NUTRITION IN SURGICAL PATIENTS

Pages with reference to book, From 145 To 147

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Significant advances in the diagnostic methods, surgical techniques, postoperative monitoring, and care of critically ill patients have favourably altered morbidity and mortality in hospitalized patients. For optimal results, however, nutritional therapy should be an integral part of present day life support systems. Basic knowledge in this field is essential in order to formulate a rational approach to surgical nutrition.

MALNUTRITION

In surgical practice malnutrition is common, being present before or occurring after operation in about 50% of the patients. Preoperative malnutrition may be due to starvation caused by poverty, dysphagia, vomiting and self neglect or due to failure of digestion as a result of pancreatic, biliary duodenal or jejunal disease. Postoperative malnutrition in most of the cases is transient in nature and occurs as a result of delayed feeding following surgery on the gastrointestinal tract. Hypercatabolic state, severe sepsis, trauma, and other disturbances of major viscera are accompanied by an accelerated and profound breakdown of tissue proteins[1].

Metabolic responses to surgery & trauma

Surgical intervention, trauma due to accident, thermal burns, infection and sepsis elicit a hypermetabolic response; the more complex is the surgical procedure especially of the abdomen or the chest, or the more severe is the trauma, the more intense is the metabolic response[2]. The key factors in nutritional care of the surgical patients are maintenance of energy, fluid and electrolyte balance and adequate nutrient and protein intake to promote wound healing and the resumption of normal activities. The catabolic phase lasts for about 24 hours after a simple repair of a hernia and for about 4-5 days after a major resection of the colon. Complications that delay healing, such as sepsis and repeated surgical interventions may prolong it, sometimes for several weeks. In such circumstances, increased protein catabolism is met by breakdown of muscle proteins resulting in weight loss[3]. The resting metabolic expenditure ranges from minimal after uncomplicated surgery to 30% with multiple fractures, 45% in peritonitis and upto 100% in burns. An increase in metabolic rate and protein catabolism of more than 25% is regarded as a hypercatabolic state. Stimulated protein breakdown in the postoperative period is associated with a change in synthesis rate in the body mass and this results in a negative nitrogen balance indicating loss of proteins derived from muscle and viscera which may be improved by enteral or parenteral feeding. The anabolic phase follows when wound healing is fully established. Depleted muscle and other tissue proteins are replaced and the fat deposits are restored. This is usually achieved after 5-7 days or earlier but when the catabolic phase lasts for weeks or months, a similar period of anabohsm is needed before convalescence is complete[3]. The effects of malnutrition include poor wound healing which may manifest as wound dehiscence, anastomotic leak, delayed callus formation, disturbed coagulation, reduced enzyme synthesis, impaired metabolism of drugs by the liver, immunological depression with increased susceptibility to infection, decreased tolerance to radiotherapy and chemotherapy, alongwith severe mental apathy and physical exhaustion of the patient.

Assessment and management

Thus it is essential to firstly assess the nutritional status of the patient, secondly determine the nutritional requirements and lastly the use of methods of sustaining normality or rectifying the

deficiencies.

Nutritional assessment

A nutritional and metabolic assessment includes evaluation of skeletal muscle, visceral protein and fat reserves and the catabolic rate.

The parameters include:

1. Body mass index (BMI). A female should have an index of 20,21, and 23 and a male, 20.5,22 and 23.5 according to the size of frame (small, medium or large).
2. Mid-upper arm circumference (MAC). MAC of less than 23 cm in females and 25cm in males indicates undernourishment.
3. Triceps skinfold thickness (TST). TST of less than 13mm in females and 10mm in males indicates undernourishment.
4. Serum albumin less than 35g/L indicates depletion of skeletal muscle and visceral protein reserves.
5. Lymphocyte count - less than 1500/mm^3 indicates an impaired cellular defence mechanism.
6. Candida skin test. A negative reaction means defective cell mediated immunity mostly due to malnutrition.

Malnutrition is mostly responsible for both impaired cellular mechanisms and defective immunity.

Nitrogen balance studies:

The total nitrogen intake is compared with the loss from all sources like urine, fistula, drain and nasogastric aspirate (1 liter =1 gN). A loss greater than the intake indicates a negative balance and tissue breakdown while a positive balance means anabolism, and tissue synthesis.

Nutritional requirements:

Energy

The energy, fluid and electrolyte requirements in the immediate postoperative period are supplied by intravenous solution of 5% dextrose, combined if necessary with electrolytes and water soluble vitamins. An adult requires 40-70 calories per kg after trauma. Therefore, the usual 2.5-3 liters of 5% D/W are unable to supply the total energy needs of an adult. Moreover, concentrated solutions of dextrose are avoided since they cause thrombosis of the peripheral veins. Therefore, during this period stores of body fat serve as the primary source of energy supply. In general the average patient is able to take food and fluid orally in 1-3 or 4 days after surgery. For some patients it may be necessary at this point to supply energy, nutrients and fluids by nasogastric, gastric orjejunal tubes. As soon as the patient can tolerate fluids and foods, he is offered a diet adequate in energy and nutrients to meet his needs to ensure groper wound healing and return to his normal activities[1]. When the gastrointestinal tract cannot be used for any extensive period of time after surgery and the patient cannot eat enough e.g. after massive bowel resection, they should be fed intravenously. [4]

Protein metabolism

After an operation there is an increase in urinary nitrogen and a rise in the resting metabolic rate by 10% or more. The more well built and nourished the patient is prior to his injury the greater is the effect; and the more severe is the accidental injury the greater is the catabolism, which generally reaches a peak between the 4-8th day after injury. Accidental injuries exhibit greater effects than elective operations. In severe trauma as much as 30g of N equivalent of 2 lbs. of muscle tissue, can be lost in one day. Significant loss of protein can also occur as a result of blood loss during surgery or trauma and atrophy of bone and muscle in the immobilized patient. The negative nitrogen balance of the catabolic phase is generally attributed to the breakdown of aminoacids to supply substrate for the gluconeogenic pathway with the urinary excretion of nitrogen and ammonia. However, Waferlow[5] et al and O'Keefe[6] et a! suggest that the reaction to moderate stress involves a decrease in the rate of cellular protein synthesis without an acute rise in the urinary rate of protein breakdown. However according to Moore[7] an early I.V. source of aminoacids is not required for wound healing in the catabolic phase if adequate oral feeding is returned. On the other hand, a prolçnged postoperative period without adequate

energy and nutrient intake does have an adverse effect on all aspects of recovery from surgery or trauma. Therefore, the postoperative patient must be monitored carefully, by the medical team for his readiness for oral fluids and food to support a positive nitrogen balance during the anabolk phase. Otherwise enteral or parenteral alimentation must be used to support the patient's metabolic needs.

Fat metabolism

After an operation the small reserves of carbohydrate in the body are soon expanded followed by depletion of endogenous stores of fat to meet the energy needs. A patient in bed may use 150 to 200g of fat daily and over 1 kg of fat may be lost weekly. This can be prevented by parenteral and I.V. feeding when a patient cannot eat a high energy convalescent diet[3].

Vitamins and minerals

Wound healing requires adequate supply of minerals, trace elements and vitamins as well as energy and aminoacids. For example the synthesis of collagen which is a basic process of wound healing, requires vit C. Protein synthesis in general requires a variety of trace elements and vitamins as well as aminoacids[1].

Practical considerations

Surgical patients do not need dietary supplementation provided that they can take a good ward diet. The three nutrients in which they are most likely to be deficient are iron, protein and vitamin C. Medicinal iron is required only when iron deficiency anaemia is present. A protein supplement is required when the patient is unable to eat sufficient ward diet to meet energy needs. Wounds do not heal readily unless the tissues have an ample supply of vitamin C. This is best provided by fresh vegetables, fruits and fruit juices. If these are not available, ascorbic acid should be given. Other supplements may be needed when absorption of nutrients are impaired. Thus in patients with obstructive jaundice, failure of absorption of the bile salts causes malabsorption of fats and fat soluble vitamins. Parenteral vit K is therefore needed before operation to ensure that bleeding is not excessive. Gastric surgery on the area where intrinsic factor is produced; requires supplementation of vit B12 to prevent megaloblastic anaemia, vit B12 is also needed after ileal resection. After any extensive intestinal resection great care is needed, to ensure that deficiency of vitamins and minerals do not arise3. Malnutrition suppresses the immune response[8,9] and thus predisposes to complications like respiratory and cardiovascular complications after surgery[10]. Therefore if the patient is undernourished it is advisable to correct this provided the need for the operation is not urgent. Obese patients are poor anaesthetic risks, therefore, it is wise to postpone surgery until some reduction in weight has been achieved by dietetic treatment. [3] Diet has an important part to play in determining the speed with which a patient recovers postoperatively and hence in the length of hospital stay. Postoperative hospital stay of undernourished patients with abdominal surgery was found to be significantly high in a recent study conducted in ward 2 of JPMC Karachi.[11] Therefore, appropriate dietary supplementation especially to under nourished patients both pre and postoperatively would improve patients care, reduce catabolic state and mor bidity and mortality[12-14]. By giving adequate amount of calories and nitrogen it is possible to minimize the loss of body weight and the nitrogen deficit. The major portion of the nitrogen deficit reported to be the result of operative trauma is in fact the result of a poor nutritional intake. [15]

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