



Dental Considerations for Treating a Diabetic Patient: A Practice Guideline Article

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Abstract

Dental treatment of diabetic patients is important due to several diabetic manifestations intra orally such as periodontitis; xerostomia; burning mouth sensation; fungal infection; oral infection; dental caries; periodontal abscess and poor wound healing. However, blood glucose levels may cause some difficulty in dental treatment that may need certain precautions. Thus, certain steps have to be taken before-, during; and after- dental treatment. A safe blood glucose level has to be obtained before commencing with dental treatment, and any signs of hypo or hyperglycemia have to be noted and treated. It is also important for the dentist to know what oral manifestations there are in a diabetic patient, and treat the manifestations accordingly.

Keywords: Oral manifestations; Before Treatment; During the Treatment; After Dental Treatment; Treatment of Oral Manifestation

Aim of the Study

This article aims to guide practitioners in clinical treatment of a diabetic patient. By providing the practitioner with valuable background information on a diabetic patient, this article aims to better equip the clinician, to identify oral manifestations of a diagnosed diabetic patient. This article also aims to guide the practitioner in therapeutic skills to treat a diabetic patient before; during and after treatment consultations.

Introduction

Diabetes mellitus type 1 is well known as “insulin deficient autoimmune disease”, where by the body produces islet cell antibodies against the pancreatic beta cells, leading to destruction, and causing a deficiency in insulin production [1]. Type 2 diabetes mellitus is generally known as “insulin-resistant diabetes” resulting from the body cells not responding to insulin [1]. When raised blood glucose levels triggers the pancreas to produce more insulin it can chronically lead to an exhaustion of the pancreas not being able to keep up with the insulin demands, and later lead to an insulin deficiency [1]. Deficiency in production of insulin or the failure of the body cells to respond to insulin, leads to an increase in blood glucose levels [1]. Raised blood glucose in type 1 and 2 diabetes

will cause damage to blood vessels if in a chronic hyperglycemic state [1].

In the medical field, dentistry has a lot of exposure to diabetic patients, resulting in particular management when treating these diabetic patients. Starting with the importance of patient medical history, a thorough medical history will reveal to a dentist that a patient is diagnosed with diabetes or not. In the case of undiagnosed diabetes mellitus, thorough oral examinations might lead to clinical signs and symptoms that the patient might be a diabetic patient. So, what are these oral manifestations of a diabetic patient? Oral complications such as periodontal diseases in 32% of controlled type 2 diabetes mellitus; tooth loss; bad breath (halitosis) in 52%, gingivitis; dry mouth sensation (xerostomia); prone to develop dental caries; a sensation of a burning mouth (especially in the tongue area) in 32%; a change in taste sensation in 28%; fungal infections in 28%; impaired wound healing; and a change in salivary gland function in 68% in controlled type 2 diabetes mellitus [2,3]. Some studies also have included some oral lesions in the mucosal area, such as, fissured tongue; geographic tongue; stomatitis; ulcers induced by trauma; lichen planus; cheilitis in the corner of the mouth known as angular cheilitis; and lichenoid reactions [4]. It has also been speculated that a long duration of oral complications can in fact also affect the control of blood glucose levels, indicating the

importance to manage and provide dental treatment for diabetic patients [3].

Periodontal disease such as gingivitis, periodontitis and periodontal abscesses are all associated with poor glycemic control in the blood of diabetic patients. The question is how does the two relate to one another? Studies have prevail that in diabetic patients, the immune and defense system is impacted, causing the defense response to function differently than normal (including the leukocyte's, such as the neutrophil, function) [3]. This occurs due to the fact that "atheroma deposits forms and proliferates in the basal membrane as well as lumen of cells, which leads to the reduction in defense abilities in the cell as well as impaired leukocyte function" [5]. When the dysfunction of neutrophils occur, there is a dysfunction in the natural inflammatory response, allowing the bacteria to persist and prevail in the periodontal tissue site, leading to tissue destruction of the periodontal ligaments, as well as alveolar bone [4]. In addition to the dysfunction of neutrophils, there is also an increase in secretion of tumour necrosis factors as well as prostaglandins which are well known pro-inflammatory cytokines, leading to the break down and destruction of collagen tissues [4]. It has also been shown in studies that collagen metabolism is also altered, due to the increased collagen destruction and a decrease in collagen formation [4]. Diabetic patients also have contributing factors to periodontitis, by reducing osteoblast proliferation and differentiation; preventing new bone formation and "reducing the ability for bone to recover" while being destroyed by bacteria. Hyperglycemia also stimulates bone resorption. All of these factors cause an overall reduction in alveolar bone level [5,6]. With vascular damage, a reduction in blood supply to the periodontium occurs, causing a reduction in oxygen supply which in turns causes an increase in osteoclast stimulation, resulting in resorption of the alveolar bone level [7]. Another implication of diabetes to the anatomical function of the human body, is the vascular system being damaged [1,3]. Just as diabetes has an effect on periodontium, similarly the periodontal diseases also affects the diabetes negatively [3]. Treating periodontitis can also in turn have a positive effect on diabetic glucose control [3]. But how can periodontal treatment affect blood glucose? Studies have shown that by treating periodontal diseases, and inducing good oral hygiene, the oral pathogens are reduced. With reduction of oral pathogens, the inflammation and the need for inflammatory response are reduced. Pro-inflammatory mediators are thus reduced which leads to the insulin resistance to reduce, creating a better glycemic con-

trol [3,5]. When the insulin resistance decreases, the insulin reacts at the cellular level and takes up the glucose from the blood and in turn, reduces blood glucose levels [3]. Thus, treatment of periodontal diseases holds multiple advantages, such as improving glucose control; providing better oral hygiene; reducing the amount of bone loss and also reducing the amount of tooth loss.

Salivary gland secretion dysfunction is also a manifestation of the diabetic patient. Multiple diabetic contributing factors lead to the destruction of the salivary gland tissues in the parotid gland, submandibular gland, sublingual gland and minor salivary gland. These contributing factors are: microvascular destruction, neuropathy and inflammatory response dysfunction. The microvascular destruction leads to the tissue destruction of the salivary gland. Inflammatory response dysfunction leads to the increase in pathogens in the salivary gland and causes tissue destruction. Diabetes also leads to neuropathy (nerve damage) causing dysfunction in the salivary gland secretion [4]. All of these factors leads to the reduction in salivary secretion from the salivary glands and results in dry mouth sensation, also known as xerostomia. Xerostomia can lead to halitosis (bad breath of the patient) [2,4]. With a reduction in salivary flow rate as well as with neuropathy, a dysfunction in the ability to taste food occurs (another oral manifestation in diabetic patients). Another study has also shown that with disturbances in taste, interferences with a good stable diet occurs, that can in turn also negatively influence the glucose control in diabetic patients [3,4]. Saliva has an immune response function (with antibody IgA) as well as a balance in pH function. Thus, the reduction of the saliva will in turn lead to carious lesions [8].

Dental lesions such as tooth caries are another manifestation in the diabetic patient. Since saliva secretion has been reduced, the salivary benefits are also reduced. Saliva has IgA antibodies that play a role in preventing attachments of bacteria. Saliva contributes to immune defense system in the oral cavity by secreting IgG antibodies as well as phagocytic cells fighting against oral pathogens and bacteria [8]. Saliva also plays an important role with pH balance maintenance in the oral cavity. With the increase flow rate of saliva, there is an increase secretion of bicarbonate as well as phosphate. Phosphate and bicarbonate acts as buffering systems against the acid production from bacteria [8]. Without saliva, the oral cavity loses vital mechanisms of protection against bacteria as well as a loss of pH buffering mechanisms [8]. In diabetic patients there is an increase in carbohydrate concentration in the saliva,

leading to bacteria being able to metabolize more carbohydrates, and as a result produce more acid. Without the pH buffering system of saliva, the acid will destroy tooth material leading to dental caries formation [8]. Thus, it is important for dentists to treat xerostomia and salivary gland dysfunction, in order to improve salivary flow. If the salivary flow is improved, bacterial attachment will be inhibited; the pH balance will be restored and dental destruction will be prevented. Saliva also secrete fluoride, magnesium and calcium that will help mature and strengthen the dental structure and protect the teeth from decaying [8]. Studies have also shown that a chronic state of high glucose levels in the blood may in fact lead to “irreversible pulpitis that will lead to pulp necrosis and periapical radiolucent lesion” [3]. Microvascular destruction leads to ischemia in the tissue and causes tissue damage, leading to pulp necrosis and later on periodontal abscesses [5].

Dental Infection is another oral manifestation of diabetic patients. When saliva flow rates are reduced and the immune response is abnormal, there is an increase in infection by pathogens including candida [3]. The immune system has a dysfunction because of macrophages having a reduction in phagocytosis due to an increase in glucose levels in the blood [7]. With high blood glucose, fat are metabolized and ketones increases. Ketones can interfere with wound healing by preventing nitric oxide secretion and reducing macrophage “appetite”. With a reduction in nitric oxide, the blood vessels remain narrow in the wound healing area. These factors prevent adequate wound healing and increase the risk for infection [7]. Candidal infection along with neuropathy can lead to burning mouth sensation [3]. In general diabetic patients are more prone to have fungal as well as bacterial infection, and due to the impaired immune system and impaired wound healing, the bacterial infection are more prone to spread to submandibular space area than in non- diabetic patients [4]. One of the major problems considered with a diabetic patient is the ability of wound healing being compromised. This poor wound healing is due to multiple contributing factors, including but not limited to immune defense system dysfunction; microvascular destruction and decline in tissue growth factor production [2-4]. With an increase in glucose levels in the blood, there is also a reduction in secreting nitric oxide vasodilator. Thus, the blood vessels becomes stiffened and narrowed, reducing the blood supply to the wound area and reducing the supply of oxygen and nutrients. This causes slow healing of the wound [7]. Due to these factors it is important for a dentist to treat infection and prevent the need for excessive wound healing after dental treatment [2].

Methods

This review article was conducted in order to gain answers to the question: “What are the dental considerations for treating a diabetic patient?” The review made use of the 27 checklist from PRISMA “Preferred reporting items for systematic reviews and meta-analysis”, in order to obtain relevant articles, to conduct this review article [9].

The database selection was made by one reviewer, by using inclusion criteria.

The search strategy included a literature search that was conducted in the Google Scholar database. The following search terms where applied: “signs and symptoms in diabetic patients”; “oral signs and symptoms in diabetic patients”; “diabetes oral manifestation”; “oral manifestations of diabetes”; “Saliva function”; “Dental extraction in diabetic patient”; “Non-invasive dental treatment in diabetic patient” and “dental consideration in diabetic patients”.

Screening and selection of articles were done by applying the inclusion criteria dates 2005 until 2022, to be sorted by relevance to the search terms and to include citations, with no exclusion criteria.

Data extraction and analyses were done by one independent reviewer. The articles obtained from this search was evaluated by availability to retrieve the document for viewing, once the article was retrieved, the abstract and conclusion was evaluated for relevance to this topic.

Results

The multiple term search, provided in the methodology section above, conducted in the Google Scholar database, identified 506 300 articles. From the search, the articles were evaluated by availability to be retrieved in full text. Once the article was retrieved in full text, the abstract and conclusion was reviewed for relevance to the review question and topic “dental considerations for treating a diabetic patient. From the multiple articles, 24 relevant articles were selected, but only 16 articles were used, based on useable information relevant to the research question and topic.

Discussion

Management of diabetic patients is thus very important in a dental practice. Before dental treatment can commence, a thorough medical history is necessary to evaluate the patient’s chronic ill-

nesses and medical treatment. It is important to establish if the patient is taking medication for diabetes or not. The dentist should also enquire about the recent history of glucose levels, and whether or not the levels reached hypo or hyper glycaemic levels [2]. The patient should also be taking medication regularly as prescribed by general practitioner, in order to control the diabetic state. A list of medications should be obtained to determine if medications taken for other reasons than for diabetes, doesn't cause a hypoglycaemic events with current sulphonylureas drugs. Examples of such drugs are high protein bound drugs including salicylates; Beta adrenergic blockers; sulfonamides; ACE inhibitors; monoamine oxidase inhibitors and dicumerol) [2,10]. Other drugs can lead to the hyperglycemia, such as: thiazide; oral contraceptives; epinephrine phenytoin; corticosteroids; calcium channel blockers and thyroid products [10]. Drugs that can also impair the secretion of insulin are the following: thiazide; interferon- α ; Dilantin and glucocorticoids [10]. The patient should also have eaten and taken medication in the morning before the consultation and treatment can begin, in order to avoid the risk of hypoglycemia [2]. Scheduling appointments for mornings sessions are important due to the endogenous hormone of cortisol that can lead to an increased level of blood glucose in a diabetic patient. These cortisol levels are usually at its highest in the morning times, thus reducing the danger of a hypoglycaemic events [2,10,12]. Also avoid the peak time period of insulin, after administration thereof, since this peak time has the highest risk of hypoglycemia [2,10]. If the patient is classified as a high risk patient with a history of uncontrolled diabetes, or using insulin, it is important to take a glucometer test before commencing with treatment [2]. According to the SEMDSA Guideline 2017, the hypoglycaemic level value is less than 3.9 mmol/L (in severe hypoglycemia level is less than 3 mmol/L); and hyperglycaemic level value above 11.1 mmol/L (but for in hospital patients it is above 7.8 mmol/L) [11]. Thus treatment can commence between the two ranges of values (5 or 5.5 - 10 mmol/L) [10,12].

During the treatment the following aspect are of importance. Look for signs of hypoglycaemic events, such as: hunger; decrease spontaneity; weakness; mood change; sweating; tachycardia; shaking; nausea; irritability and incoherence [2,10,11]. If hypoglycaemia is suspected, stop dental treatment immediately; administer fast acting carbohydrates orally in 15 - 20g dosage in the form of a gel or tablet; or provide sugar (3 - 4 teaspoons) dissolved in water; or 175 ml juice; or 1 - 1.5 tablespoons of honey. These interventions will increase the blood glucose with about 2.1

mmol/L within the next twenty minutes [2,10,11]. If the patient is unconscious, uncooperative or cannot swallow or take in the treatment given orally, take an IV drip and administrate 50% dextrose fluid in 20 - 50 mL dosage. An alternative method is to give 1 mg glucagon, but not in a sulphonylurea induced hypoglycaemic condition, since glucagon will worsen the condition [11]. Another staff member must seek medical assistance [2,10,11] while intervention steps are taken. Assess the glucose response over ten minutes, if the glucose levels remains beneath 4.4 mmol/L, a second dosage of IV 50% dextrose in 20 - 50 ml dosage will be needed. To prevent recurrence, continue to give the IV of 10% dextrose contained in water at a rate of 1L over 6 hours [11]. Provide the patient with a snack once the blood glucose level is normal. If hypoglycemia remains untreated the patient can be paralyzed; have a seizure; have permanent brain damage or fall into a coma (11). After providing the initial carbohydrates, provide bread and milk, to restore the blood glucose in a more prolonged manner [11]. After treatment, the blood glucose levels should be tested to determine if a second dosage is needed or not [2,10]. The risk for hyperglycemia is less than for hypoglycemia. In the case of hyperglycaemic events, look out for signs, such as: abdominal pain; nausea; vomiting and an acetone odor [2,10]. Managing this hyperglycaemic patient will require administration of insulin [2,10]. It might be difficult to determine whether the patient is undergoing hypo or hyperglycaemic attack. Thus, for fast treatment provide carbohydrate irrelevant of the glycaemic state, since the small amount of sugar provided to a hyperglycaemic patient is unlikely to cause harm, but can save the life of a hypoglycaemic patient [2,10]. If the patient is hyperglycaemic, refer the patient for medical assessment at their general practitioner before dental treatment can commence [10].

Treatment of oral manifestations is also important during dental treatment. With periodontitis it is important to control the plaque accumulation in the mouth by providing adequate oral hygiene instructions followed by a thorough scale and polish [10]. Regular follow ups will be needed to maintain good oral hygiene and good periodontal health [5]. Keeping in mind the poor wound healing, limiting the dental treatment to non-surgical and conservative methods only [10]. The hemoglobin A1C levels can be reduced significantly with scale and polish; root planning and 0.2% chlorhexidine mouth wash treatment [13]. Studies have shown that treatment with doxycycline systemically improves the hemoglobin A 1 C sugar levels [13]. Treatment with tetracycline can also reduce C reactive protein as well as improve the levels of A1C [13]. Since

tobacco smoking causes an increase in periodontitis, it is also important to provide smoking cessation advise and counseling to the patient [10]. If the patient struggles with salivary gland dysfunction and dry mouth, it is important to advise the patient to drink water frequently as well as use sugar free gum to reduce the dry sensation in the mouth. A full mouth bitewings are necessary to determine if patient is prone to caries [10]. Restorative dentistry and dietary advice will be necessary if the patient has dental caries manifesting in the mouth [10]. If fungal infection is present in the patient, an antifungal therapy can be provided systemically or topically [10]. Topical antifungal therapy includes nystatin or miconazole [5]. If the patient complains of a burning sensation in the mouth, clonazepam medication can be prescribed to alleviate the pain [10]. If the patient has a necrotic pulp or an abscess, endodontic treatment will be necessary. The diabetic patient has a lower success rate with root canal treatment and may need extraction after root canal treatment) [5]. If the necrosis and abscess are severe beyond restorative repair, dental extractions will be needed.

How can emergency dental treatment such as extraction occur in an uncontrolled diabetic patient? Studies have shown that emergency extraction in a diabetic patient with blood glucose level of 13.3 mmol/L (240 mg/dl) can result in severe infection and poor wound healing [7]. A delay in socket healing will occur due to the high ketone buildup levels in the blood [7]. As stated earlier, the safe cut off glucose level for elective (non-emergency) tooth extraction is 10 mmol/L (180 mg/dl) [7]. However, even emergency extractions have cut off points. Studies have recommended that the safe cut off point for an emergency tooth extraction is about 12.8 - 13 mmol/L (234 mg/dl) [7]. One of the risks for extraction are post operative infection in an uncontrolled diabetic patient with fungal infection. This will provide access and entrance for fungal infection into the wound, spreading to other spaces in the body such as the maxillary sinus, causing mucormycosis [7]. Another study has also shown that extraction in a geriatric patient with uncontrolled diabetes can lead to post operative osteonecrosis in the jaw [7]. It has also been shown that applying "plasma-rich growth factors" after a dental extraction, does improve wound healing in a diabetic patient, and will accelerate the socket to close and tissue to mature [7]. A risk also occurs with local anesthetics containing adrenaline, since this can increase the blood glucose levels. Thus, extracting a tooth in an uncontrolled diabetic patient or a patient with high blood glucose levels, must indicate the usage of local anesthetics without adrenaline [7]. Studies have also shown the

risk of interrupting warfarin therapy before dental extraction in diabetic patients, since it can lead to thromboembolic events and cause a stroke [14]. As long as the INR levels are below 4.0, dental extractions can continue without interrupting the warfarin therapy [14]. It is thus important to refer patient for INR tests prior to dental extraction and to consult with the patient's physician regarding the warfarin dosage before treating the patient.

After dental treatment, it is important to remember that diabetic patients have a risk of developing infection and are also prone to have delayed wound healing [10,12]. Thus, antibiotic treatment might be necessary if the patient has a severe case of oral infection or underwent a severe surgical procedure. Antibiotic treatment will then prevent further infection and prevent the increase in insulin resistance [7,10]. Antibiotic such as amoxicillin 500mg for 5 days can be given after extraction of uncontrolled diabetic patient [7]. Studies have shown that prescribing antibiotics can in fact reduce the amount of blood glucose levels, by increasing the rate of food being transitioned in the digestive tract, causing a reduction in the carbohydrates being absorbed [15]. Inform the patient to avoid aspirin containing medication since it contains salicylates which will increase insulin secretion and if taken with sulfonylureas, can lead to hypoglycemia [2,10]. Also provide adequate post operative instructions to the patient to ensure proper healing, especially after extracting the tooth. Patient should avoid introducing unnecessary bacteria into the extraction socket, by avoiding the fingers and tongue as well as tooth brush into the extraction site. Patient should also gently rinse the mouth with warm salt water, to reduce infection from the extraction site. Also inform the patient of possible side effects and indications of infection, to which the patient should respond to, by seeking medical attention. Risks such as trismus, and swelling in the jaw area can occur [16], these occurrences needs medical attention to prevent the swelling from spreading or worsening. The patient with fungal infection should also be informed of possible risks of developing mucormycosis. Thus, the patient should look out for symptoms such as fever; facial pain; swelling; headaches and malaise [17]. In severe cases, the mucormycosis can spread to the orbital region and impair the function of cranial nerve III, IV as well as VI, with an end result of orbital cellulitis; proptosis; loss of vision; papillary dilation and ptosis [17]. Infection may even spread to the cavernous sinus and lead to thrombosis that may be fatal to the patient [17]. In these cases patient should seek medical attention, providing antifungal treatment systemically such as liposomal amphotericin B (for an example AmBi-

some) [17,18]. The patient may also require surgical debridement to remove infected as well as necrotic tissue [17,18]. Thus, proper post operative instruction and information are needed for the patient to ensure best possible healing and to detect possible side effects early and to treat these patients before infection becomes detrimental.

Conclusion

In conclusion the dental considerations to be acknowledged to treat a diabetic patient, is to conduct a good medical history, obtaining information on the diabetic status and medication being taken. Assure that the patient has eaten a normal breakfast and have taken their meds before the consultation can commence. A morning appointment will be best, to avoid hypoglycemia, which is at a lower risk during early morning sessions. Obtain a blood glucose level by using a glucometer test, and only commence with treatment if the reading is between 5.5 - 10 mmol/L. If the patient is undergoing a hypoglycemic event, provide the patient with a fast acting carbohydrate of 15 - 20g dosage in a gel or tablet form, or provide 175 ml juice. If the patient is uncooperative and oral administration is impossible, provide 20 - 50 ml of 50% dextrose through an IV. If instead the patient is undergoing a hyperglycemic event, administrate normal insulin medication. If the patient has a stable glucose reading of between 5.5 - 10 mmol/L, normal dental treatment can commence. It is important to treat the main complaint of the patient as well as any oral manifestations of a diabetic patient. After treatment has been completed, antibiotic treatment can be prescribed for a severe case of oral infection. It is important to avoid aspirin medication prescription and to provide instruction to the patient not to take these medications with sulfonyleureas, to prevent increased insulin that can lead to hypoglycemia. Conclude your dental appointment with proper post operative instructions and information regarding risks and signs of poor wound healing and infection. Also instruct the patient to seek medical attention, at the sign of infection.

Bibliography

1. Silverthorn DU. "Human physiology: an integrated approach". 6th edition. Pearson; 2013.
2. Miller A, Ouanounou A. Diagnosis, Management, and Dental Considerations for the Diabetic Patient. *J Can Dent Assoc.* 2020;86:k8.
3. Rohani B. Oral manifestations in patients with diabetes mellitus. *World J Diabetes.* 2019;10(9):485-489.
4. Al-Maskari AY, Al-Maskari MY. Oral Manifestation and Complications of Diabetes Mellitus: A review. *SQU Med J.* 2011;11(2):179-186.
5. Mauri-Obradors E, Estrugo-Devesa A. Oral manifestations of Diabetes Mellitus: A systemic review. *Med Oral Patol Oral Cir Bucal.* 2017;22(5):e586-e594.
6. Bajaj S, Prasad S. Oral manifestations in type-2 diabetes and related complications. *Indian J Endocrinol. Metab.* 2012;16(6):777-779.
7. Gazal G. Management of an emergency tooth extraction in diabetic patients on the dental chair. *Saudi Dent J.* 2020;32(1):1-6.
8. Kumar B, Kashyap N. The composition, function and role of saliva in maintaining oral health: A review. *Int J Contemp Dent Med Re.* 2017.
9. Moher D, Liberati A, Tetzlaff J. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *BMJ.* 2009;339:b2535.
10. Lalla RV, D'ambrosio JA. Dental management considerations for the patient with diabetes mellitus. *JADA.* 2001;132(10):1425-1432.
11. JEMDSA. The 2017 SEMDSA Guideline for the Management of Type 2 Diabetes. *J Endocrinol Metab Diabetes S. Afr.* 2017;22(1):S1-S196.
12. Alamo SM, Soriano YJ. Dental considerations for the patient with diabetes. *J Clin Exp Dent.* 2011;3(1):e25-30.
13. Indurkar MS, Maurya AS, Indurkar S. Oral manifestations of diabetes. *Am Diabetes As.* 2016;34(1):54-57.
14. Lu SY, Lin LH, Hsue SS. Management of dental extractions in patients on warfarin and antiplatelet therapy. *J Formos Med As.* 2018;117(11):979-986.
15. Wray L. The diabetic patient and dental treatment: an update. *Brit Dent J.* 2011;211(5):209-215.
16. Power DJ, Sambrook PJ, Goss AN. The healing of dental extraction sockets in inulin-dependent diabetic patients: a prospective controlled observational study. *Aust Dent J.* 2019;64(1):111-116.

17. Bakathir AA. Mucormycosis of the jaw after dental extractions: two case reports. Sultan Qaboos Univ Med J. December 2006;6(2):77-82.
18. Prabhu S, Alqahtani M, Shehabi MA. A fatal case of rhinocerebral mucormycosis of the jaw after dental extractions and review of literature. J Infect Public Health. 2018;11(3):301-303.

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