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Role of diabetes in the prosthodontic management of a completely edentulous patient

Rathee M[1], Jain P[1], Singh S[2*], Divakar S[1], Chahal S[1], Wakure P[1]

[1] Department of Prosthodontics, Post Graduate Institute of Dental Sciences, Pandit Bhagwat Dayal Sharma University of Health Sciences, Rohtak, Haryana, India

[2] Post Graduate Student, Department of Prosthodontics, Post Graduate Institute of Dental Sciences, Pandit Bhagwat Dayal Sharma University of Health Sciences, Rohtak, Haryana, India

Abstract
Diabetes is a common disease associated with oral manifestations that can affect dental care. Dentists must be well-acquainted with techniques to diagnose, treat and prevent stomatological disorders in patients with diabetes. Diabetes mellitus type 2 is a globally pandemic disease. Contributing factors include genetics, obesity, physical inactivity and advancing age. The purpose of this review is to summarize the types, etiology, diagnosis, oral manifestation and treatment of diabetes, as well as role of diabetes in the success of complete denture treatment.

Keywords: diabetes mellitus, hyperglycemia, complete denture treatment, prosthodontic management

Introduction

Diabetes mellitus, is a group of metabolic disorders in which blood sugar levels are abnormally high over a prolonged period of time. It is characterized by three P's i.e. polydipsia, polyuria, and polyphagia. These terms correspond to increase in thirst, urination, and appetite, respectively (Davidson *et al*., 2018) [1]. Dentists can decrease the fatality associated with diabetes by referring patients with symptoms of diabetes to physicians for further evaluation and treatment (Vernillo *et al* 2003) [2].

Types and Etiology

In Diabetes either the pancreas does not produce enough insulin, or the cells do not respond properly to the insulin produced. Diabetes can be classified into the following categories:

1. Type 1 diabetes results from pancreas not producing enough insulin due to loss of beta cells. Also called as "insulin-dependent diabetes mellitus". It is an autoimmune disorder [1].
2. Type 2 diabetes is due to insulin resistance, a condition in which cells fail to respond to insulin properly. It is also termed as "non-insulin-dependent diabetes mellitus" (NIDDM). Most common cause is a combination of excessive body weight and insufficient exercise [1].
3. Gestational diabetes (diabetes diagnosed in the second or third trimester of pregnancy that is not clearly overt diabetes) is characterized by high blood sugar level during pregnancy. It affects 10% of pregnant women. It can also affect pregnancy and baby's health.

According to American Diabetes Association (2015), specific types of diabetes due to other causes include monogenic diabetes syndromes (maturity-onset diabetes of the young [MODY]), diseases of the exocrine pancreas (such as cystic fibrosis), and drug or chemical-induced diabetes (In the treatment of HIV or after organ transplantation) [3].

(Katariya *et al*., 2017) Prosthodontic concerns in a diabetic patient [4]

The factors that should be considered in a diabetic patient before and during the prosthodontic treatment are discussed below.

a. Salivary hypofunction
b. Candida infections
c. Denture stomatitis
d. Poor wound healing
e. Burning mouth syndrome
f. Dental caries
g. Residual ridge resorption
h. Antibiotic consideration
i. Anaesthetic consideration

Salivary hypofunction

Xerostomia is the most common complication of diabetes mellitus. Diabetes mellitus is well known to alter qualitatively and quantitatively the parenchyma of major salivary glands leading to hypo salivation (Rahman *et al*., 2013) [5]. Patient has difficulty in wearing denture and has constant irritation in the mucosa. Patient is instructed to wet his mouth constantly during appointments and sugar free salivary substitutes which are available in the form of tablet, gel, paste and swab can be given if condition is severe. Cholinergic agonist drugs such as pilocarpine (Salagen) or cevimeline (Evoxac) can also be prescribed.

Candidal infection

Hypo salivation is normally associated with augmentation of fungi such as Candida albicans and other species leading to increased chance of oral infections [5]. Candidal infection occurs due to change in pH, increased salivary glucose levels and immune dysregulation in diabetic patients. The manifestations of oral candidiasis may occur in different forms such as median rhomboid glossitis, atrophic glossitis,

denture stomatitis and angular chelitis (Guggenheimer *et al*., 2000) [6].

Delayed or impaired wound healing

It occurs in diabetes because of poor blood supply to the tissues, microvascular angiopathic changes, reduced oxygen to the cells, reduction of collagen production, increased collagenase activity (Loo *et al*., 2009) [7]. Any surgical procedure planned like pre-prosthetic surgery or dental implant placement should be performed only when normal glycemic levels are achieved.

Burning mouth syndrome

Most diabetic patients experience altered taste sensation, burning mouth syndrome, dysphagia etc. The cause for this is due to the variations in the salivary flow, changes in the buffering capacity of saliva and peripheral neuropathy (Ship *et al*.,2003) [8].

Increased caries risk

In diabetes mellitus, there is increased risk of caries and periodontal problems. Periodontitis is the sixth complication of diabetes [9]. Risk of caries increase due to change in the oral environment because of decreased salivary flow and pH and increased pathogenic bacterial growth in the mouth which results in damage to the hard and soft tissue of the teeth (Loe *et al* 1993) [4].

Residual ridge resorption

Diabetes is associated with increased level of residual ridge resorption. Decreased blood supply to the tissues because of microvascular angiopathy increase the amount of residual ridge resorption.

Antibiotic consideration

Antibiotic coverage (Penicillin V of Erythromycin) is strictly recommended in diabetic patients before implant placement or invasive surgery.

Anaesthetic Consideration

During local anaesthesia, excessive quantities of epinephrine should be avoided. In gingival retraction, retraction cords impregnated with epinephrine should also be avoided. Epinephrine breakdowns glycogen to glucose and this results in the precipitation of hyperglycemia. Alumina or zinc chloride-based retraction cords are preferred in patients with diabetes (Kostić *et al*., 2012) [10].

Diabetes and success of complete denture treatment

In Diabetes resilience of Oral mucous membrane loses because of xerostomia which indirectly affect the retention of complete denture. Resiliency of soft tissues is an important factor for acceptable adaptation of the denture.

Functional salivary reservoir in maxillary complete denture

Complete dentures are difficult to be tolerated by patients with xerostomia. A salivary reservoir can be made into a denture that provides slow, sustained, and continuous release of salivary substitute. It is simple, cost effective, easy to use, Clean and refill the reservoir. The disadvantage of this is that the patient should manually refill the reservoir at regular intervals and high degree of precision is mandatory to ensure accurate and smoothly fitting of the reservoir lid (Joseph *et al*., 2016) [11].

Candidal stomatitis treatment

Candida-associated denture stomatitis, even if asymptomatic, should be treated extensively as it may act as reservoir for infections and encourage the resorption of the alveolar bone. Recommended antifungal drugs for treatment of oral candidiasis: topical administration (Nystatin, Amphotericin, Miconazole, Clotrimazole), systemic administration (Ketoconazole, Fluconazole, Itraconazole). The chemical method is considered to be the most effective for inhibiting Candida albicans infection. Chemical denture cleaners such as alkaline peroxides, alkaline hypochlorite, acids, disinfectants, and enzymes can be used as an alternative to regular brushing. Microwave irradiation has proved to be a safe, simple, easy to use, effective, and inexpensive disinfection method that can be used not only to disinfect dentures, but also for the treatment of denture stomatitis (Gleiznys *et al*.,2015) [12].

Frequent Relining and Rebasing

Frequent relining and rebasing of complete denture is required due to more ridge resorption. Residual ridge Resorption can be decreased by having broad area of coverage under the denture base. A decrease in the number of artificial teeth, decrease in the buccolingual width, improved occlusal tooth design are some of the other techniques that may also be used (Samyukta *et al*., 2016) [13]. Denture border and tissue surfaces of the dentures should be smooth without any sharp nodules or over extensions to prevent tissue damage as there is impaired or delayed wound healing,any sharp nodule may result in ulceration [5].

Impression technique for prosthesis fabrication

Due to more residual ridge resorption in diabetic patient, mucostatic or minimal pressure impression technique or neutral zone impression technique is recommended for impression making in such patients. These approaches will decrease the stress on the underlying tissue to retard bone resorption.

Liquid supported dentures

In diabetic patients, liquid supported denture bases are good alternatives then conventional dentures. An ideal denture base would continuously adapt to the mucosa and thus should be flexible. However, it also has to support the teeth during function and thus should be rigid. Liquid supported dentures combine both the features.

Liquid supported dentures offer minimal distribution of forces and hence preservation of residual ridge, better retention, stability and support, prevention of chronic soreness from rigid denture bases, comfort to the patients with flexible surfaces, and improved patient tolerance. Liquid dentures thus provide benefits of soft liners and tissue conditioners on long term basis (Kaur *et al*.,2014) [14].

Prosthodontic Management

Eradication of disease that will affect the prognosis of any dental prosthesis will be the first line of treatment. Teeth which require restoration must be managed by appropriate restorative procedures like filling, endodontic treatment etc. Restoration and the maintenance of good oral hygiene is most important before starting any prosthodontic

procedures. First visit of the patient should include proper history taking and examination. All details regarding different types of prosthesis, duration of treatment, number of appointments required must be explained to the patient in his native language (Roumanas *et al*.,2002) [15]. Radiographic evaluation must be carried out. Patient is advised to bring reports of recently done and up to date laboratory investigation regarding blood sugar level. Secondly, with the help of simple glucometer we should check blood sugar level before starting any dental procedure. Patient must be instructed to consult his or her physician before initiating any procedure (Habib *et al*.,2002) [16].

Conclusion

The ultimate goal of prosthodontic therapy for diabetic patients requires thorough understanding of the disease and acquaintance with its clinical manifestations. The dentist can play a vital role in referring patients with signs and symptoms suggestive of diabetes to a physician for additional evaluation. The patient with systemic complications due to diabetes may require modification of the dental treatment plan following a consultation with the patient's physician. Good oral & denture hygiene maintenance and proper dental checkup is a prerequisite for ensuring the long-term successful prosthodontics treatment.

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