Review Article:
Protocol of Periodontal Management for Diabetic Patient

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Abstract

Diabetes mellitus is an endocrine-metabolic disease produced by non-well controlled blood glucose levels because of deficiencies in insulin production or activity. Clinical and epidemiological studies have shown that patients with a long history of diabetes seem to have more periodontal tissue breakdown than age matched, non-diabetic controls. The influence of diabetes over periodontal disease is well established, but the effect of periodontal disease and its treatment over the diabetes control is not so clear. For Periodontal management to diabetic patients you may face many problems regarding diabetes complications, timing for treatment diet Medication balance, dealing with apprehensive diabetic patient dealing with the most common dental office complication, the need for antibiotics and host modulatory agents, the acceptable laboratory values before performing periodontal surgery, lastly the preventive strategies to minimize the debilitating effects of diabetes on the patients periodontium. The goal of the present study was to formulate a guideline of periodontal management for diabetic patient.

Key Words: Diabetes – Periodontitis – Protocol – Treatment.

Introduction

DIABETES is recognized as an important risk factor for periodontitis. Periodontitis is a common chronic inflammatory disease characterized by destruction of the supporting structures of the teeth and has multiple negative impacts on the quality of life [1]. Epidemiological data confirm that diabetes is a major risk factor for periodontitis; There is a clear relationship between degree of hyperglycemia and severity of periodontitis. Susceptibility to periodontitis is increased by approximately threefold in people with diabetes [2]. Periodontal infection on another hand complicates diabetic conditions through several pathological mechanisms including exaggerated production of stress hormones than antagonizing insulin action, elevated circulating levels of interleukin (IL)-6, tumour necrosis factor (TNF-α) which can worsen insulin resistance and thereby impair glycaemic control [3].

Treatment of periodontitis is associated with HbA 1c reductions and improvement of diabetic status in general, therefore oral and periodontal health should be promoted as integral components of diabetes management [4,5].

Material and Methods

The data collected for the present review were obtained from the pervious studies and investigations performed by the author from 1991-2010 concerning the bi directional relation between diabetes and periodontal diseases and the outcome of different periodontal treatment modalities on both diseases.

Proteolytic activity of Subgingival microflora was estimated in 18 diabetic and 21 nondiabetic [6]. The clinical and microbiological effect of tetracycline (TCN) subgingival irrigation was studied on 13 type II diabetics & 13 non diabetics all suffering from periodontal disease [7]. The relation between diabetic periodontitis and diabetic retinopathy was investigated [8], periodontal conditions of 64 adult diabetic patients with differant grades of diabetic retinopathy were evaluated including bleeding & plaque indices, pocket depth and bone level index. The effect of splinting abutment teeth under overdentures on their supporting structures in diabetics was studied on 24 diabetics with edentulous maxillary arch and standing mandibular canine and second premolars [9]. Regarding the immunological profile of diabetic periodontitis a
comparison between prostaglandin level in gingival inflammation in diabetics & nondiabetics was done to estimate the level of this potent inflammatory mediator and to clarify the role of prostaglandins in the pathogenesis of periodontal disease in diabetic patients [10]. Analyzing of alveolar bony changes during post extraction healing in type I diabetic patients was investigated in 25 type I using computerized radiographic density method (Gray level detector program) [11]. The effect of periodontal treatment on diabetic status was also investigated in. Level of serum fructosamine was measured in 48 adult before and after non surgical periodontal therapy to detect the positive relation between improvement of periodontal condition and the reduction of serum fructosamine (S.F) as periodontal disease exaggerates (S.F) values [12]. In 1997 a study was designed to test the effect of systemic administration of Doxycycline as an adjunctive to mechanical debridement in type II diabetic patients [13]. Regarding the outcome of regenerative periodontal surgery on diabetic patients a study was performed to evaluate the use of bone grafting for management of angular bony defects in type II diabetic patients clinically & radiographically using computerized Gray scale bone density [14]. Moreover the therapeutic effect of Locally administered metronidazole as an adjunct to conventional periodontal therapy was evaluated including the clinical and microbial response [15]. The bidirectional relations between diabetes mellitus (DM) and periodontal disease and the possible relation between (DM) complications and the severity of periodontitis was investigated [16]. Finally Periodontal profile of diabetic patients including the clinical pathological and immunological aspects of both diseases was explained in a Review article in 2010 [17].

Results and Discussion

According to the results obtained from the above mentioned studies and methodology the following guideline is formulated to help periodontists and general dentist for management of his/her diabetic patient for better periodontal treatment outcome without medical complications.

Medical profile:

The initial information you gather from your patient is the first step of good periodontal management as follows:

- Type of diabetes (I or II), and the medications your patient is already taking insulin or antidiabetic oral agents, or your patient was originally type II but he is now on insulin treatment.
- Duration of the diabetes, the more the duration of the disease the more the expectance of cardiac and renal complications.
- Controlled or not, use his or her medication regularly or not, the patient glycemic condition right now. You can use your patient glucometer also you have to know the average glycemic level in the last 3 months (Glycated Hemoglobin) if your patient is not controlled it is better to delay the treatment session unless there is a need for emergency periodontal management.
- History of recent hypoglycemic attack: Is your patient always exposed to hypo/hyperglycemic attacks or not, this may occur with the change of medication from anti diabetic oral agents to insulin or from insulin sensitizer agent to sulfonylurea.
- Presence or absence of diabetic complications on heart or on kidneys.
- Finally communications must be established with the patient. diabetologist [18-21].

Timing of periodontal treatment:

- Generally speaking Morning appointments are better because levels of endogenous corticosteroids are generally higher at that time so the patient can better tolerate treatment procedures.
- For type I diabetes and for type II patients treated by insulin periodontal treatment can be timed during the day to avoid the peak of insulin activity to reduce the risk of hypoglycemia [21,22].
- So you have to look at the pamphlet to see the action profile of insulin is it short, rapid, intermittent, long or peakless action and be away from the peak of action.

Diet medication balance:

The first line of diabetes management is diet regime and its balance with the medications. Be sure that your patient has taken his medication followed by a meal to protect your patient and yourself from a disaster called hypoglcmic coma.

If you planned to perform Periodontal surgery you have to formulate an alternative diet/medication regime till the patient can restore his normal chewing ability.

Sedation and anesthesia:

If conscious sedation is needed for your apprehensive diabetic patient, the patient may require not to eat breakfast so you have to inform the
physician about this unusual situation for special dietary and medical attention.

Epinephrine should not be used in Conc. > 1:100,000 as adrenaline antagonizing insulin therapy. Patient anxiety should be managed to minimize endogenous epinephrine release, because epinephrine may increase insulin utilization and deplete insulin levels more quickly.

Emergency periodontal treatment:

Usually the diabetologist refers the diabetic patient to you because the patient is still uncontrolled in spite of receiving high doses of insulin. Periodontal abscess may be the real cause of this medical problem. Periodontal abscess may interfere with the chewing ability, with the diet regime prescribed to the patient (high fibrous low caloric diet).

This septic focus increase insulin resistance, worsening of the diabetic state and exaggerates production of stress hormones as glucagon, catecholamine & cortisone. Therefore immediate drainage leads to dramatic improvement in the glycemic control and the diabetologist may reduce the high doses of insulin [21].

Monitoring blood/glucose:

Patients should be asked to bring their glucometer to the dental office at each periodontal appointment, it will help you and protect your patient from serious dental office diabetic complications you can obtain the drop of blood needed from the gingiva while performing your scaling or your surgery and by pushing one bottom you can get the glycemic condition of your patient. The accuracy is nearly 90% of Finger stick capillary blood but much easier & needs no interference at your work. So if your reading is ranged between 60 or 70mg/dl then you have to react quickly [23].

Dealing with the most common dental office complication:

The most common dental office complication that may occur to diabetic patient is hypoglycemic coma it is an acute and serious condition, the most common causes are: Excessive exercise, stress, insulin overdose & dietary imbalance but for us as dentists, the main cause is that the patient has taken his medication as usual (either insulin or sulphonyl urea) but could not eat his meal due to dental pain. So signs and symptoms of hypoglycemia start to appear which is mainly due to: First, excessive release of epinephrine and glucagon, and second due to lack of glucose supply to the brain (glucose is the brain’s sole energy). Excessive release of epinephrine & glucagon leads to warning signs of hypoglycemia as the body tries to increase Blood/Glucose level, by releasing these hormones to squeeze the glycogen from the liver so the warning signs here increase heart rate - irritability - hunger & sweating. If the condition is not managed, brain manifestations will develop so quickly: Headache Lack of concentration - Impaired vision, emotion & mood changes and finally hypotension and coma.

The best way to prevent hypoglycemic attack during your periodontal treatment is to measure Blood/Glucose (B/G) level Pretreatment & Intra-operative using Glucometer. If 60mg/ml or less, you have to react to prevent it from dropping even lower, your periodontal treatment should be immediately terminated.

Provide 15g of oral carbohydrates (CHO) to your patient, like orange juice or you can give glucose tablets which is quickly dissolved in the mouth - but if the patient is unable to take food or drink by mouth or if the patient is sedated, give dextrose 30ml intravenous (I.V) or glucagon 1gm, the advantage of glucagon is that it can be injected by many ways subcutaneous (SC), intramuscular (IM) if no (I.V) access. If no Glucometer is available then treat the case as hypoglycemic attack if you are confused between hypo and hyperglycemia manifestations [24,25].

Ketones:

This serious condition is due to Chronic hyperglycemia. Due to Chronic Lack of insulin the body shifts from using glucose for fuel to using fat. To do so other hormones start to act causing fat to breakdown into fatty acids (F.A) these fatty acids are attacked by hyperglycemia (unused high glucose concentration, in the blood) leading to (F.A) oxidation which is called ketones. Accumulation and building up of these ketone bodies in the blood leads to: Increase bood acidity - severe urination - severe dehydration - dry skin - electrolytes imbalance - hyperkalemia - cardiac arrest and death this condition is called Diabetic ketoacidosis, (DKA).

Recent glucometer devices can measure b/g level in the blood and also the amount of ketones if present. Detection of ketones in the blood are off course more superior than in urine as it appears first in the blood, any degree of Positivity means that the danger is coming. Recent researches demonstrate that periodic checking of patient, ketones significantly decrease the rate of development of DKA and hospitalization is then indicated. This
test must be performed for any diabetic with blood glucose $>$ 240mg/dl.

If you face this problem, your patient, must be hospitalized immediately; administration of 100% $O_2$ followed by fluid and electrolytes replacement and this must be followed by insulin. Some cases may need 6 to 7 liters of fluid replacement-recovery is usually slower than seen in hypoglycemia.

In your clinic if this condition has occurred the patient must drink water as much as he can till the emergency management is performed [26, 27].

**Antibiotics (A.B.):**

For over 100 years non surgical periodontal treatment has relied primarily on mechanical method only for control of infectious component of periodontal disease. Basically periodontal diseases is an infectious disease so, it is not surprising that antibiotics have been used in some situations for their control.

Surely, diabetes is one of these situations the use of (AB) in support to conventional scaling & root planing may improve the periodontal therapy outcome, control the infectious component of the disease also improve gaining of tissue attachment & pocket reduction finally not only it helps to improve the periodontal status but also contributes to better glycemic control in the uncontrolled diabetics (suppress the glycation of proteins).

**Doxycycline (DOX) 100mg:** is one of tetracycline (TCN) family it is the most potent family member as an anticollagenase drug besides its potent antimicrobial effects on most periodontal microorganism (bacteriostatic activity). It has the ability to concentrate in periodontal tissues with less side effects (nephrotoxic) comparing with TCN as it is not metabolized in the kidney. Also Doxycycline can be used in a sub antimicrobial dose of 20mg to inhibit collagenase activity so here it acts as a host modulation not as an (AB) [28].

**Metronidazole:** Lt can be used locally and delivered with a syringe in periodontal pockets to get benefit of its bactericidal effects on anaerobic bact. And the application is repeated after 7 days.

**Periochip:** Local delivery of chlorhexidine chip with a small size chip (4 x 5 x 0.35mm) delivered inside the pocket to maintain drug concentration for 7 days and it is biodegradable to inhibit bacterial attachment to tooth surface.

**Chlorhexidine:** Can be used in another way by pumping CHX solution to irrigate the pockets during ultrasonic scaling and root planing [29].

**Atridox:** Can be used locally as antimicrobial anti collagenase drug [30].

Prophylactic, Penicillin is the best (AB) you can use after periodontal surgery like (amoxicillin and augmentin) to reduce the formation of resistant bacteria. If your patient is allergic to, Penicillin you can use clindamycin or erythromycin.

**Host modulation:**

The following agents may be of therapeutic value in support to periodontal therapy for diabetics:

Sub antimicrobial dose of (DOX) can be used as anti enzymatic agent rather than as antimicrobial to inhibit collagenase release in gingival tissues.

**Non steroidal anti inflammatory drugs (NSAID):** Inhibits cyclooxygenase pathway of arachedonic acids so it reduces the exaggerated production of the potent mediators for bone resorption.

**Bisphosphonate (alendronate):** Anti osteoporoses drug used to fight the over function of osteoclastic activities some recent researches demonstrates its positive effect in reducing alveolar bone resorption in diabetics more researches are needed to confirm its therapeutic effect without its adverse reactions.

**Antioxidant agent:** Excessive generation of free radicals (F.R) leads to cell membrane damages as these unstable molecules want to steal electrons from the surrounding cells-antioxidant agents are so generous and are ready to donate these electrons to change the unstable aggressive F.R molecules to a stable one and so decease the damaging effects of increase oxidative stress induced by diabetes [31].

**Acceptable laboratory values before performing periodontal surgery:**

Before performing periodontal surgery you must respect diabetes otherwise diabetes will teach you a lesson, you must be sure about the following:

- Casual blood glucose is not more than 160–170mg/dl.
- Lab Tests must not exceed these values.
- HbA1c 6.2–7.5%.
- Fasting 91–120mg/dl.
- Post Prandial 136–160mg/dl [32].
Screen for heart or kidney problems:

Narrowing of the lumen of the coronary artery due to diabetic macroangiopathy leads to decreased blood flow to a portion of heart muscle resulting in ischemic heart diseases.

In angina pectoris coronary atherosclerosis is occurred and your patient may feel heavy squeezing pain in the mid chest region and may radiate down the left arm - this is mainly related to stress and anxiety during your work.

For management and prevention:

- Make it a short appointment as much as you can.
- Be sure that the patient is bringing with him his/her Nitroglycerin tablets, better to use for prophylaxis.
- Diazepam 5mg 1 hour before the appointment as a conscious sedation.

Myocardial infarction When a true infarction is occurred the condition now is myocardial infarction:

- No periodontal treatment until at least 6 months after infarction.
- Your patient is under anticoagulant therapy so you have to contact his/her physician to reduce the prothrombin time to be at least 1.5 times normal.
- Diazepam may be used here as well.

You can monitor your diabetic patient cardiac condition during periodontal surgery to protect your patient from any ischemic complications: Attach the automatic self inflation blood pressure monitor to the wrist of your patient and by pushing one bottom you can measure the systolic blood pressure and the pulse rate by multiplying the two values you will get what is called - Rate pressure Product (RPP), if the equation value is equal or less than 12000 so you can continue your surgery but if greater than that so you have to slow down and stop the procedure as the patient may be exposed to anginal pain. This test monitor the myocardial muscle wall tension which is the systolic blood pressure and the heart rate. Example for this if the systolic blood pressure is equal to 150 and the heart rate is equal to 90 so the final value of the equation will be more than 12000 indicating excessive over load on the myocardial muscles [33].

Diabetic nephropathy, one of the serious complications of diabetes, is diabetic nephropathy (D.N) the main cause here microangiopathy of the afferent arteriols. Thickening of walls of these arteriols decrease the blood supply to the kidney for filtration also advanced glycated end product (AGE) accumulate on the glomerular basement membrane (B.M) masking the negative charges on the basement membrane (B.M) which prevent albumin leakage from the blood to the urine (microalbuminuria) Microalbuminuria is the early sign of (D.N) and if not controlled macroalbuminuria will occur.

The important point here for periodontist is not to use NSAID for these patients, because it has non selective inhibitory effects on cyclooxygenase enzymes and inhibits not only the inflammatory prostaglandins (PGs) but also the physiological PGs leading to vasoconstriction of the kidney arteriols which have already been affected from diabetes which complicate the problem more and more leading to reduction of the blood supply to the kidney due to diabetes and due to your NSAID. Finally the condition is complicated by excessive generation of angiotensin leading to generalized hypertension.

So to avoid this complication either prescribe paracetamol as an analgesic or selective NSAID which inhibit only the inflammatory PGs with minimal adverse reactions on kidney or on gastrointestinal tract (GIT) [38].

Preventive strategies:

Prevention means: To let the occurrence of the progression of any disease process unlikely or impossible - for example in our problem here to minimize the debilitating effects of diabetes on the patients periodontium and if the disease progresses and the defect in the host become evident so our target will be directed towards defects correction & disability limitation.

Who must take the responsibility:

- General practitioner: Must be aware of the size of problem depending on current knowledge of Dentists and Physicians in Dental and Medical centers about Diabetes/Periodontal problems perhaps he/she is the one who will discover the disease from the beginning. Dental practitioner with his team of hygienists can manage-if well trained - the early signs of the disease with the cooperation of the diabetologist and the periodontist.
- Diabetologist: Must realize and understand the link between the two diseases and referring any cases which are difficult to control to the periodontist to search for any septic focus and cooperate with the periodontist by preparing alterna-
tive diet medication balance before and after periodontal surgery.

**Periodontist:** Take the responsibility for active treatment and corrective therapy for diabetics with residual deep pockets, save bone loss and furcation invasion also good cooperation with the pt. diabetologist before & after periodontal surgery, with long term monitoring of the periodontal condition by alternating maintenance appointments with the general dentist.

**Diabetic person:** The most successful periodontal treatment will be compromised if the diabetic person is not compliant. We have to teach them how to be patients, how to carry the responsibility of their general health.

The three lines to put their diabetes under control is to follow the diet regime prescribed by their diabetologist - exercise regularly but after following some precautions .. according to the medical condition - take medication as prescribed & maintain the periodontal health to make their diabetes easy to be controlled.

This is the consent form to make your patient carry the responsibility of maintaining his/her periodontal health:

- Yes I, __________________ agree to do the following goals to keep my gum healthy after periodontal surgery.
- Brush teeth twice daily.
- Use dental floss daily.
- Look for early signs of gum disease (bleeding).
- Stop smoking.
- See Periodontist every 4 months for examination and Cleaning.
- See Diabetologist for periodic check up.
- Keep Diabetes under control (80~140mg/dl).

So all of us must take the responsibility to understand this cycle and how to break it to provide our patients with enough healthy teeth to eat to talk and to smile.

**Conclusion:**

For successful periodontal therapy and better treatment outcome without any serious medical complications every periodontist must understand the bi-directional relation between diabetes mellitus as a systemic disorder and periodontal disease,. Diabetes is the most systemic disease that affects oral and dental tissue the target tissue that diabetes attack in the oral cavity is the periodontal tissue leading to rapid destruction of the supporting tissues and loss of teeth in early stages of life. On the other hand periodontal infection may deteriorates diabetic status and make diabetes difficult to be controlled. The present review formulates a treatment guide line to be followed for successful periodontal management for diabetic patients. The treatment protocol includes: Medical Profile of diabetic patient - Timing of periodontal treatment Diet Medication balance Considerations for Sedation & anesthesia - Emergency periodontal treatment - Monitoring Blood/glucose from crevicular blood - Dealing with the most common dental office complication Role of antibiotics & Host modulation drugs in support to the mechanical periodontal treatment - Acceptable laboratory values before performing periodontal surgery - Screen for heart or kidney problems - Sharing responsibilities in Preventive strategies.

**References**


10- ELSAYED H. and ELSAYED H.: “Comparison between prostaglandins in gingival inflammation in diabetics &