method of administration of nutritional treatment on early and long-term clinical outcomes in patients with moderate to severe TBI. The reviewers concluded that the evidence base for determining the effect of nutrition support is insufficient, particularly in the post-injury phase [22]. Three other systematic reviews [23–25] on nutrition therapy in TBI were published in 1996, 2000, and 2002 however these have since been updated [26,27], but not synthesised. Since these reviews were published, the influence of nutrient delivery in TBI, specifically immunonutrients, has emerged as an area of scientific interest. The extent of research and best practice with regards to nutrient provision in TBI is unknown, and questions regarding optimal timing of introduction of feeding, rate of achievement of nutrient targets, method of nutrient delivery, and feeding environment, remain.

The aim of the current scoping review was to summarise the current literature in the area of nutrition therapy and TBI, and to investigate the influence of nutrition therapy on outcome measures of mortality, morbidity (measured using Glasgow Coma Scale (GCS), Glasgow Outcome Scale (GOS), Acute Physiology and Chronic Health Evaluation II (APACHE II)), and length of hospital/intensive care unit (ICU) stay, most commonly collected in the moderate to severe TBI population. The objective of the scoping review was to address the impact of four areas of nutrition therapy: (1) timing of feed provision; (2) route of administration of feeding; (3) the type of nutrients provided, including immunonutrients; and (4) the feeding environment.

Methods

Scoping reviews aim to identify and describe evidence in broad topic areas, such as nutrition therapy following TBI, that encompass a range of interventions and outcome measures. Like systematic reviews, they should include a comprehensive search