Dental implant in patients with type II diabetes: placement to 5 years

A Clinical Study

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Abstract: Unfortunately recent data about the prevalence of diagnosed diabetes mellitus (DM) mainly type II and it is relation to dental implants in Yemen was not estimated.

Several objectives have been considered in this study, 1- to establish a base line data for future research in dental implant in Yemen, 2- to study the rate of success of dental implants for medically compromised patients in Yemen.

The present study is the first to be conducted in Republic of Yemen.

Diabetes may effect as many as 18% of people over the age of 65, many of whom will be partially or totally edentulous. The disease has far reaching systemic sequelae, including an increased susceptibility to caries and periodontal disease. It is also known to impair healing which increases the risk of tissue necrosis and infection. However improvements in diabetic management have resulted in many patients being well controlled with stability of their blood glucose and metabolic control. These patients have been shown in previous studies to be suited to dental implant surgery, with an acceptable degree of predictability. This study reports retrospectively on the survival of dental implants placed into diabetic patients.

34 females and males patients with 227 implants were followed through to final restoration. Upon uncovering, 214 of the 227 implants were found to have osseointegrated, yielding a 94% success rate. Of the thirteen failed implants 10 were from the immediately loaded group and three from bone grafting group. All other patients don't lose any implant. Failures occurred either in the maxillary and in the mandibular jaws, and also in the anterior and posterior segments.

Five of the 13 surgical failures were located in the posterior mandible, five were in the posterior maxilla, two were in the anterior maxilla, and one was in the anterior mandible.

It was established that, diabetes was categorized into uncontrolled diabetes and controlled diabetes. Only the former was identified as a contra-indication to dental implant treatment. It is important to extract a thorough medical history from the patient, who if diabetic, should be able to demonstrate a good level of control of blood glucose levels, with confirmation that they are metabolically stable prior to and at the time of implant surgery.

Patients need to be advised of the importance of maintaining their drug regime throughout treatment and they should be routinely prescribed prophylactic antibiotics, using a broad spectrum drug for 10 days.

Under these circumstances it can be concluded that the provision of implants in well controlled diabetic patients yields a high success.

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Introduction:

Implants are the newest and most exciting frontier of dentistry. In This article we will try to explain and simplify the practice of implant dentistry for type II diabetics among Yemeni patients.

Diabetes may effect as many as 18% of people over the age of 65, many of whom will be partially or totally edentulous. The disease has far reaching systemic sequelae, including an increased susceptibility to caries and periodontal disease. It is also known to impair healing which increases the risk of tissue necrosis and infection. However improvements in diabetic management have resulted in many patients being well controlled with stability of their blood glucose and metabolic control. These patients have been shown in previous studies to be suited to dental implant surgery, with an acceptable degree of predictability. This study reports retrospectively on the survival of dental implants placed into diabetic patients.

- Type II diabetes: Accounts for approximately 75% of patients with diabetes; its onset is usually after age 40. Patients with Type II diabetes produce insulin; however, there may be inadequate production or resistance to its action. These patients are not ketosis prone.
- Type I diabetes: (Insulin dependent) is caused by an auto-immune destruction of the pancreatic beta cells that make insulin resulting in a sustained hyperglycemic state.

Type I accounts for approximately 25% of patients with diabetes; its onset is most commonly seen in childhood or young adulthood. It is caused by immune-mediated destruction of the insulin-producing beta islet cells of the pancreas. The destruction of these cells leads to almost total loss of production of endogenous insulin.

Treatment:

- For patients with Type I diabetes, insulin injection is required to regulate glucose levels and prevent diabetic ketoacidosis.
- Type II diabetics are treated with oral antihyperglycemics like Glucatrol, glucophage & Avandia. i-e Type II diabetes may be managed by diet and weight control, oral hypoglycemics or insulin to regulate glucose levels.

Diabetics have vascular complications in "end organs" such as eyes, brain, heart and the periodontium. The gingiva can become enlarged and hemorrhagic with attachment and bone loss. Abscesses, mobility and delayed post-surgical healing are common.

Diabetic patients can be treated safely in the dental office. A few simple questions can make a difference. Asking about the patient's condition, including medications and glycemic control are paramount for optimal treatment outcomes. Proper management of the diabetic patient can help maintain not only the periodontal tissues, but the patient's health on a whole.

In the oral cavity, diabetes mellitus is associated with:

- Xerostomia,
- Increased levels of salivary glucose,
- Swelling of the parotid gland, and
- An increased incidence of caries and periodontitis (Murrah, 1985; Report of the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus, 1997; Rees, 2000).

Objectives

Several objectives have been considered in this study:

- To establish a base line data for future research in dental implant in Yemen,
- To study the rate of success of dental implants for medically compromised patients in Yemen.

The present study is the first to be conducted in Republic of Yemen under the topic of this article (study).

Martial and methods:

The study population (Table 1) included 17 females and 17 males ranging in age from 34 to 79 years. The average age was 62.1 years. Diabetic status was generally determined from patient health histories or personal interviews.

3

Between September 2001 and December 2006, the study subjects were treated with a total of 227 implants, an average of 5-7 implants per person. Table 2 shows the anatomical distribution of positions in both jaws.

One types of implant system were used in this study; this includes Friadent®-2 Stepped Cylinder Implant. An example of dental implant operation can be shown in Figures 1-8.

Fig.1. Anterior profile before dental implant operation

Fig.2. Intra oral view before dental implant operation

Fig.3. Dental implants in place

Fig.4. Suturing after dental implants.

Fig.5. Panoramic radiograph before dental implant operation

Fig.6. Panoramic radiograph after dental implant operation

Fig.7. Intra oral view after placement of fixed bridge over dental implants

Fig.8. Anterior profile after placement of fixed bridge

Each patient needed mandibular and/or maxillary implants for retention of fixed prosthodontic appliances and each patient suffered from well-controlled type II diabetes mellitus. Blood glucose level were monitored and tabulated prior to surgery, during the operation, immediately following surgery and one week post operatively.

Patient was advised to continue their regular medication. In addition patient was instructed to receive 1.5 g Amoxicillin one day prior to surgery and to continue the medication for the next five days. Mucosal health was evaluated during observation intervals of three weeks, eight and twelve months after surgery.

Table 1. Gender and Distribution

		Age	
sex	No.	Average	Range
Female	17	59.1	34-75
Male	17	64.7	39-79

Table 2. Anatomical Distribution of Implants sites

Region	Total
Ant. Mandible	46
Post. Mandible	63
Mandible	109
Ant. Maxilla	45
Post. Maxilla	73
Maxilla	118

| Total | 227 |

Ant.= Anterior
Post.= Posterior

Of the 227 total implants, 91 were immediately Implanted. The remaining 136 implants were placed in osteotomies created by standard drilling techniques. 32 of the 227 implants were loaded immediately after placement, in different patients. Bone grafting was used with 27 of the 227 sites. The healing period between the first- and second-stage surgeries ranged from 0 to 6 months, with 5.9 months being the average healing period per implant.

Results

34 patients with 227 implants were followed through to final restoration. Upon uncovering, 214 of the 227 implants were found to have osseointegrated, yielding a 94% success rate. Of the thirteen failed implants 10 were from the immediately loaded group and three from bone grafting group. All other patients don't lost any implant. Failures occurred either in the maxillary and in the mandibular jaws, and also in the anterior and posterior segments.

Five of the 13 surgical failures were located in the posterior mandible, five were in the posterior maxilla, two were in the anterior maxilla, and one was in the anterior mandible.

Table 3 summarizes the position and number of implants failed.

Table 3. Anatomical Distribution of Implants Faild

Position	No. Of Implants Failed
Posterior Mandible	5
Posterior Maxilla	5
Anterior Maxilla	3
Anterior Mandible	1
Total	13

Autogenous bone and a membrane were used in some cases.

Incidence and Risk Factors:

Auto-immune reactions, possibly triggered by viral illness (such as rubella or cytomegalovirus), are causative in the development of Type I diabetes. Although both Type I and Type II diabetes have genetic components, genetics are a greater factor in Type II. In addition to genetics, obesity has a poorly understood but important role in the development of Type II diabetes. (Little JW, Falace DA. 1993).

Pathology

The primary defect in Type I diabetes is immune-mediated destruction of the insulin-producing pancreatic islet cells. The destruction of these cells leads to an absolute deficiency of insulin. In contrast, the patient with Type II diabetes continues to produce insulin in variable amounts. In addition to reduced insulin (in some cases), the defect in Type II diabetes appears to lie in a reduction in insulin receptors and reduced post-receptor activity (Little JW, Falace DA. 1993). In a patient with either type of untreated diabetes, the relative lack of insulin results in hyperglycemia combined with an inability to use glucose. In the patient with Type I diabetes, this combination can lead to potentially life-threatening diabetic ketoacidosis.

The long-term implication of diabetes is the development of vascular complications secondary to microangiopathy and accelerated atherosclerosis. These complications usually start to occur 15 to 20 years after the initial diagnosis (Foster et al, 1996). The vascular complications lead to complications in various organ systems, most notably the kidneys, the heart, the peripheral vascular system and the eyes (Orland et al., 1996).

Diagnostic Tests

Three diagnostic tests are available for provisional diagnosis with supplemental tests performed to support initial suspicions. The fasting plasma glucose test requires blood to be drawn after an 8 hour fast. Levels >110 mg/dl are borderline and > 126 is indicative of

diabetes. The 2 hour post-prandial glucose test involves taking a dose of 75g of glucose and drawing blood 2 hours later. Levels >140 mg/dl are borderline and >200 is indicative of diabetes. But the most valuable test is the glycosylated hemoglobin assay because it assesses glycemic contol over a 6-12 week period where 7% indicates diabetes.

Insulin treated patients may take dosages of different types of insulin that peak at varying times, from ultra-short to short to long-acting. This allows better control for a longer time. Morning appointments may be better for these patients (Rees, 2000).

Disscution:

It was established that, diabetes was categorized into uncontrolled diabetes and controlled diabetes. Only the former was identified as a contra-indication to dental implant treatment. It is important to extract a thorough medical history from the patient, who if diabetic, should be able to demonstrate a good level of control of blood glucose levels, with confirmation that they are metabolically stable prior to and at the time of implant surgery.

Patients need to be advised of the importance of maintaining their drug regime throughout treatment and they should be routinely prescribed prophylactic antibiotics, using a broad spectrum drug for 10 days.

Under these circumstances it can be concluded that the provision of implants in well controlled diabetic patients yields a high success (Blanchaert, 1998; Balshi and Wolfinger, 1999; Morris et al., 2000).

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