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Research Article

**AN OVERVIEW OF DENTAL IMPLANTS IN DIABETIC
PATIENTS, RISK AND COMPLICATIONS**¹Saad Abdullah Alqarni, ²Samaher Mohammad Almarshedy, ³ABDULLAH Faisal Alim, ⁴Shaza
Jamil Ashqar**Article Received:** August 2019**Accepted:** September 2019**Published:** October 2019**Abstract:**

In this review we discuss the background of diabetes, survival risks, complications and if there any prohibition of carrying out this surgical technique in diabetic patients. We performed a comprehensive search using electronic databases; MEDLINE, EMBASE, and google scholar, through September, 2019. Search strategies used following MeSH terms in searching via these databases: "dental implants" "diabetic patients", "complications", "diabetes", "management", "treatment". Dental implants offer substantial benefits that call for that they be thought about for the treatment of a vast spectrum of patients, including the expanding variety of individuals with diabetic issues mellitus. Although uncontrolled diabetes mellitus has been revealed to disrupt various elements of the healing procedure, the results of the research studies show that a high success rate is achievable when oral implants are put in diabetic people whose illness is controlled. It is advisable to postpone the placement of implant in badly regulated diabetics till the control of diabetic issues.

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INTRODUCTION:

A complex syndrome with more than one cause, diabetes is responsible for numerous complications affecting the whole body. In the oral environment, it has been associated with xerostomia, increased levels of salivary glucose, swelling of the parotid gland, and an increased (2) incidence of caries. Adult diabetics also experience a 2.8 to 3.4 times higher risk of developing (3) periodontitis than nondiabetics. Although there has been some conflicting evidence, diabetic patients (4-6) seem to be more prone to infection. Healing after surgery in the diabetic patient seems to occur more slowly, exposing the tissues to complications (7) such as tissue necrosis. Furthermore, animal studies indicate that streptozotocin-induced diabetes interferes with the process of (8,9) osseointegration. A complex syndrome with more than one cause, diabetes is responsible for numerous complications affecting the whole body. In the oral environment, it has been associated with xerostomia, increased levels of salivary glucose, swelling of the parotid gland, and an increased (2) incidence of caries. Adult diabetics also experience a 2.8 to 3.4 times higher risk of developing (3) periodontitis than nondiabetics. Although there has been some conflicting evidence, diabetic patients (4-6) seem to be more prone to infection. Healing after surgery in the diabetic patient seems to occur more slowly, exposing the tissues to complications (7) such as tissue necrosis. Furthermore, animal studies indicate that streptozotocin-induced diabetes interferes with the process of (8,9) osseointegration.

Today, dental implants are among the remedial methods to change missing teeth. Improvements in dental implant design, surface area attributes, and medical records made implants a protected and extremely foreseeable treatment with a mean survival rate of 94.6 % and a mean success rate of 89.7 % after more than 10 years [1]. Implant survival is at first dependent on effective osseointegration following placing. Any type of change of this biological process might negatively impact therapy outcome. Consequently, as an implant is recovered and placed into function, bone alteration becomes a vital facet of dental implant survival in replying to the practical needs put on the dental implant restoration and supporting bone. The important reliance on bone metabolism for implant survival leads us to analysis of certain danger components. Among the questionable discussed ailments is diabetes mellitus.

Diabetes mellitus is a chronic metabolic problem that causes hyperglycemia, which raises multiple difficulties brought on by micro- and

macroangiopathy. Diabetic patients have boosted frequency of periodontitis and tooth loss, postponed wound healing, and damaged reaction to infection [2]. In 1980, greater than 150 million people around the world were influenced and that number had grown to 350 million by 2008 [3].

A complicated sign with more than one reasons, diabetes oversees countless complications impacting the entire body. In the oral environment, it has been related to xerostomia, raised degrees of salivary glucose, swelling of the parotid gland, and an increased occurrence of cavities [4]. Adult diabetics additionally experience a 2.8 to 3.4 times greater danger of developing periodontitis than nondiabetics [4]. Healing after surgical procedure in the diabetic person patient seems to take place more slowly, revealing the tissues to problems such as tissue death [4]. Moreover, animal researches show that streptozotocin-induced diabetes mellitus disrupts the procedure of osseointegration [5]. Because of such considerations, diabetic issues has actually occasionally been thought about a contraindication for using dental implants.

A sufficient dental recovery allows the patient to boost nourishment and the metabolic control. On the other hand, it is still unclear how high quality of diabetes treatment and period of illness affect the success of dental implants. The capability to expect outcomes is an important part of risk management in dental implant surgery. Identifying conditions that place the patient at a higher threat of complications will certainly enable the surgeon to make the right decisions and improve the therapy plan to enhance the results. For that reason, in this review we discuss the background of diabetes, survival risks, complications and if there any prohibition of carrying out this surgical technique in diabetic patients.

METHODOLOGY:

We performed a comprehensive search using electronic databases; MEDLINE, EMBASE, and google scholar, through September, 2019. Search strategies used following MeSH terms in searching via these databases: “dental implants” “diabetic patients”, “complications”, “diabetes”, “management”, “treatment”. Then we also searched the bibliographies of included studies for further relevant references to our review. Restriction to only English published study with human subject.

DISCUSSION:**• DIABETES**

There are two major kinds of diabetic issues: Type 1 is brought on by an autoimmune response ruining the β cells of the pancreas, causing an inadequate production of insulin; and Type 2 is considered as a resistance to insulin in connection with an inability to create extra compensatory insulin. Type 2, typically linked with excessive weight, is the primary form,

significantly in the grown-up populace offering for dental implant therapy [6].

Consistent high levels of plasma glycaemia are related to different systemic difficulties (Table 2). Oral complications of DM consist of xerostomia, swelling of the parotid gland and a raised occurrence of cavities and periodontitis (Table 3).

Table 1. Classification of DM [6].

<p>Type 1 diabetes</p> <ul style="list-style-type: none"> • Immune mediated • Idiopathic
<p>Type 2 diabetes</p> <ul style="list-style-type: none"> • Genetic defects of β cell function or defects of insulin action • Pancreatic disease • Drug induced -Corticosteroids, Thiazide diuretics, Phenytoin • Viral infections -Congenital rubella, Mumps, Coxsackie virus B • Genetic syndromes- Down's syndrome, Klinefelter's syndrome, Turner's syndrome • Excess endogenous production of hormonal antagonists to insulin

Table 2. Complications of DM [2].

<p>Microvascular</p> <ul style="list-style-type: none"> • Neuropathic Retinopathy • Nephropathy • Peripheral or autonomic neuropathy • Foot disease • Erectile dysfunction • Periodontal disease
<p>Macrovascular</p> <ul style="list-style-type: none"> • Myocardial ischemia • Cerebrovascular disease • Peripheral arterial disease

Table 3. Oral manifestations of DM [2].

<ul style="list-style-type: none"> • burning mouth syndrome • dental caries • candidiasis • periodontal disease • glossodynia • lichen planus • salivary dysfunction • altered taste • xerostomia • delayed wound healing

• **Implant Placement As A Treatment Choice**

Oral implants are unreactive, alloplastic materials embedded in the maxilla and/or mandible for the management of missing teeth and to aid replacement of shed orofacial structures as a result of injury, neoplasia and congenital defects. One of the most usual kind of oral implant is endosseous implant.

An intimate relationship in between the bone and the implant comes to be developed during the healing procedure, called - "osseointegration" [7]. This process is vital for the security and long life of the dental implant, which secondarily sustains the prosthetic component. A prerequisite problem is that there must be enough osseous bone bordering the dental implant-- around 1 mm extensive [7] Failing or lack of osseointegration is primarily defined by the

loss of bone around the base of the implant. Endosseous-implant treatments can be successful for the substitute of shed teeth; diabetic issues are still considered a dangerous problem when embarking on such treatment [7].

- **Effects Of Diabetes On Osseointegration Of Implants**

Although there are reports evaluating the success and failing rates for implants in diabetic person patients, only experimental researches with animals have shown the effect of diabetic issues and insulin treatment on the osseointegration of implants.

Results of osseointegration of implants in experimental models of diabetes:

The analysis of the effect of diabetes mellitus on implants has revealed a change in bone renovation processes and deficient mineralization, leading to much less osseointegration. Some researchers have shown that, although the quantity of bone formed is comparable when contrasting diabetes-induced animals with controls, there is a reduction in the bone-implant contact in diabetics [8]. One research study that examined the positioning of implants in the femurs of diabetic rodents observed bone neoformation comparable to that of the control team around the periosteum, whereas it was significantly lower in the endosteum and medullar canal, and bone bridges between the endosteum and the dental implant surface area were just observed in a small number of instances [9]. The decrease in the levels of bone-implant contact verifies that diabetes mellitus prevents osseointegration. This circumstance might be reversed by dealing with the hyperglycemia and keeping near-normal sugar levels [10]. In the light of the articles published, there is a greater possibility that the implants will certainly integrate in areas predominated by cortical bone. However, further studies are essential in humans to identify the biological aspects impacting osseointegration in diabetic person patients.

Effect of insulin on bone and osseointegration of implants in experimental models

Different scientists have verified that osteopenia related to diabetes caused in animals can be reversed when therapy with insulin is applied [11]. When implants are positioned in the tibia of diabetic person rats, a decrease of 50% is observed in the bone development area and on the contact surface area between bone and dental implant. If insulin is used, the ultra-structural characteristics of the bone-implant user interface become like those in the control group. These outcomes suggest that metabolic control is necessary for osseointegration to happen, as constant

hyperglycaemia delays the healing of the bone around the implants [12]. Although many researches have shown that insulin treatment permits guideline of bone formation around the implants and boosts the quantity of neoformed bone, it was not feasible to amount to the bone-implant connection when compared to non-diabetic groups [13].

- **Implant Survival In Patients With Diabetes Mellitus:**

The survival rate for implants in diabetic patients varies between 88.8 and 97.3% 1 year after placement, and 85.6 to 94.6% in functional terms 1 year after the prosthesis was put.

In a retrospective research with 215 implants put in 40 diabetic people, 31 failed implants were documented, 24 of which (11.2%) took place in the initial year of functional loading. This evaluation shows a survival rate of 85.6% after 65 years of functional use. The results acquired show a higher index of failings throughout the very first year after placement of the prosthesis [14]. Another research study performed with 227 implants positioned in 34 patients reveals a success rate of 94.3% at the time of the second surgery, prior to the insertion of the prosthesis [15]. In a meta-analysis with two dental implant systems positioned in edentulous jaws, failure rates of 3.2% were obtained in the initial stages, whereas in the later phases (from 45 months to 9 years), this number raises to 5.4% [16]. A possible research study with 89 well-controlled type 2 diabetics in whose jaws a total amount of 178 implants had actually been put discloses very early failing rates of 2.2% (4 failings), escalating to 7.3% (9 more failures) 1 year after positioning, showing a survival rate of 92.7% within the initial year of functional loading. The 5-year survival rate was 90% [17].

The truth that many failures happen after the second-phase surgical procedure and throughout the very first year of functional loading might suggest microvascular involvement is just one of the elements implicated in dental implant failings in diabetic individuals [18], [19].

The microvascularization alteration connected with diabetes mellitus brings about a decreased immune reaction and a decrease in bone remodeling procedures [17], [20]. The majority of the reports changed conclude that, despite the higher threat of failing in diabetic person patients, maintaining sufficient blood sugar levels in addition to various other measures enhances the dental implant survival rates in these patients [18].

A research was done to determine if type 2 diabetes mellitus represents a substantial threat variable to the lasting medical performance of dental implants. A total of 2,887 implants (663 patients) were operatively put, brought back and adhered to for a duration of 36 months. Of these, 2,632 (91%) implants were placed in nondiabetic patients and 255 (8.8%) in kind 2 patients. It was concluded that implants in kind 2 patients have considerably much more failures; using preoperative antibiotics developed survival by 4.5% in non-type 2 patients and 10.5% in type 2 patients [21].

- **Bone Healing And Diabetes:**

Clinical research studies show that diabetic issues are no contraindication for implant positioning, on condition that it remains under metabolic control. The influence of age and timeframe of diabetic issues on the success of oral implants has been investigated. Diabetes has revealed that there is no relation of age with the survival rates of oral implants [22]. Diabetic patients experience postponed wound healing, which rationally affects the osseointegration process. Fiorellini et al. (2001) demonstrated a lower success rate of only 85% in diabetic patients, while Olson et al. (2000) located that the duration of the diabetes mellitus had a result on dental implant success: More failings happened in patients that had diabetes mellitus for longer durations. Fiorellini et al. (2001) additionally observed that many failings in diabetic person patients took place in the first year after dental implant loading [23]. Diabetic issues mellitus may hinder bone recovery after dental implant placement. Gui-Ke Zou et al. evaluated impacts of the local delivery of fundamental fibroblast development factor (bFGF) from poly (lactide-co-glycolide) (PLGA) microspheres on osseointegration around titanium implants in diabetic rats. The regional delivery of bFGF from PLGA microspheres right into locations around titanium implants might enhance osseointegration in diabetic person rats [24].

- **Complications**

Review reveals high early failure in diabetic patients thus individuals experienced low implant stability quotient (ISQ) in period of 2-12 weeks and reduced the degree of glycemic control, greater the level of ISQ decrease and longer the duration of recovery in ISQ at base level was required. Nevertheless, most implants obtained base degree of stability within 4 months even in unrestrained diabetic patients, if the patients were

refrained with micro- and macro-vascular difficulties [25].

Period of diabetes mellitus substantially influenced the success of dental implant, observed in one research while another did not show considerably greater late dental implant failures in diabetic patients despite longer period. In general, lower success of dental implant in patients with diabetes mellitus of longer duration may result from greater possibility of micro-vascular difficulties which consequently cause delayed healing around implants and thus higher early failing [25].

Unchecked diabetes lead to periimplantitis and succeeding failing of implant, so focus is now being put on preventive measures to manage periodontitis in the preoperative setup.

- **Management Approaches In Order To Receive Dental Implants**

A full health background regarding period, existing therapy and degree of HbA1c should be gotten from every patient that will obtain an oral implant. If the metabolic control seems scientifically insufficient, dental implant therapy should be postponed up until much better control is achieved.

High degrees of glucose in plasma have an unfavorable impact on wound healing and bone formation. In order to guarantee osseointegration, it is required to keep great glycemic control prior to and after implant surgery [26]. To decrease the risk of infection a ten-day regimen of broad-spectrum antibiotics ought to be started on the day of surgery. Prophylactic anti-biotics have actually shown to be efficient for success of dental implants in diabetic individuals [Table 4].

Next to antibiotic prophylaxis, making use of 0.12% chlorhexidine mouth wash have a vital benefit by reducing the failure rates from 13.5% to 4.4% in kind 2 diabetics, throughout a follow-up duration of 36 months [28]. Cigarette smoking may considerably increase the risks of implant failure in diabetic patients. Systemic and local corrective aspects are made use of in identifying the extent of diabetes mellitus and its issues, as well as the factor to consider for the rehabilitating program. The correlation of these factors dictates the type, variety of implants positioned, and likewise which sort of oral implant supported prosthesis needs to be done.

Table 4. Prophylactic antibiotics and their doses [27].

Name of antibiotic	Preoperative adult dose (1 hr before surgery)	Postoperative adult dose
Amoxicillin	2 gr	500 mg every 8 hr
Clindamycin	600 mg	150-450 mg every 6 hr
Cephalexin	2 gr	250-100 mg every 6 hr
Azithromycin or Clarithromycin	500 mg	250-500 mg once a day

CONCLUSION:

Diabetes mellitus is a bunch of metabolic disorders in which there are high blood sugar degrees over a prolonged duration. When looking at the problems and adverse effects resulting from diabetic issues, it is necessary to understand which kind of diabetic issues the patient suffers from, if there is any therapy, which type of treatment, the quality of glycemic control, and period of the ailment.

Dental implants offer substantial benefits that call for that they be thought about for the treatment of a vast spectrum of patients, including the expanding variety of individuals with diabetic issues mellitus. Although uncontrolled diabetes mellitus has been revealed to disrupt various elements of the healing procedure, the results of the research studies show that a high success rate is achievable when oral implants are put in diabetic people whose illness is controlled. It is advisable to postpone the placement of implant in badly regulated diabetics till the control of diabetic issues.

The bibliography recommends great glycaemic control in the perioperative period in order to improve the survival rates for implants in diabetics. To boost dental implant survival and reduce postoperative complications, helpful treatment containing prophylactic anti-biotics and chlorhexidine mouth rinse is recommended. Overall, oral implant failure is low and there are no absolute contraindications to implant placement. Conditions that were discovered to be associated with a boosted danger of failure need to be taken into consideration throughout therapy planning and factored right into the notified consent procedure. Longer period potential professional studies with majority of diabetic people and non-diabetic controls are still needed to develop far better understanding of effect of diabetes mellitus over dental implant success.

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