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Review Article

Role of Nutrition in Head Injury Patient

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Abstract

Head injury is an important public health problem with high morbidity and mortality. Till recently no significant was attached to nutrition. Nutritional management is important for the patient of severe head injury with coma there is negative nitrogen balance high catabolic state, unless properly managed patients rapidly lose weight and develop of protein, calorie, malnutrition, which reduces the chance healing and increases the risk of complication. In this write up we have highlighted the importance and positive role of nutrition in patient of head injury. We hope this must be understood by the clinicians and incorporated in the management protocol.

Keywords: Nutrition; Head Injury

Introduction

Traumatic brain injury is the most common cause of death and disability In young people [1]. Monitoring of nutritional status in patients of TBI is vital, as it can guide us towards better nutritional management. Numerous studies have reported the changes in biochemical measure like, blood glucose, and serum albumin in patients of TBI. Pedal edema emerged as more significant with respect to neurological outcome. These may act as valuable markers of adequacy of nutritional replacement in future studies [2-4]. Recognizing the role of nutrition in maintaining optimal mental and physical condition, the military has long been given importance ensuring adequate nutrition. Nutritional support is an integral component of the care of critically injured patients. Any injury to the brain, the main centre for receiving and processing information and response, results in a complex disease or condition. Head injury as a traumatically induced structural injury or physiological disruption of brain function resulting from an external force that is indicated by new onset or worsening of symptoms involving level of consciousness, memory, mental or neurological states. The importance of nutrition not only to augment overall defensive mechanisms against the effects of traumatic brain injury but also as post injury effects of traumatic brain injury (TBI). However, unfortunately very often nutritional aspect in often neglected.

After a severe or moderate head injury, patients needs more energy as their body's metabolism work at a great role. This increases nutritional requirements for the patients. Many a time they are often unable to meet the increased nutritional requirements for which it leads to to malnutrition.

Metabolic Change In Head Injury Patients with severe head injury have a disruption in metabolic and homeostasis that includes increased energy expenditure and increased protein metabolism [5]. Protein with severe head injury results increased muscle efflux of amino acids. Lack of nutrient supplementation in this patients is associated with increased mobility and mortality. Clinically brain metabolism changes in patients with TBI and these changes are often assessed a few to several days after trauma.

Nutrition status indicators

The purpose of the nutritional screening rapidly identify the patient with highly nutritional risk. Changes to the nutritional status of the patients are: weight, BMI, adequacy of food intake and subjective global assessment nutritional tools through SGA medical history, (weight changes, poor dietary intake, gastrointestinal symptoms and physical examination (muscle wasting, subcutaneous fat loss and edema). BMI is calculated by dividing weight in

kilograms by square of bodyweight in meters has been advocated by WHO for assessment. The cut off BMI for well nourished, mild, moderate and severe malnutrition are >18.5, mild <18.5 <17, moderate <16.9 and severe malnutrition <15 [3].

Nutritional requirements

Patients with head injury tend to be associated with hyper metabolism and hyper catabolism resulting in negative nitrogen balance [ref] which may exceeds 30g per day. Early enteral feeding should begin when the patient is haemodynamicaly stable. Calorie intake should be 30-35kcal /kg/wt. and Protein 1.5-2.5gm/kg/body wt [3].

Types of food for negative nitrogen balance

Eating well improves brain function and Concerntration. Nutritious diet increase energy levels, prevent some chronic diseases and maintain a healthy body weight.

Role of protein

Protein is beneficial to increase protein intakes when energy intake is less than energy expenditure. A protein intake higher than the recommended 1.5kg/body wt. /day for the general population is appropriate for TBI patient in order to improve synthesis of protein and preserve lean body mass. Current recommendations suggest protein amount should be 1.5-2.0g/kg/d for acute TBI patient for the excess catabolism [15]. Most of the TBI patient tolerate standard intact protein formulas.protein doses should be adjusted during the course of TBI patient. If protein doses is high may cause azotemia in patient with renal insufficiency. So monitoring should be done in proper way [15].

Role of calorie

Total daily calorie expenditure has been considered to be composed of basal expenditure which often estimated by the Harries Bendict equations based on height, weight sex and age. A rough estimate of basal energy expenditure for most patients who are not severely malnourished and who are in the same age group is approximately 22-24 kcal/kg/day. With severe head injury such as TBI, the energy intake in the range of 25-30kcal/kg/day are generally recommended (cerra et al 1997). A recent study concluded that, for critically ill patients, permissive underfeeding (60–70 percent of calculated requirement) may be associated with lower mortality rates than underfeeding (90–100 percent of calculated requirement) (Arabi et al., 2011). For reasonable retention of lean tissue with injury, both energy sufficient to meet at least basal energy expenditure and a greater amount of protein (up to 1.5 g/kg/day) are required (Bistrian and Babineau, 1998); even then, total sparing of lean tissue is often impossible in the acute phase of injury, due to the impact of the systemic inflammatory response on the protein catabolic rate (Jensen *et al.*, 2010; Ling *et al.*, 1997).

Role of Fat

The human brain consists of 60% lipid by dry weight, and docosahexaenoic acid is one of the most abundant fatty acids found in the solid matter of the brain.DHA is a primary structural component of the mammalian cerebral cortex and comprises 50% of neuronal membrane phospholipids. Omega-3 FAs are essential for maintaining membrane fluidity [2,7], which in turn impacts neuronal cell adhesion, axon guidance, synapse maintenance, dendritic formation, and the speed of neurotransmission. Requirement of fat <35% of total calories per day [5]. Saturated fat (SFA) and trans fat <7% of total calories, polyunaturated fat (PUFA) >10% of total calories, monosaturated fat (MUFA) 20% of total calories.

Role of Magnesium

Magnesium play a important role in brain functioning. In normal conditions magnesium inhibits the action of the excitatory neurotransmeter glutamate. Magnesium relaxes vascular smooth muscle, resulting vasodialation and increased cerebral blood flow in TBI patient. Recommended dietary allowances for magnesium 80g /day children between ages of 1-3, 420mg/day male over age of 30, 320mg/day for female over age of 30 [11,13]. Magnesium therapy is failed in recent clinical trials of trauma because of an intact blood brain barrier at the time of administration reducing central penetrations. Under such conditions, magnesium peripheral effect on cardiovascular parameters may dominate over the central and potentially neuro protective.

Magnesium is an essential nutrient that serves as a cofactor for more than 300 enzymes involve in biological reaction. 50% magnesium found in bone while other 50% found in soft tissue.

Role of metals and vitamins

The additional of antioxidant vitamins and minerals

Iron: Adequate iron intake has been improve brain function, lentils, dark green vegetables, reduce morally in critically ill patients cooked spinach, whole white bread, ragi, rice flakes and sunflowers seeds. formation of HB which carries oxygen to cells of brain.

Zinc: Zinc supplementation for up to one month appears to improve protein metabolism and neurological prognosis and plays a crucial role in memory formation and cognitive stability. It may

improve GSC score and visceral protein amounts. Food high in zinc such as wheat germ, bran cereals, red meat, liver, sea foods.4).

Copper: Nuts, seeds, whole bread, dark chocolate, impairs brain function and immune response., hence must be supplementation diet is liquid for head injury patient.

Selenium: It provide synthesis for some hormones and protect cell membrane from damage.it found in seafood, liver, egg, grains, seeds.

Vitamin B1

It metabolises glucose and found in grain products, legumes, nuts and seeds, organmeats.

Vitamin B 12

It protects nerve cells by maintaining a myelin sheath. It is found in dark green leafy vegetables, milk, meat, fish.

Folic acid

It prevents build up of blood reducing the risk of heart disease and stroke also can lower levels of serotonin level in the brain. liver, yeast, asparagus, beans, peas, broccoli and nuts.

Vitamin A

It provides protection against infection and found in carrots, yellow squash and spinach.

Vitamin E

It supplies oxygen to the brain and slow down ageing process. It is an antioxidant and neuro protective. It found in plant oils, green leafy vegetables.

Vitamin B6

It helps with metabolism of CHO and fats, support nervous system. whole wheat product, fruits and vegetables.

Vitamin D

Maintain levels of calcium and phosphorus in the blood and increase absorption of calcium.

Omega 3 fatty acid

It is highly concentrated in the brain. Nuts, oil seeds, salmon, flax seeds, chia seeds(alasi). Requirement per day 6-1.2% of intake of ALA. 500mg EPA+DHA per day [19].

Fibre

In head injury, fibre helps in releasing sugar from the blood slowly. It is found in whole grain bread, vegetables, fruit, pasta, beans, Blue berries, broccoli, avocado, pomegranate. These are the anti oxidants rich food has been found to boost memory and keep battle Alzheimrs disease. These food can influence the production of brain chemicals such as serotonin, dopamine and Neurotransmitter and help the patients to feel calm, happy and stress free. Fibre require 25-30gm per day.

Early methods of feeding

Head injury increases the body metabolic responses and therefore it needs early nutrition demands. The best route for administrating nutrition in enteral feeding. Enteral feeding is a method of supplying nutrients directly into the gastrointestinal tract. Some times the temperature is maintained at room temperature during bolus and continuous feeds. Early nutritional support reduces the secretion of catabolic hormones, which are already increased in this setting. Gastric, jejuna and parenteral are the three ways of early feeding. Better nitrogen retention has been found with jejuna and parenteral methods [13]. Altered gastric emptying, residual, lower esophageal dysfunction and aspiration pneumonia may complicate gastric feeding. Once patient is stabilized enteral nutrition is started. Some recommended starting as early as within 24hrs. Enteral route is preferred due to reduced risk of hyperglycemia, infection and is cost effective. The risk of infection from central venous catheters is also overcome of the same.

Role of jejunostomy feeding

In jejunostomy feeding, a feeding tube is inserted endoscopically or surgically through abdominal wall directly into the stomach. Correct placement of tube should be confirmed prior to administration of gastrostomy feed by checking insertion sit at the abdominal wall and observing the patient for abdominal pain or discomfort in jejunostomy feeding and the feed is given slowly 50ml/3hrly and the rate of feeding is increased according to the condition of the patient. Carbohydrates should be provided exclusively by glucose which cover 50–60% of non-protein energy requirements.

Role of parenteral elimination

Parenteral nutrition is given immediately when sufficient oral and enteral feeding is not possible for the TBI patients. The parenteral intake is provided approximately 200–3000 kcal/day, including 35–130 g amino acids per day, and the oral intake ranged from 13 to 39 kcal/kg/day. The primary advantage of parenteral nutrition is well tolerated. It is preferred if higher nitrogen intake is desired or if there is decreased gastric emptying or uncontrolled diarrhea due to antibiotic use. Cerebral edema is potential contraindication for parenteral elimination. The amino acids intake

should 1.2g/kg/d in patients who are malnourished or moderately malnourished and 1;5g/kg/d for severely malnourished patients.

When the TBI patient is stable the nutritional feeding is started. Table 1 gives the details of the on Nutritional feeding schedule.

Duration	Types of Feeding	Need	Supplimentation
1st week	Enteral	50-60 % of body wt. kcal	Peptide based
2nd week	Parenteral	65% of body wt. kcal	Amino acid based
3rd week	Immune enhancing formula	75% of body wt. kcal	Omega-3 fatty acid

Table 1: Nutritional feeding schedule.

Conclusion

The TBI patients are to be fed the proper nutritional food described above as soon as possible to overcome consciousness, memory loss, edema, hypoglacimia, infection and for nitrogen balance etc. Overall proper nutritional management is the key to impaired outcome with TBI.

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