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Mini Review

A Review of Perioperative Nutritional Assessment and Management in the Oral & Maxillofacial Surgical Patient

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Introduction

Oral and maxillofacial surgical scope is broad, with specific focus on the craniomaxillofacial complex. Emphasis is placed on facial reconstructive surgery, craniofacial surgery, facial trauma surgery, orthognathic surgery, and dentoalveolar surgery. Many of these surgical modalities directly impact patients' postoperative ability to masticate and ingest food. This is largely due to postoperative edema, dysphagia, generalized discomfort, as well as anatomical and physiological changes in the head and neck region. Less commonly, some unique procedures which include fixation of facial fractures and orthognathic corrective surgery require the utilization of postoperative fixation in the form of surgical elastics or Maxillomandibular fixation hardware. These countermeasures, although necessary for surgical success and stability, come at the cost of compromised nutrition due to partial or complete hinderance of the patient's ability to receive nutrition orally.

Patient education and implementation of alternative routes to adequately nourish and hydrate should be established as a priority for the surgical team, as the oral and maxillofacial surgery patient faces different nutritional challenges than most general surgery patients. This standard of care must include pre and postoperative nutritional evaluation coupled with a robust plan to mitigate any complications, infections, delayed wound healing, drastic body weight fluctuations, as well as any negative psychological tolls.

Impact of Nutrition on Surgical Patients

It is understood that surgery and anesthesia induce a measurable neuroendocrine response from the body. This comes in the form of increased epinephrine, cortisol, and inflammatory marker circulation. Nutrition, or lack thereof, plays a critical role in meeting the body's needs to mount and sustain physiological function in order to promote healing and facilitate adequate recovery [1].

Malnutrition in surgical patients has a high occurrence rate in most hospital populations. An eleven-year study starting from 2008 and ending in 2018 by Haukeland University Hospital, Norway, carried out 34 point-prevalence surveys to determine the prevalence of malnutrition in their hospital system. 18,933 subjects were studied, 52.1% male with a median age of 65 years. The study reports that 27% of patients were identified to be at risk of malnutrition [2].

Malnutrition impairs immune response in the form of reduced complement activation and blunted leukocyte production. This suggests that both cell-mediated and humoral pathways of immunity are compromised [3].

Inadequate nutrition forces the body to utilize alternate mechanisms to breakdown native tissue reserves of fat and skeletal muscle in order to provide lipid and glycogen as energy sources. In turn, the patient is placed at increased risk of delayed wound healing, postoperative infection, secondary organ dysfunction, and a prolonged hospital course.

It is precisely because of this that it is imperative for each patient to be evaluated preoperatively to screen for risk of malnutrition based on their baseline body weight, body mass index, fat stores, muscle mass, basic metabolic panels, and complete blood count.

Nutritional Evaluation

Initial evaluation of patient susceptibility to malnutrition is imperative to formulating a comprehensive postsurgical management regimen. The following paraments should be included:

Caloric requirements

Calculating a baseline patient profile is imperative for establishing data points as reference for ongoing management and adjustment. Most patients undergoing minor procedures do not require drastic deviation from their baseline intake. Those undergoing more extensive and invasive procedures inherently require more supplementation. Body mass index calculation can serve as a helpful indicator of patient requirements. The objective is to avoid overfeeding whilst meeting caloric requirements. To do so one must consider the following factors:

- Basic metabolic rate
- Increased metabolic demands post operatively
- Infection
- Organ dysfunction
- Physical activity

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Caloric requirements can be calculated via direct or indirect calorimetry. These techniques require extensive equipment and primarily rely on gas exchange values to calculate metabolic rates. However, these techniques are neither cost effective nor easily accessible for most patients; predictive equations serve as a valuable alternative. Although less accurate, they are more easily utilized and possess far less challenges. These include the Harris-Benedict equation, Mifflin equation, and the Ireton-Jones equation.

Most surgical guidelines publish similar recommendations with slight variation in values:

- 1.2 to 2 g protein/kg/day
- 1 to 2 g/kg/day of glucose, ~ 50 percent of total calories
- 1 to 1.2 g/kg/day of fats ~ 15 percent of total calories [4]

Glycemic control

Glycemic control is warranted in healthy patients, but crucial in patients with comorbidities like diabetes. A fine balance between preoperative nil per os (NPO) status, insulin regulation, meal scheduling is essential in avoiding drastic hypo/hyperglycemic episodes. Markers such as blood glucose and glycated hemoglobin (HbA1C) can help cue providers on patient status and guide management. The American Diabetes Association recommends a perioperative blood glucose of 80 to 180mg/dL [5].

To compare the predictive value of postoperative complications, blood glucose and HbA1C levels were compared to evaluate 30-day mortality rates following surgical intervention. Van den Boom and colleagues retrospectively analyzed electronic medical records with isolated perioperative glucose levels >200 mg/dL but non-elevated HbA1C. They reported an increase in 30- day mortality rates [6]. The argument can still be made to delay surgery in light of chronically elevated HbA1C levels.

Protein

Base line protein status is an approximate predictive physiological marker of tissue healing and postsurgical complications.

Protein status, typically correlated to serum albumin levels, is sensitive to daily protein intake, muscle mass, extent of surgical intervention, and a prolonged disease course.

Transferrin and prealbumin may also be utilized to extrapolate data on baseline protein levels and tracking throughout interventional course, these markers have varying half-lives when compared to albumin.

Surgical site infection risk has been estimated to be six times higher in hypoalbuminemia as reported by Hennessy and colleagues [7].

Another study conducted to evaluate preoperative albumin levels as a predictor of postoperative complications in maxillofacial fracture repair failed to demonstrate an association with postoperative complications. It did, however, identify hypoalbuminemia as an independent factor of extended length of hospital stay, adverse disposition and rehospitalization [8].

This notion was again demonstrated by Seres, who reported that a decrease of serum protein levels correlated to poor outcomes in the surgical patient, supplementation to boost serum levels has not shown a significant association with better outcomes [9].

In contrast, a meta-analysis demonstrated reductions in postoperative complications and lower infection rates in patient with glutamine and arginine supplementation regimens [10].

Fluid and electrolyte management

Surgical patients are especially susceptible to fluid and electrolyte imbalances. Intravenous fluid administration, blood loss, transfusions, and the stress responses to surgery can all potentiate electrolyte derangements.

Crystalloid fluids such as 0.9% Sodium Chloride (Normal Saline), Lactated Ringer, Plasma Lyte (Balanced Salt Solution) vary in PH, sodium, potassium, and chloride concentrations. The judicious selection of the indicated management fluid with appropriate electrolyte supplementation should be performed on a case-by-case basis to meet each patient's unique needs. Electrolyte imbalances, usually transient hyponatremia, hypokalemia and hyperchloremia with potential acidosis are observed when administering such fluids.

A standard maintenance fluid rate of 1- 1.5 mL/ Kg/ hour is recommended in the absence of any organ dysfunction or ongoing fluid disturbances.

Up to two-thirds of intravenously administered fluid ends up in the extravascular space, this extravasated fluid is commonly referred to as "third spacing" into soft tissue. This phenomenon usually resolves as the inflammatory response subsides and capillary permeability returns to homeostatic levels. Electrolyte imbalances tend to loosely follow a similar course, although they are much more unpredictable [11].

Nutritional Routes

In order to ensure adequate nutrition and hydration once all previously mentioned parameters are factored in, multiple modalities are available including enteral (oral or tube feeds,) and parenteral (intravenous) nutrition.

The Oral and maxillofacial surgery patient population more commonly displays increased need for enteral and parenteral nutritional supplementation due to the nature of the procedures and the anatomical limitations associated with such interventions.

Enteral nutrition

Intestinal route administration of nutrition via oral or tube feeds. A multitude of enteral supplements are available to choose from in various consistencies, energy densities, glucose content, protein content, and flavors to accommodate patient needs and requirements.

Parenteral nutrition

Intravenous route administration of nutrition rich in dextrose, protein, and necessary electrolytes. Indications for intervention include known nutritional deficits, anticipated changes in caloric intake and expenditure, and extent of disease and intervention.

There is a clear link between surgical outcomes and nutrition status.

A large cohort study was conducted to explore the relationship between preoperative nutritional supplementation in 512 surgical patients at risk of malnutrition. Lower complication rates were observed in the preoperative nutrition group when contrasted to the control group (25.6 versus 50.6 percent). Significantly shorter hospital stays were also observed (13.7 versus 17.9±11.3 days) [12].

Summary

All surgical patients, in particular those undergoing Oral and maxillofacial surgery, who are at increased risk of postoperative malnutrition should participate in a preoperative nutritional assessment to screen for supplementation need. This patient population specifically is at increased risk of malnutrition due to localized intervention in the oral cavity, and the head and neck. Discretional use of laboratory studies should be implemented to ascertain baseline information of caloric, protein, and electrolyte status.

Postoperative management to coordinate adequate caloric intake, protein consumption, glycemic control, and electrolyte balance is vital for an optimized and uncomplicated postoperative course. The surgical team can utilize nutrition consults to aid in formulating and scheduling meals. Speech pathologists may also be consulted to evaluate swallowing status to appropriately advance diet when necessary.

Numerous studies have been conducted to explore the effect of nutrition, or lack thereof, on surgical outcomes. The data available varies due to the vast range of surgical intervention in a multitude of settings. However, general consensus still remains that nutritional evaluation and supplementation, when indicated, demonstrated lower complication rates, shorter hospital stays, and reduced readmission rates.

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