Review Article

Role of nutrition in oral and maxillofacial surgery patients

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ABSTRACT

Diet, nutrition, and dental health are closely related and have multidirectional impacts. Any oral diseases, may it be congenital, infective, traumatic, inflammatory, or neoplastic, affect routine functions of the oral cavity and even after corrective surgeries done to improve may adversely affect the food and fluid intake and further compromises nutritional status. Unlike other general surgeries, the surgeries done in oral and maxillofacial region impairs normal food intake, especially by mouth which is the preferred commonly used route. This oral cavity being harbored by multiple organisms makes it prone to further infection which again hampers the healing. Oral surgeries include the dentoalveolar region for the treatment of fracture or prosthetic reasons, for maxillofacial trauma, orthognathic surgeries, tumors, cleft lip and palate correction, etc., Nutrition plays a major role in the postoperative recovery and healing. Malnutrition in the Oral and Maxillofacial Surgery (OMFS) patients increases the postoperative morbidity and mortality rate. Nutrition in jaw fractures treated with intermaxillary fixation is more compromised. Healing is impaired in malnourished, critically ill, elderly, and patients with prolonged stay in hospital and hence nutrition in the form of enteral, parenteral, and oral sip feeding plays a major role in providing nutritional care. Preoperative nutrition and perioperative nutrition influence the postoperative outcome and hence metabolic and nutritional care is important for the uneventful healing. This article provides a basic review of the role of nutrition in the postoperative outcome of OMFS patients based on the search through articles in journal and internet.

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Introduction

Nutrition is defined as the science of how the body utilizes food to meet requirements for development, growth, repair, and maintenance. Nutrition is major determinants of health status exerting the "womb to tomb" effect which mediates the course of various health outcomes. Each nutrient has a specific role in maintaining the integrity of the oral tissues. Basic nutrients are carbohydrate, protein, fat, vitamins, minerals, and water needed for all to survive and live a healthy life and to heal well. Carbohydrates, proteins, and fatty acids are the chief sources of energy. The body requires an adequate supply of carbohydrates to prevent protein catabolism and fatty acid metabolism.[1-4]

Total calories stored is 200,000 kcal for a 75 kg man and only if 140,000 kcal is burnt death occurs. This means that man can survive till 3–5 months the energy which is provided by 75% fat and 50% protein during starvation.[5]

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Malnutrition and Wound Healing

The world faces only two extremes of disease associated with diet: One is malnutrition and other obesity. Incorrect diet leads to oral disease which in turn again impairs food intake and compromises health. Both pediatric and geriatric population are susceptible to malnutrition.[4]

Patients undergoing surgical procedures require protein source needed for cellular proliferation and repair and energy. Alternatively, excess glucose is not useful as it results in decreased leukocyte function, dehydration, and metabolic acidosis. Bone healing is the major prognostic factor in oral and maxillofacial surgery, and protein plays a vital role in fracture repair. Severely malnourished patients demonstrate delayed wound healing and impaired wound contraction. A malnourished patient has increased susceptibility toward infection and all this lead to a prolonged rehabilitative period. When the food intake is less, it results in loss of fat, muscle, skin, and ultimately bone and viscera, with subsequent weight loss, and expansion of the extracellular fluid compartment. As the individual's body mass decreases nutritional requirements fall which reflects more efficient utilization of ingested food and a reduction in work capacity at the cellular level which in turn impedes normal homeostatic responses to stressors such as surgery or critical illness. The stress of surgery or trauma creates a hypermetabolic state, increasing protein and energy requirements. There is a redistribution of macronutrients (fat, protein, and glycogen) from the labile reserves of fat tissue and skeletal muscle to more metabolically active tissues such as the liver and visceral organs. This leads to the onset of protein calorie malnutrition (defined as a negative balance of 100 g of nitrogen and 10,000 kcal) within a few days. Preexisting nutritional status, nature, and complexity of the surgical procedure, and the degree of hypermetabolism in an individual influences the rate of development of postoperative malnutrition. The negative consequences of malnutrition includes delayed wound healing, increased susceptibility to infection, abnormal nutrients loss through the stools, prolonged stay leading to decubitus ulcers, nosocomial infections and overgrowth of bacteria in stools and leads to immune system dysfunction by impairing complement activation and production, bacterial opsonization, and the function of neutrophils, macrophages, and lymphocytes. The role of nutrition in healing is noncontroversial. The healing so naturally is impaired in alcoholics, undernourished, elderly, and homeless in various stages of malnutrition, multisystem trauma with prolonged stay with impaired food intake and immunocompromised. A good oral surgeon should be able to assess nutritional status and nutritional requirements prior to surgery and should be knowledgeable of the various modalities of nutritional support to recommend the same for the welfare of the patient.[3,6-8]

Nutritional support can be provided by supplying at least 80% of energy with at least 70% of energy given in the carbohydrate form, 30% given as fat. There is a need for Vitamins (A, C, and E) and minerals (zinc, selenium, and magnesium) and all protein or amino acid feeding should include glutamine. The preferred route is enteral if not then can be by parenteral. Nutrients should be administered early in the catabolic course, especially glucose, sodium, potassium, vitamins, and minerals. Over time (approximately 7 days) amino acids should be added and approximately 50% of caloric support should be provided. Finally, full nutritional support should be provided (by 7–10 days) if the catabolic course is expected to continue. Caloric support should be provided. Finally, full nutritional support should be provided (by 7–10 days) if the catabolic course is expected to continue.[6,9,10]

Of note is that underfeeding results in delayed wound healing, organ failure, delayed wound healing, and infection. Overfeeding leads to hyperglycemia, increased carbon dioxide, respiratory failure, and hepatic steatosis and hence optimal nutrition is needed.[6]

Nutritional Assessment

All patients should be assessed preoperatively by the dietician, and this should be an integral part of a multidisciplinary team approach in managing nutritional deficient patients. Perioperative support should equally continue.[6,11-13]

Nutritional assessment is based on the findings of a routine history and physical examination.

History

History of preoperative weight, recent weight loss if any weight gain, loss of appetite, ability to swallow, chronic disease (particularly diabetes), infection, recent hospitalization, and prior surgery (particularly gastrointestinal (GI) surgery), recent hospitalization and if prolonged stay as this if not known an uneventful stay would turn out to be a postoperative disaster. Unintentional weight loss of more than 10% body weight within 6 months is to be carefully dealt, and proper nutritional support is indicated in these patients.

Diet history

History of use of dietary supplements, diet history from patient or family or caretaker is very important. Moreover, to be noted is any allergies or food intolerances.

In addition to vital signs and a general physical examination, the following should be noted:

- Height and weight (calculate body mass index [BMI] using weight in kg divided by height in meters

squared, or using a nomogram. BMI is calculated as body weight in kilograms divided by height in meter squares
- General: Loss of subcutaneous fat, any generalized fluid accumulation
- Head and neck exam: Hair loss, bitemporal wasting, conjunctival pallor, xerosis, glossitis, bleeding or sores on the gums and oral mucosa, angular cheilosis or stomatitis, dentition
- Cardiovascular: Evidence of heart failure or high-output state
- Neck: Thyromegaly
- Extremities: Edema, loss of muscle mass
- Neurologic: Evidence of peripheral neuropathy, reflexes, tetany, mental status, handgrip strength
- Skin: Ecchymoses, petechiae, pallor, pressure ulcers, assessment of surgical wound healing, and signs of surgical site infection (if postoperative).[6,14]

The widely applied traditional methods to assess nutritional status rely heavily on objective anthropometric measurements and laboratory tests results. Anthropometry is the science that defines physical measures of a person's size, form, and functional capacities. This includes triceps skinfold, mid-arm, muscle circumference, body weight, degree of weight loss, and rate of weight loss.[6]

Assessing protein status

Protein status is affected by previous intake, muscle mass, duration of current illness, blood loss, wound healing, infections, and GI absorption. Assessment of nutrition should include calorie nitrogen ratio using daily dietary intake. Serum albumin is the most abundant plasma protein in mammals. Albumin is essential for maintaining the osmotic pressure needed for proper distribution of body fluids between intravascular compartments and body tissues. Sodium ions are necessary for regulation of blood and body fluids, transmission of nerve impulses, heart activity, and certain metabolic functions. Potassium is a very important mineral for the proper function of all cells, tissues, and organs in the human body. It is also an electrolyte, a substance that conducts electricity in the body, along with sodium, chloride, calcium, and magnesium. Potassium is crucial to heart function and plays a key role in skeletal and smooth muscle contraction, making it important for normal digestive and muscular function.[3,6,15]

Laboratory tests

Diagnostic tests including hematological evaluations provide insight into possible causes of oral or other systemic diseases. Complete blood count should be assessed to aid in determining immune response. Laboratory data provide value for electrolytes, serum proteins, trace elements, glucose, lipids, and organ function, blood urea nitrogen/creatinine help assess overall clinical and fluid volume status and need to be obtained if parenteral (intravenous) nutrition will be instituted. Iron levels should be measured in the setting of unexplained anemia as should specific vitamin levels if clinically indicated (e.g., B12/folate in macrocytic anemias, others based upon specific physical signs). Serum calcium, magnesium, and phosphorous should also be assessed periodically, particularly in the setting of poor oral intake or diarrhea. Serum albumin and the lymphocyte count are considered "key" parameters which permit an instant assessment in emergency situations.[6,16,17]

Several clinical tools are available to quickly assess and score nutrition status in the hospitalized patients. The Subjective Global Assessment of Nutritional Status is a brief tool that includes history and physical examination findings and allows standardized assessment. The Nutritional Risk Screening tool (2002) can be applied rapidly and used to screen for poor baseline nutritional status. Prognostic nutritional index and creatinine height index correlated with postoperative complication rates.[3,18-22]

Considerations in Oral and Maxillofacial Surgery

As well known, surgery is an inflicted controlled injury and delays or lengthens the process of healing. The extent of injury and presence of sufficient and continued nutrition influence the ability of healing capacity of the body. The mouth is the portal for entry of food into the body; thus, the disease of the oral and maxillofacial region and/or surgery of these structures may result in impaired food intake both prior to and after surgery. The severity and duration of the impairment are dependent on the disease state and the surgical intervention required correcting it. The knowledgeable oral surgeon ensures the patient has appropriate nutritional support. Hence, assess the nutritional status and the impact imparted by the dental treatment. For example, postcancer treatment by chemotherapy/radiotherapy may lead to xerostomia, mucositis, altered taste sensation, and weight loss which should be considered.[3,23-27]

After wisdom tooth removal

Mostly a common procedure done under local anesthesia and at times when done under general anesthesia for medical reasons or preference of the patient, after routine 1-day postoperative period can go for regular soft, bland diet like any other extractions.

After dental implants and after exposure of an impacted tooth

Drink plenty of fluids. Avoid hot liquids or food. Soft food and liquids should be eaten on the day of surgery.

Return to a normal diet as soon as possible unless otherwise directed.

Dentoalveolar surgeries can have short-term impacts on oral function and ability to eat and drink depending on the location and extent of surgery.[27]

Major jaw surgery

Maxillofacial trauma results in increased energy and nutrient needs for wound healing and depending on the location and extent of trauma; nutrition support may be needed. If intermaxillary fixation is done as a procedure, a liquid diet will be necessary until the teeth are released and following initial healing, a more varied diet will be desirable. Cooked foods can be blended of proper consistency with juice, milk, water, or broth added as a thinner and may be strained to remove particles and food fiber to prevent oral hygiene problems. The period of intermaxillary fixation which may last for 6 weeks, may be associated with many problems such as airway problems, poor nutrition, weight loss, poor oral hygiene, phonation difficulties, insomnia, social inconvenience, patient discomfort, work loss, and difficulty in recovering normal range of jaw function and more problematic in epileptics where it can be avoided. The significant changes in serum potassium levels during the fixation period in traumatized patients necessitate special attention regarding monitoring and supplementation of this electrolyte during the fixation period.[28-32]

Treatment following orthognathic surgery typically requires diet consistency modification and additional calories and nutrients for wound healing.[33]

Cleft lip and palate corrective surgeries

Patients with cleft lip and palate require modified feeding strategies preoperatively and initially postoperatively. Nutrition support following oral surgery is typically achieved using oral liquid nutrition supplements or an enteral tube feeding.[26,34]

Nutritional Interventions

The basic diet of the patient should all the vital nutrients to promote healing and modes of support commonly used in the ambulatory patients during the perioperative period being clear liquid diet, full liquid diet, pureed diet, mechanical soft diet, and regular diet. A clear liquid which is more nutritionally complete diet is often used in the immediate postoperative period after a parenteral sedation after recovery from GI intolerance the patient is advised for a complete diet which is low in nutrients. This is good for patients who cannot chew or swallow foods. A fully liquid diet frequently consists of milk products but to be used cautiously in patients with lactose intolerance. A pureed or mechanical soft diet is a transitional diet which is also easy to administer and provide patients with increased consistency and food texture. A soft diet grants more choices in selecting food items and also is appealing than a liquid diet. Meats and fruits can be made quite flavored. Meats can be thinned with milk to make broth, while fruits can be used or is added to other foods. Nutritional intervention may include oral supplementation, enteral (tube) feeding, or parenteral (intravenous) feeding. Enteral support is recommended over parenteral support because of its relative simplicity, safety, reduced complications, and lower cost, as well as its ability to maintain mucosal barrier function. Once the presence of malnutrition is established or it becomes clear that the patient will not be able to maintain adequate nutrition. By providing adequate nutritional support in the preoperative and postoperative period avoids complications and ensures adequate healing.[6,35-38]

Enteral nutrition

Enteral nutrition support refers to the provision of calories, protein, electrolytes, vitamins, minerals, trace elements, and fluids through an intestinal route, either orally or via a feeding tube.

Oral supplementation

There is a wide variety of supplements available for oral supplementation in a wide range of styles (juice, yogurt, and milkshakes), formats (liquid, powder, pudding, and prethickened), types (high protein, fiber-containing, and low volume), energy densities (1–2.4 kcal/mL), and flavors. Most oral supplements provide 300 kcal, 12 g protein, and a full range of vitamins and minerals. Specific types of oral supplements may benefit certain groups. In general, high protein oral supplements are most suitable for patients with wounds, and those with malignancy. Prethickened supplements and puddings are helpful for providing nutritional support to individuals with dysphagia and those with neurological conditions.

Tube feeding – Enteral nutrition may be delivered in a gastric or postpyloric fashion.

Parenteral nutrition

It is an intravenous solution that contains dextrose, amino acids, electrolytes, vitamins, minerals, and trace elements.[6,37,39]

Adequate perioperative nutritional support in either form may improve nutritional rehabilitation in catabolic patients.[40]

Immunonutrition

There are specific naturally occurring additives to nutritional support, which may modulate

inflammation (and the associated oxidative stress and lead to an increase, improve or maintain in immune system function and therefore a reduction in infection, hospital length of stay, and chance of death. This is called immunonutrition. These additives are termed immunonutrients and include glutamine, arginine, branched-chain amino acids and omega-3 fatty acids (fish oil), several amino acids, antioxidant vitamins and minerals, long-chain n-3 fatty acids, and nucleotides. The role for immunonutrition is unclear. Thus far, there is insufficient high-quality evidence to suggest any specific amino acid or other supplementation for surgical patients. It is notable that in critical illness the mucosal barrier and cellular defense are impaired and reinforcement with enteral immunonutrition is desirable, while local or systemic inflammatory response should be downregulated by nutritional intervention.[6,41,42]

Experimental studies support a role for each of these nutrients in surgical, injured, or critically ill patients, but more evidence of clinical efficacy are required. Mixtures of antioxidant vitamins and minerals are also clinically effective, especially if they include selenium. Their action appears not to involve improved immune function although an anti-inflammatory mode of action has not been ruled out. Enteral immunonutrients mixtures, usually including arginine, nucleotides, and long-chain n-3 fatty acids, have been used widely in surgical and critically ill patients. Evidence of efficacy is good in surgical patients. However, whether these same mixtures are beneficial or should even be used in critically ill patients remains controversial since some studies show increased mortality with such mixtures. There is a view that this is due to a high arginine content driving nitric oxide production.[43]

In patients with severe sepsis, shock, and organ failure, no benefit or even disadvantages from immunonutrition were reported as we hypothesize that systemic inflammation might be undesirably intensified by arginine and unsaturated fatty acids, directly affecting cellular defense and inflammatory response. Hence, it is recommended that in patients suffering from systemic inflammatory response syndrome great caution should be exercised when immune-enhancing substrates are involved which may aggravate systemic inflammation.[44]

Nutritional Requirements

GI tract acts as an important immune organ. Patients suffering from upper GI tract cancer suffer from severe protein calorie malnutrition. In these patients, enteral nutrition is preferred over parenteral nutrition. Immunonutrition should be considered in critically ill patients and elective surgery patients.

Level 1
Patients with chronic malnutrition benefit from nutritional support. Enteral nutrition is preferred over parenteral nutrition in patients with functional GI tract which should be initiated within 18 h of injury in burn patients and initiated within 24 h of admission in critically ill patients. Immunonutrition should be used in malnourished elective GI surgical patients and should involve an initial 5–7-day course with subsequent re-evaluation.

Level 2
Patients with severe head injury who did not tolerate gastric feeding within 48 h of injury should receive postpyloric feeding. Nutritional assessments should be performed weekly and adequate nutritional support should be provided to meet individual's needs.

Level 3
Incompletely resuscitated patients should not receive direct small bowel feedings due to gastric intolerance. Intragastric feeding of severe closed head injury patients should be initiated within 12 h of admission. In severely injured patients, parenteral nutrition should be started within 7 days if the patient is unable to tolerate at least 50% of caloric requirement.

Monitoring and supervising the patient are very important step. Whether it is enteral or parenteral, a check on patient's weight, calorie nitrogen ratio, daily dietary intake, and fluid balance is necessary. Weight loss should be constantly monitored by dietician if any.[3]

Discussion

The knowledge of nutrition is very important prior to critical evaluation of the therapeutic benefit gained from the provision of nutritional support. Nutritional assessment is essential for the optimal care of the hospitalized patient. Careful preoperative nutritional assessment should include a determination of the level of stress, an evaluation of the status of the GI tract, and the development of specific plans for securing enteral access. Anthropometric estimates subcutaneous fat and lean skeletal muscle mass reflects protein and calorie intake not applied to trauma patients as compared control data based on healthy subjects.[45]

Clinical observation, certain anthropometric measurements, diet history and determination of serum albumin, total lymphocyte count, and nitrogen balance are recommended. An initial assessment should always be made on the basis of whatever pertinent information is available. A proper preoperative assessment of nutritional status definitely plays a major role in preventing

postoperative complications and then perinutritonal support would be more beneficial. This does reduce postoperative complication but not mortality.[46]

Enteral nutritional support has the advantage of providing key nutrients. After surgical procedures, there are complex and typical changes of the homeostasis, which are summarized as postaggression syndrome. Energy demands in the immediate postoperative period are lower than presumed until recently. After elective surgery, the basal energy requirement will increase to about 10% above the preoperative level. Artificial nutrition is used in clinical practice to overcome this. Enteral and/or parenteral nutrition is necessary to meet the energy and nutritional demands in the postoperative period. Enteral nutritional support has advantages over parenteral nutrition and the administration of key nutrients has clinical benefits, reduced infectious, and major complications too but does not alter mortality. The use of specific combinations of nutrients appears to offer the greatest promise for the use of perioperative nutritional support. Enteral nutrition appears to be as effective as parenteral nutrition in improving operative outcome as compared with *ad libitum* oral nutrition candidates for preoperative tube feedings. Total parenteral nutrition should be the mainstay of nutritional support when the GI tract cannot be used adequately, patients with a functional gut who cannot eat because of anorexia or upper GI tract obstruction. Irrespective of the route of nutrition, it also "depends not only on how much and how well it is given but also on how depleted the recipient" is. Allowing a patient's nutritional state to deteriorate through the perioperative period adversely affects the measurable outcome related to nosocomial infection, multiple organ dysfunction, wound healing, and functional recovery.[47,48]

The patient sustaining maxillofacial trauma, disease, or deformity presents with unique nutritional problems, especially during the postoperative period. By providing a nutritionally adequate diet in the preoperative and immediate postoperative period and during convalescence, complications can be reduced and healing improved. Perioperative nutritional support can reduce postoperative complications in well-nourished patients. Consideration should be given to the nutritional status of these patients in both preoperative and postoperative period so as to reduce postoperative complications. It should be imperative upon the part of dental professional to identify patients at nutritional risk, perform nutritional screening tests, and provide dietary guidelines.[49-51]

All health-care professionals including physician, nurses, paramedical persons, and dietician can interact and help in providing proper nutritional support and hence awareness is important of all.[52]

Conclusion

Poor nutrition plays an important role in the development of postoperative complications and may increase patient morbidity. Proper nutritional assessment and appropriate preventive measures should be undertaken in the patients undergoing maxillofacial surgery. Nutritional support should be considered in severely malnourished patients. The surgeon should look upon the diet as an adjuvant, similar to analgesics and antibiotics, which is a means of making the patient more comfortable and of speeding recovery. Some of the prime functions of adequate nutrition are to enhance convalescence, to promote wound healing, and to increase the patient's resistance to infection, but the indiscriminate use of nutritional support should be avoided to reduce postoperative complications. Henceforth, a basic knowledge of nutrition is essential for the treating surgeon.

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