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Evaluation Of Implant Supported Overdenture In Diabetic Patients: A Review

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Abstract : Diabetes mellitus is a pandemic metabolic disease prevailing globally and is characterized by chronic hyperglycemia due to absolute or relative deficiency of insulin. It affects most parts of human body including the oral cavity. Modern medical care uses a vast array of lifestyle and pharmaceutical interventions aimed at preventing and controlling hyperglycemia. In addition to ensuring the adequate delivery of glucose to the tissues of the body, treatment of diabetes attempts to decrease the likelihood that the tissues of the body are harmed by hyperglycemia.

Keywords – Implant supported overdenture, Diabetes, Treatment, Failure

I. Introduction

Diabetes is fast gaining the status of a potential epidemic in India with more than 62 million diabetic individuals currently diagnosed with the disease. In 2000, India (31.7 million) topped the world with the highest number of people with diabetes mellitus followed by China (20.8 million) with the United States (17.7 million) in second and third place respectively. the prevalence of diabetes is predicted to double globally from 171 million in 2000 to 366 million in 2030 with a maximum increase in India. It is predicted that by 2030 diabetes mellitus may afflict up to 79.4 million individuals in India, while China (42.3 million) and the United States (30.3 million) will also see significant increases in those affected by the disease. India currently faces an uncertain future in relation to the potential burden that diabetes may impose upon the country.[1]

Long term studies on the DM has shown various complications. Broadly they come under microvascular complication and macrovascular complication.[2] During the treatment planning of dental implant supported overdenture in DM patient surgeon should know all the complications of DM and its management. As the treatment outcomes will deliberately affect due to the same. Number of studies has proved the adverse effect of chronic hyperglycemia on oral mucosa and with some controversies on alveolar bone. This review article gives actual scenario to practicing implantologist regarding success and failure of dental implant supported overdenture treatment in diabetic individuals observed by various studies.

II. Bone and osteointegration in diabetes patient after treatment with IOD:

The persistent hyperglycemia in diabetic individuals, inhibit osteoblastic activity and alters the response of parathyroid hormone which in turn decreases collagen formation during callus formation, induces apoptosis in lining cells of bone and increases osteoclastic activity due to persistent inflammatory response. It also induces deleterious effect on bone matrix and diminishes growth and accumulation of extracellular matrix. The consequent result is diminished bone formation during healing[3]

Type -1 diabetes causes decreased bone mineral density, as well as reduced bone formation and higher bone resorption[4]. Whereas Type -2 diabetes produces normal or greater bone mineral density in some patients[5]. Constant hyperglycaemia delays the healing of the bone around the implants.Osteopenia associated with diabetes induced in animals can be reversed when treatment with insulin is applied. When implants are placed in the tibia of diabetic rats, a reduction of 50% is observed in the bone formation area and on the bone - implant contact surface. If insulin is used, the ultra-structural characteristics of the bone-implant interface become similar to those in the control group. These results suggest that metabolic control is essential for osseointegration to take place. Although the insulin therapy

allows regulation of bone formation around the implants and increases the amount of neoformed bone, it was not possible to equal the bone-implant contact when compared with non-diabetic groups[6].

III. Clinical outcomes of diabetes patient after treatment with IOD:

A study was performed on 89 diabetic patients, where IOD was given to 52 of them and clinical outcome was seen at 6 months and 24 months. A total of 102 diabetic patients, treated with or without insulin, were randomized to receive a new maxillary denture and either a conventional or an implant-supported removable mandibular overdenture. Treatment was completed for 89 patients, 37 with the conventional and 52 with implant supported dentures. Detailed examinations, tests, and questionnaires were given before and at 6- and 24- months after treatment completion. Comparisons between the two treatment groups were made.

Clinical outcomes of IOD was explained in terms of 1) Attachment levels and alveolar bone height measurements around implants; 2) Assessment of general health status; 3) Assessment of the clinical quality of dentures and tissue support.

The IOD were superior to the original dentures in terms of retention, stability, and occlusion. The better fit considerably reduced the number of patients with moderate-to-severe chewing discomfort and increased the percentage of patients with high overall satisfaction with both types of study dentures. The mandibular IOD denture was found to be clinically more retentive and stable even after 24 months but caused tissue trauma in fewer patients. A higher percentage of patients of IOD perceived improvement in chewing comfort and overall satisfaction. One failure in IOD resulted from complete dissatisfaction. Patients with successful treatment required few maintenance care visits for clip replacements to correct their problem. Patients with treatment failures required excessive maintenance care, in the IOD group required clip replacements and denture repairs.[7]

IV. Marginal bone height changes of diabetes patient after treatment with IOD:

A study was conducted to evaluate the marginal bone height changes around dental implants in mandibular implant-retained complete acrylic overdentures using cone beam computed tomography (CBCT) with implementation of both immediate and delayed loading protocols in controlled type II diabetes mellitus (DM) patients.

Twenty completely edentulous controlled diabetic patients were selected to participate in this study to receive mandibular implant-retained overdentures. Then, the study patients were randomly divided into two equal groups according to the loading protocol: group I, ten patients had received complete overdentures retained with two implants and two ball attachments while applying the immediate implant loading protocol and group II, ten patients had received complete overdentures retained with two implants and two ball attachments while applying the delayed implant loading protocol. For each patient, a computer-guided surgical stent was prepared for CBCT assessment to properly determine the dimensions and angulations of the two implants that were inserted in the inter-foraminal region. Afterward, the dental prosthetic was loaded, and a second CBCT was done for each patient to measure the marginal alveolar bone height. Then CBCTs were periodically performed after a period of 6 and 12 months after prosthetic loading in order to monitor the changes in marginal bone height surrounding the inserted dental implants.

Statistical analysis of obtained records revealed no significant difference between the two loading protocols in the studied groups[8]. Within limitations of this randomized clinical study on type II diabetic patients that were controlled through all study period, it can be concluded that both immediate and delayed loading protocols for flapless implant retained mandibular overdentures achieve a successful clinical outcome regarding osseointegration and preservation of marginal bone height.

V. Impact of crestal level position of implants of diabetes patient with IOD:

A randomized controlled trial assessed the impact of crestal level position of implants installed in type 2 diabetes mellitus (T2DM) patients rehabilitated with overdentures. Twenty-two mandibular edentulous T2DM patients were submitted to implant placement for retention of an overdenture. By means of a split-mouth design, two implants were installed:one at supracrestal level (SL) and oneat crestal level (CL). Clinical, immunoenzymatic and tomographic analyses were performed at prosthesis placement (baseline) and after 6, 12 and 24 months following implant loading.

Increased peri-implant probing depths were detected in CL implants when compared with SL implants at all time-points. Indeed, augmented clinical attachment levels were also detected in CL implants when compared with SL implants at all time- points. CL implants demonstrated increased amounts of interleukin-6 (IL-6) at 6 months and higher IL-17, IL-21 and tumour necrosis factor alpha (TNF-a) concentrations at 24 months in comparison with SL implants. CL group revealed enhanced bone loss from baseline to 6, 12 and 24 months when compared with SL.

In conclusion, this study showed that implants placed supracrestally in T2DM patients rehabilitated with overdentures demonstrated lower bone loss and better clinical parameters with beneficial modulation of peri-implant immunoinflammatory biomarkers when compared with implants positioned at crestal level.[9]

VI. Discussion:

Proper selection of patients for dental implants treatment is one of the most important factors that can influence the prognosis and integration of implants. A primary complication in the integration of dental implants includes traumatic surgery, in which the frictional heat generated during placement of implant causes necrosis to the surrounding tissues and consequently lack of healing and integration. A second complication that interferes with bone integration is an implant recipient site of low healing potential.

The success rate was higher by in the IOD group than that in the CD group. It would seem more reasonable to consider a mandibular IOD after clinically acceptable existing or new conventional dentures fail to meet a patient's needs. The existing conventional denture could be modified to an implant overdenture without duplicate costs. Further insight will be gained on this issue by the ongoing data analyses of functional outcomes such as masticatory performances, muscle activity, biting forces, and jaw movements during chewing and dietary intakes. Even the fairly or moderately controlled diabetes persisting for very longer duration (more than 10 years)may produce complications and diminish the health of tissues.The compromised condition along with some unfavorable restorative factors may bargain the success ofdental implants. Therefore, numerous factors associated with rehabilitation and diabetes itself, more or less, affect the survival of dental implant in diabetic subjects.

Conclusion

The survival of dental implant in well/fairly controlled diabetic patients appears as good as in general population. Use of prophylactic antibiotic, longer duration of post surgical antibiotic course, chlorhexidine mouth rinse, bioactive material coated implants and implant with higher width and length seems to further improve the survival of implant in diabetic individuals. However, it is advisable to delay the placement of implant in poorly controlled diabetics till the control of diabetes. Longer duration prospective clinical studies with greater number of diabetic individuals and non-diabetic controls are still recquired to develop better understanding of impact of diabetes over dental implant success.

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