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Nutritional and prosthodontic care for geriatric patients

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Abstract

Perfect health is a prize that has been the goal of mankind throughout all ages. It must be understood that there can be no separation between good bodily health and good dental health.

Oral health is not separate from general health, but maintaining oral health is definitely difficult and different in old age. For older patients, clinicians should consider maintaining teeth and using functionally-orientated treatment strategies as an alternative to removable prostheses. When the remaining dentition has a poor prognosis, key teeth should be preserved as overdenture abutments and a gradual transition to edentulousness planned. Where complete dentures are provided, these can be retained using dental implants to overcome many of the problems associated with conventional replacement dentures. The elderly population of today is better informed and more demanding of oral healthcare providers than previous generations. Clinicians should be aware of all the prosthodontic treatment options available for older patients.

Introduction

Aging is a natural process. Old age should be regarded as a normal, inevitable biological phenomenon. Elders above 65 years (old age) have health problems as a result of aging process, which calls for special consideration. Proper nutrition is essential to the health and comfort of oral tissues and healthy tissues enhance the possibility of successful prosthodontic treatment in the elderly.(1) In patients with partial or complete tooth loss, prosthetic therapy may be important to maintain or restore masticatory function. However, many other factors also are essential for the nutritional status of older adults. Thus, many age-related medical problems and diseases have nutritional aspects and the patient's socioeconomic status and dietary habits have a profound influence on their dietary selection. The dental team must be aware of these potential detrimental effects of dental treatment and provide counteractive dietary guidance.(2) Problems vary with the patient and the dental condition, so suggestions must be tailored to meet the patient's specific needs. The purpose of this article is to describe management of a contemporary denture patient and to make recommendations for solving complete denture problems.

Increased Life Expectancy

The current denture population may be characterized as having a larger number of medical problems that require the care of 1 or more physicians. It has been reported that the typical complete denture patients of today have a greater mean age, live independently, are financially able to afford care, and are retaining more teeth. Additionally, missing teeth are being replaced by more fixed partial dentures, more removable partial dentures, and more implant-supported prostheses. These patients are frequently taking a large number of medications, often prescribed by different physicians, without collaboration. These factors may result in tissue responses to complete dentures being less satisfactory and reduce the healing capacity of the oral tissues. Subsequently, it may be more difficult to manage the edentulous patient with predictable success. Clinically, many of these patients are seen with severely resorbed residual ridges and prominent anatomic landmarks or bony abnormalities. The soft tissues are often redundant and unsupported. Maxillary arches frequently demonstrate enlarged tuberosities and reundant anterior tissues resultant to the use of maxillary complete denture opposing a mandibular removable partial denture with natural anterior teeth. Anterior teeth on existing prostheses are often in occlusal contact because of wear and loss of vertical dimension. Some patients expect the anterior teeth of the new dentures to contact in a manner similar to their natural teeth. In many situations, the restoration of natural anterior tooth contacts could result in compromised function and esthetics, making it necessary to educate the patient about the need to modify the tooth position and tooth contact to facilitate an acceptable functional prognosis.

Expectation

A thorough examination is invaluable for proper diagnosis, treatment planning, and identification of realistic goals or expectations. Many patients are aware that physical changes have occurred in their bodies, but some are unaware of the impact on their oral cavities. Burnett et al points out that attempts to improve denture hygiene (habits) of veteran denture wearers with either verbal or written instructions were equally ineffective in changing the habits when reviewed 6 months after the instructional material was delivered.

Many common characteristics of an aged population, such as decreased neuromuscular coordination, reduced ability to sense where the mandible is in relation to the maxilla (oral awareness), and impaired ability to position the mandible or tongue in desired locations (oral dexterity), will complicate the complete denture treatment process.

Nutrition and Age

1. To establish a balanced diet which is consistent with the physical, social, psychological and economic background of the patient.
2. To provide temporary dietary supportive treatment, directed towards specific goals such as carries control, postoperative healing, or soft tissue conditioning.
3. To interpret factors peculiar to the denture age group of patients, which may relate to or complicate nutritional therapy.

Factors Affecting Nutrition

Physiological factors: With a decline in lean body mass in the elderly, caloric needs decrease and risk of falling increases.

Vitamin D deficiency in turn, is a major cause of metabolic bone disease in the elderly.

Declines in gastric acidity often occur with age and can cause malabsorption of food-bound vitamin B12.

Many nutrient deficiencies common in the elderly, including zinc and vitamin B6, seem to result in decreased or modified immune responses.

Dehydration, caused by declines in kidney function and total body water metabolism, is a major concern in the older population.

Overt deficiency of several vitamins is associated with neurological and/or behavioral impairment B1 (thiamin), B2, niacin, B6 [pyridoxine], B12, foliate, pantothenic acid, vitamin C and vitaminE).

Psychosocial factors: A host of life-situational factors increase nutritional risk in elders.
Elders, particularly at risk, include those living alone, the physically handicapped with insufficient care, the isolated, those with chronic disease and/or restrictive diets, reduced economic status and the oldest old.

Functional factors: Functional disabilities such as arthritis, stroke, vision, or hearing impairment, can affect nutritional.

Pharmacological factors: Most elders take several prescription and over-the counter medications daily.

Prescription drugs are the primary cause of anorexia, nausea, vomiting, gastrointestinal disturbances, xerostomia, taste loss and interference with nutrient absorption and utilization. These conditions can lead to nutrient deficiencies, weight loss and ultimate malnutrition.

Oral factors that affect diet and nutritional status
Xerostomia affects almost one in five older adults. Xerostomia is associated with difficulties in chewing and swallowing, all of which can adversely affect food selection and contribute to poor nutritional status. The use of drugs with hypo salivary side effects may have deleterious influence on denture bearing tissues.

Age-related changes in taste and smell may alter food choice and decrease diet quality in some people. Factors contributing to this reported decreased function may include health disorders, medications, oral hygiene, denture use and smoking.

The presence of natural teeth and well-fitting dentures were associated with higher and more varied nutrition intakes and greater dietary quality, in the oldest old Iowans sampled.

Effects of dentures on chewing ability as adult's age, they tend to use more strokes and chew longer, to prepare food for swallowing. Masticatory efficiency in complete denture wearers is approximately 80% lower than in people with intact natural dentition.

Nutritional Care for Geriatric Patients

Several of the larger studies noted that dentition status is associated with dietary intake however, most of the studies fail to show weather these associations are independent of common factors or total calorie intakes.

Energy needs decline with age due to a decrease in basal metabolism and decreased physical activity. Cross-sectional surveys show that the average energy consumption of 65-74 year old women is about 1300 kilocalories (Kcal) and 1800 Kcal for men of the same age. Caloric requirements decrease with advancing age. The mean RDA is 1600 Kcal for women and 2400 Kcal for men.

As the patients become older, the amount of protein required increases. Protein depletion of body stores in the elderly, is seen primarily as a decrease of the skeletal muscle mass. Proteins is a must for denture wearers. The RDA for proteins, for persons aged 51 and over, is 0.8-g protein/kg body weight per day. (56 gms for males and 46 gms for females, or 9 and 10% respectively, of the recommended calorie intake. The best sources of protein**s** for the elderly diet are dairy products, poultry, meats and fish in the boiled and not dried form. Nuts, grains, legumes and vegetables contain protein, which if eaten in the proper combination, is of the same quality as animal sources of protein.

The elderly consume a large proportion of their calories as carbohydrates, possibly at the expense of protein, because of their low cost, ability to be stored without refrigeration and ease of preparation. The recommended range of intake is 50 to 60 per cent of

total calories. Food sources include grains and cereals, vegetables, fruits and dairy products. An important component of complex carbohydrates is fiber, which promotes bowel function. Fiber in the form of bran is frequently added to dry cereals and breads, but vegetable fiber is more effective and less expensive. Reduced selection of foods rich in fiber that are hard to chew, could provoke gastrointestinal disturbances in some edentulous elderly, with deficient masticatory performance.

Elderly are particularly susceptible to negative water balance, usually caused by excessive water loss through damaged kidney. Inadequate intake of fluid by the elderly will lead to rapid dehydration and associated problems such as hypotension, elevated body temperature and dryness of the mucosa, decreased urine output and mental confusion. Under normal conditions, fluid intake should be at least 30 ml per kg body weight per day.

The RDA for vitamin A is 800-1000 micrograms. Vitamin A in food occurs in two forms: retinal, or active Vitamin A in animal foods (liver, milk and milk products and beta-carotene or pro-vitamin A, found in deep green and yellow fruits and vegetables (apricots, carrots, spinach).

Deficiency causes Bitot's spots (eyes), conjunctival and corneal xerosis (dryness), xerosis of skin, follicular hyperkeratosis, decreased salivary flow, dryness and keratosis of oral mucosa and decreased taste acuity. Long standing deficiency may cause hyperplasia of the gums, as well as generalized gingivitis The RDA has been set at 0.5 per 1000 calories, or at least 1 mg daily. Food sources include meats (especially pork and chicken), peas, whole grains, fortified grains, cereals and yeast. Deficiency causes beriberi. Vitamin B6 deficiency (pyridoxine) - ranges from 50 to 90% of the elderly affected. The RDA is 1.2-1.4 mg. Deficiency causes nasolabial seborrhea, glossitis.

Vitamin B12- RDA is 3.0 microgram. Food sources are kidney, heart, milk, eggs, liver and green leafy vegetables. Deficiency causes nasolabial seborrhea, fissuring and redness of eyelid corners and mouth magenta-colored tongue and genital dermatosis. The RDA is about 60 microgram. Food sources include citrus fruits, tomatoes, potatoes and leafy vegetables. Deficiency causes spongy, bleeding gums, petechiae, delayed healing tissues, painful joints. The elderly are frequently deficient in Vitamin D because of lack of sun exposure and an inability to synthesize Vitamin D in skin and convert it in the kidney. Vitamin D is found in fish liver oils. The RDA is 5 microgram. Deficiency causes bowlegs, beading of ribs. Vitamin E deficiency in the elderly does not seem to be a problem. Total plasma vitamin E levels increase with age.

All minerals also plays very important role in maintenance of health. Good food sources of folic acid include leafy green vegetables, oranges, liver, legumes and yeast. Deficiency causes megaloblastic anemia, mouth ulcers, glossodynia, glossitis, stomatitis. The recommended daily allowance of calcium is 800 mg/day. Because calcium absorption decreased in the elderly (lack of hydrochloric acid in the stomach), the calcium must be acidulated before digestion. Food sources of calcium include milk and milk products, dried beans and peas, canned Salmon, leafy green vegetables and tofu. Elderly patients with complete dentures often experience a rapid and excessive ridge resorption, which may be related to negative balance of calcium, which contributes to development of osteoporosis. The RDA for iron is 10 mg. Good food sources include meat, fish, poultry, whole grains, fortified breads and cereals, leafy green vegetables, dried beans and peas. Deficiency causes burning tongue, dry mouth, anemia and angular cheilosis.

Treatment planning for partially dentate patients with good prognosis

As rates of edentulousness decline, clinicians are faced with treating increasing numbers of older partially dentate patients. If prosthodontic replacement of teeth is required, the majority receive **removable partial dentures (RPDs)** to meet functional and aesthetic demands. There is always a biological price associated with RPD provision, but the risk of disease can be reduced if patients maintain a good standard of oral hygiene and their previous dental history indicates a low risk of disease. Given the propensity for RPDs to complicate plaque control, it is vital that they are designed using hygienic principles. RPDs constructed with a cobalt-chromium framework can be used to minimize gingival coverage and ensure that

components do not encroach on root surfaces. Frameworks for dentures should not be overly complicated, and the minimal number of components needed to provide adequate retention and support should be provided. Ideally, unless additions are planned, **cobalt chromium frameworks** should be favoured over acrylic baseplates. **Acrylic RPDs** often gain retention through extending over the soft tissues or engaging with the embrasure spaces of remaining teeth. They can be unhygienic and cause trauma to the soft tissues, thus their use should be limited where possible. Some researchers have suggested that older adults have different functional needs from young patients and therefore do not need a complete natural dentition.[4]

The concept of **'minimally invasive dentistry (MID)'** has also been proposed as an effective and acceptable form of dental management for older adults. In addition to caries prevention strategies and conservative management of cavities, this strategy also includes the use of **resin-bonded or cement-retained bridges** to maintain shortened dental arches where anterior teeth are missing. The use of bridgework instead of RPDs. In this way has been shown to be an effective means of replacing missing teeth with a reduced maintenance burden. Especially in partially reduced dentitions with (almost) sound remaining teeth, resin-bonded bridges offer a good treatment alternative to RPDs. They are relatively easy to place, are relatively inexpensive and well accepted by the patient. The biological price is low compared to conventional bridges and RPDs.

Glass fibre-reinforced composite bridgework can also be used to restore patients with a shortened dental arch. Fibre-reinforced composite, resin-bonded bridges can be made both directly in the mouth by the clinician or indirectly in a dental laboratory. However, for use in the management of partially reduced dentitions in the elderly, this is compensated for by the relative ease with which they can be repaired and extended, if necessary.

These functionally-oriented treatment strategies aim to reduce the burden of maintenance for older adults. It is essential that the remaining natural dentition has a good long-term prognosis, and that the patient is sufficiently motivated (and physically able) to be able to maintain a good standard of oral hygiene and thus reduce the risk of further tooth loss.

Treatment planning for partially edentulous with poor prognosis[2]

In certain clinical situations, it is very likely that the patient will eventually lose all of his/her natural teeth. These situations can include the following considerations: Questionable patient motivation, advanced periodontal disease, poorly controlled caries, advanced tooth wear, financial considerations.

Immediate Denture: The goal of **Immediate Denture** therapy is to maintain satisfactory appearance and function during the post-extraction phase of treatment. When providing immediate replacement dentures. The patient must also be advised that immediate dentures are intended to be temporary, and will probably have to be replaced after 6–12 months. Removable partial dentures can be used to replace mainly posterior teeth in the first instance. An existing partial denture can be immediately added to or an acrylic prosthesis fabricated. After a suitable transitional period, six months is usually sufficient, the clinician may convert the transitional partial denture to a complete immediate replacement denture. Occasionally, it is possible to rebase the immediate replacement dentures but, in most cases, new replacement complete dentures would be required after 6–12 months.

Maintaining key teeth

OVERDENTURES: Providing an older person with his/her first complete replacement denture can be a difficult experience for both clinician and patient. One possible alternative to complete tooth loss is the retention of a number of strategically important teeth and the utilization of overdentures. Overdentures have proven to be very successful, especially in the mandible where bone resorption can severely compromise denture stability and retention.

Advantages of overdentures

As the oral health of older adults improves, it seems likely that older adults will be less likely to accept that tooth loss is an inevitable part of the ageing process. Consequently, retaining some portion of their natural dentition will be of great benefit. They can be useful if partial denture construction is proving difficult, for example in cases with unsuitable abutment teeth or where saddles have conflicting paths of insertion. Overdentures can prove successful in hypodontia cases as well as cleft palate or surgical defect cases. With non-carious tooth surface loss, an increasing problem amongst older patients, overdentures can be used as diagnostic or definitive prostheses to restore teeth. Planning for overdentures requires the careful assessment of potential abutment teeth. The prognosis for the retained teeth should be good, and they should be considered restorable.[4]

Saving some of the remaining natural teeth can convey huge psychological benefits to the patient. As

well as making the denture feel more secure, patients are comforted by the fact that they still retain some of their own natural teeth. Through the retained roots, sensory feedback and proprioception are maintained, helping to provide an awareness of jaw-space relationships and improving chewing efficiency.

Greatly enhance support for the denture. By utilizing teeth to retain the prosthesis, alveolar bone is preserved, thus reducing loss of vertical dimension and lip support.

Patients for whom overdentures may be indicated are often not ideal dental patients. They will have lost teeth due to a combination of disease susceptibility and neglect. Vigilance is therefore essential and a programme of intensive maintenance will be required. Unfortunately, caries and periodontal disease are common problems associated with overdenture abutments. In addition, if an adequate thickness of acrylic is not provided over the abutment teeth, the prosthesis can be susceptible to fracture.

In cases where retention is severely compromised, the clinician can consider the use of precision attachments to enhance denture retention. A precision attachment is an interlocking device, one component of which is fixed to an abutment, while the other is incorporated into a denture or bridge. Precision attachments can be particularly useful when providing elderly patients with a complete denture for the first time. They can also be utilized successfully in patients with poor muscular control, including those suffering from Parkinson's disease or a post-cerebrovascular accident.

Treatment planning in completely edentulous patients

Despite falling rates of edentulousness, many elderly patients still require prosthodontic replacement of all their natural teeth. Successful provision of **complete dentures**, even for patients with experience of wearing previous prostheses, can be challenging as many have resorbed alveolar ridges and postural jaw relationships. However, many patients can be successfully managed using conventional complete replacement dentures when fundamental prosthodontics principles are applied. Care should be taken to ensure that dentures are well extended, especially in the mandible, to take advantage of retention from the retromolar pads, and that balanced articulation has been achieved. Patients who present wearing existing complete dentures which have proved successful can be candidates for copy dentures, or at least incorporation of the successful features into new conventional dentures.

Preprosthetic Care[5]

Long-term denture use, especially of a poorly maintained or ill-fitting denture, can lead to tissue trauma and chronic soreness. These conditions must be corrected before new denture fabrication by use of tissue rest, tissue conditioning, or preprosthetic surgery. Adequate tissue rest by way of denture removal for a period of days is a common method of correction. The use of tissue conditioners is the next procedure that can help return the tissues to a healthy condition. Tissue conditioning therapy is often requisite to surgical procedures and can provide suitable modification of an existing complete denture for use during the treatment phase.

Preprosthetic surgery may be viewed as a questionable treatment recommendation by an experienced denture wearer unaware of the deleterious tissue response that has developed. One of the more frequent treatment recommendations is the surgical management of large tuberosities. Failure to recognize and manage enlarged tuberosities may impede the clinician's ability to develop proper vertical dimension and occlusal plane orientation. Both of these considerations impact the forces applied to the denture bases during function and parafunction. Denture base movement and lack of stability is a common cause of soreness and lack of retention.

Another preprosthetic procedure frequently overlooked is soft tissue removal from the superior and lingual surfaces of the retromolar pad. This procedure provides a firm retromolar pad with a shallower slope in the molar area. When unrecognized, this region may be distorted during impression making, potentially resulting in tissue impingement and patient soreness. The removal of redundant tissues covering a sharp or highly resorbed residual ridge, or augmentation of redundant tissue with artificial materials has fallen into disfavor because of frequent complications.

With the predictability of osseo-integration there has been a growing shift towards the routine use of **implants** to stabilize complete removable prostheses.

This is driven by the fact that implants can overcome many of the functional, psychological and physiological consequences of edentulousness. Implants help to preserve alveolar bone and bite force is increased when compared with conventional complete dentures. This may enable the patient to chew food with a higher nutritional value, which is important for general health. However, providing **implant supported prosthodontics** involves more complex and lengthy treatment procedures than conventional care.

Prior to implant placement, careful planning is required to assess the width and height of the alveolar ridge present. Bone augmentation may be required prior to implant surgery if insufficient bone levels are present to support the implants. Patients suffering from any condition that precludes a minor oral surgical procedure, eg poorly controlled diabetes mellitus, blood dyscrasia, immunologically compromised, would be unsuitable for implant placement. Amongst elderly patients, particular attention should also be paid to any history of head and neck radiotherapy and use of bisphosphonate medications. Whilst not universally considered an absolute contra-indication, patients who smoke should be advised that the failure of implants and postoperative complications are much higher in smokers than non-smokers.

In addition, as with other prosthodontic treatment options, **implant-retained dentures** require careful maintenance from both the patient and clinician. Implant-retained prostheses have been a major advance in the treatment of patients with denture wearing difficulties, and offer the possibility of overcoming many of the problems associated with conventional replacement dentures. Evidence suggests that implant-retained mandibular overdentures should be considered as first choice treatment for edentulous patients. However, for many elderly patients who could benefit most from implant-retained prosthodontics, they remain financially prohibitive.

Conclusion

Many Prosthesis failures are the result of nutritional deficiencies. Good health and nutrition of older patients are necessary for the successful wearing of dentures or any prosthesis. A better informed, more demanding elderly population is less likely to accept traditional treatment philosophies based around extractions and replacement of teeth with complete dentures. Functionally-orientated and minimally invasive treatment strategies can enable older patients to maintain natural teeth and avoid the need for a removable prosthesis. For those patients who will lose natural teeth, key teeth should be preserved to support overdentures or a careful transition to edentulousness should be planned.

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