irreversibly glycated to form advanced glycation end products (AGEs). These stable carbohydrate containing proteins have multiple effects and are thought to be a major link between the various diabetic complications. The contributions of the AGEs in increasing the periodontal pathology in diabetic individuals are summarized in the figure on the following page.

|| Pathogenesis Of Diabetic Complications In Periodontitis

Effects Of Periodontal Disease On The Diabetic State

The presence of periodontitis increases the risk of worsening of glycaemic control over time. Periodontitis may also be associated with an increased risk of other diabetic complications.

In subjects with severe periodontitis, the death rate from ischaemic heart disease was 2.3 times higher than in subjects with no periodontitis or mild periodontits, and the mortality rate from diabetic nephropathy was 8.5 times higher in the severe periodontitis group after accounting for other known risk factors. The overall mortality rate from cardio-renal diseases was 3.5 times higher in subjects with severe periodontitis.

Conflicting data exists about the benefit offered by periodontal therapy as far as improvement in glycaemic control is concerned. Although some studies indicate an improvement in glycaemic control, other studies have shown no significant improvement. Further studies would be required to determine whether periodontal therapy provides a significant benefit on glycaemic control.

|| Mechanisms By Which Periodontal Disease May Influence Diabetes

Periodontal disease may induce or perpetuate an elevated systemic chronic inflammatory state. Diabetic patients with periodontitis may hence present with an even greater systemic inflammatory condition with elevated levels serum of IL-6, TNF-α and C-Reactive Protein (CRP). This can worsen the insulin resistance and thereby aggravate glycaemic control. Thus, periodontal treatment may reduce inflammation locally and also decrease serum levels of the inflammatory mediators that cause insulin resistance, thereby positively affecting glycaemic control.

|| Periodontal Management Of The Patient With Diabetes Mellitus

The treatment of the diabetic patient can be very challenging. The following is a review of the status of periodontal therapy in diabetics.

The well-controlled diabetes mellitus patient with periodontal disease is often an acceptable candidate for complete periodontal therapy, including surgical procedures when indicated. As discussed previously, however, the presence of medical complications associated with diabetes mellitus should be carefully evaluated and considered in any periodontal therapeutic decision. In most instances periodontal surgical therapy should be carefully planned and coordinated with the patient's physician to insure minimal disruption of metabolic diabetes mellitus control. Most authorities recommend that periodontal surgery

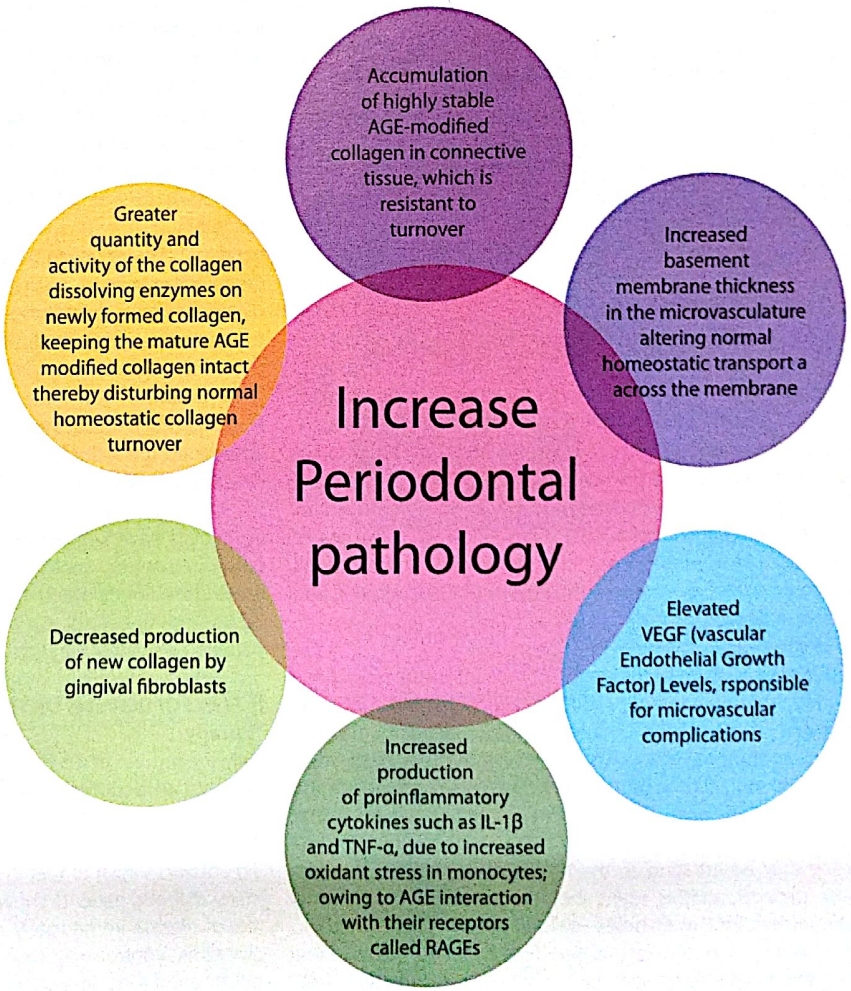

Fig.3: Effects Of Periodontal Disease On The Diabetic State

be scheduled in the morning after breakfast and medication administration.

Treatment procedures should be short (2 hours or less), as atraumatic as possible, and should not significantly interfere with the patient's normal dietary intake. Patient anxiety should be managed to minimize endogenous epinephrine release, because epinephrine may increase insulin utilization and deplete insulin levels more quickly. In most instances preoperative oral sedation is suitable for this purpose. In the event that general anesthesia or intravenous conscious sedation techniques are necessary or if extensive surgical procedures are likely to alter the patient's dietary intake, then changes in the type 1 patient's insulin intake may be necessary under the guidance of the patient's physician.

Decisions regarding the prophylactic use of antibiotics in conjunction with periodontal surgery are best made on a case-by-case basis since there is no evidence-based information to indicate that antibiotic premedication is necessary.

The poorly controlled type 1 patient is not a good candidate for periodontal therapy other than necessary emergency services. Medical coordination is probably indicated for any type o periodontal therapy and hospitalization may be required for emergency care. If time permits microbiological testing is desirable to identify putative periodontal pathogens prior to antibiotic therapy. If stable metabolic control is achieved, routine periodontal therapy may be considered with close medical monitoring.

In general, all diabetes mellitus patients should be encouraged to maintain meticulous oral hygiene and to receive supportive periodontal therapy at intervals necessary to sustain a high level of periodontal health. Patients should be carefully monitored for dental caries and home and office use of fluoride caries preventive agents is recommended. Diabetes mellitus–related xerostomia should be managed on a case-by-case basis, but in general patients should be encouraged to adhere to strict diabetes mellitus metabolic control and to avoid smoking or the use of alcohol (including mouthrinses with high alcohol content) and caffeine-containin beverages. Artificial saliva substitutes and frequent ingestion of water may be of benefit. A pilocarpine-containing drug (SalagenA) has recently been approved by the Food and Drug Administration for management of xerostomia resulting from therapeutic radiation exposure and Sjo¨gren's syndrome. The benefits of this drug in managing diabetes mellitus or drug induced xerostomia have not yet been studied, and it should only be prescribed with the consent of the patient's diabetologist. There is some evidence to suggest that oral hygiene products containing the detergent sodium lauryl sulfate may be irritating to the mucous membranes of xerostomic patients, andthis agent should be avoided if xerostomia is a problem for the diabetes mellitus patient. Patients should be encouraged to stimulate salivary flow by the use of sugarless gum or natural salivary stimulants such as chewing raw carrots and celery.

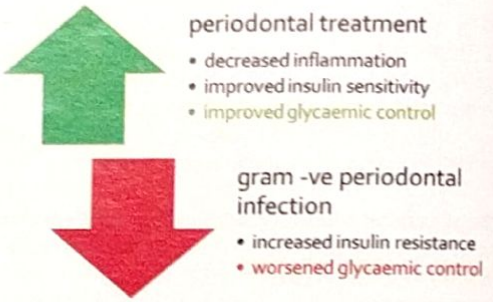

Fig 4: Mechanisms By Which Periodontal Disease May Influence Diabetes

Frequent monitoring for the overgrowth of oral fungal organisms such as Candidia albicans is indicated, and on occasion the prophylactic use of topical antifungal agents may be necessary. Most topical oral antifungal products contain sucrose and may be contraindicated for caries-susceptible diabetes mellitus patients. The topical agent, nystatin, however, can be obtained in a powder form which is sucrose-free, but it must be mixed with water for each use. More recently, an oral antifungal rinse containing itraconazole has become available that uses saccharin in place of sucrose. Improvement in burning mouth and altered taste sensation may occur when diabetes mellitus metabolic control is established or when xerostomia and associated candidiasis are controlled. Some patients respond more effectively, however, to the prescription of low-dose amitryptyline-containin antidepressant drugs, probably due to their effect on neural inflammation. Again, use of such agents should be coordinated with the consulting physician and some diabetes mellitus complications or medications may contradict its use.

|| Implants

Placement of implants in diabetic patients is a matter of great interest to periodontists. Successful implantation has been described in well-controlled individuals with diabetes mellitus, but two recent studies of uncontrolled diabetes mellitus in animals have suggested an altered pattern of bone formation in relation to implants. In view of these studies, plus clinical evidence of delayed healing in diabetic patients, it is doubtful that the uncontrolled or poorly controlled diabetes mellitus patient is a suitable candidate for implant placement.

|| Effect Of Diabetes On The Response To Peridontal Therapy

Only limited evidence is available to evaluate the comparative response to periodontal therapy in diabetic and non-diabetic patients with periodontitis. In well controlled diabetic subjects, the clinical and microbiologic response to scaling and root planing appears similar to that in non-diabetic individuals. Although many diabetic patients show improvement in clinical parameters of disease immediately after therapy, patients with poorer glycaemic control may have a more rapid recurrence of deep pockets and a less favourable long term response.

Further longitudinal studies of various periodontal treatment modalities are needed to determine the healing response in individuals with diabetes compared to individuals without diabetes.

|| Final Word Of Caution

In most instances the well-controlled type 1 or type 2 patient can be managed in a manner consistent with a healthy non-diabetic individual. Periodontal surgical procedures can be performed, although it must be assured that the patient can maintain a normal diet post-surgically.

In the event that the treatment procedure modifies the patient's dietary habits, dietary supplements should be recommended. Supportive periodontal therapy should be provided at relatively close intervals (2 to 3 months) since some studies indicate a slight but persistent tendency to progressive periodontal destruction despite effective metabolic diabetes mellitus control.

In many instances, the type 2 patient is not well controlled by rigid standards, yet the patient's physician will provide medical clearance to perform periodontal therapy because the patient is likely to tolerate the procedure without undue difficulty. In this circumstance the periodontist should proceed with caution since the treatment outcome may be compromised. It should be remembered that inadequate diabetes mellitus control can adversely affect the severity of the periodontal disease response, the patient's wound healing capacity and the ability of the patient to withstand both emotional and physical stress. The clinician should insist that the patient achieve and sustain a highly effective level of oral physiotherapy, and in most instances a nonsurgical approach to periodontal therapy is preferred, with or without the use of appropriate antibiotic therapy. In the event that antibiotic therapy is anticipated, microbiological testing to identify putative periodontal pathogens is suggested.

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|| Guidelines For Periodontal Management Of Diabetic Patient