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INFLUENCE OF GLYCEMIC CONTROL, USE OF ADJUNCTS AND ANTIBIOTIC PROPHYLAXIS ON SOCKET HEALING IN DIABETICS: A REVIEW OF CURRENT CLINICAL GUIDELINES

Dentistry

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ABSTRACT

Background: Diabetes mellitus is a chronic metabolic disorder associated with a wide range of complications. Extraction of teeth is the most common out-patient dental procedure in these patients. Delayed wound healing, persistent pain, inflammation, infection, and dry socket in relation to the post-extraction sockets are some of the unfavourable outcomes seen. There is less evidence on the correlation between HbA1c level and post extraction healing and complications. There is ambiguity in administration of routine antibiotics in diabetics after simple tooth extraction. Recently multiple adjuncts are used in the extraction socket to improve the wound healing in diabetic patients. **Methods:** This article critically reviewed twenty-three researches published between 2012- 2023 in esteemed journals related to diabetes, extraction of teeth, wound healing, post extraction complications, glycemic control and antibiotic prophylaxis. **Results And Conclusion:** Routine antibiotic prophylaxis in diabetics is not required for simple extractions. The level of glycemic control does not influence the socket healing or increase the risk of developing complications post extraction of teeth. The application of agents improved the healing in the extraction socket by hastening socket closure and bone regeneration in diabetic patients.

KEYWORDS

Antibiotic prophylaxis, Diabetes, Extraction of teeth, Glycemic control, Wound healing,

INTRODUCTION

Diabetes mellitus is a chronic metabolic disorder exhibiting as hyperglycemia due to dysfunction in blood glucose regulation.[1] A broad spectrum of complications are classified as macrovascular, microvascular, and neuropathic are predisposed to develop as a result of poor glycemic management [2].

A notable change in the microvascular circulation leads to a decreased inflammatory response, which can have a major impact on the healing of wounds following surgical procedures. Diabetes patients have altered permeability, impaired hyperaemia, and impeded leucocyte migration due to alterations in the blood capillaries, like thickening of the basement membrane [2]. This results in under perfusion under tissue hypoxia and stress. Hyperglycemia with higher ketone levels, with impaired blood supply and delivery of nutrients to the tissues causes delay in wound healing, increasing the chances of infection [3]. The higher level of free radicals at the site of the wound may induce more oxidative stress causing prolonged healing. Such modifications may adversely affect the surgical outcomes, leading to poor wound healing and infection[2].

The most common oral complications of diabetes include loss of teeth, gingivitis, periodontitis and soft tissue pathologies[4]. The most common out-patient dental procedure is removal of teeth. High glycemic index is reported to adversely affect the outcomes following extraction. Delayed wound healing, persistent pain, inflammation, dry socket and pus discharge are some of the unfavorable outcomes seen in these patients.

Various adjuncts such as hydrogels and platelet gels are used in the extraction socket to promote healing as they contain growth factors and anti-inflammatory action. These have been advocated to reduce pain and post operative complications and to improve epithelization and regeneration of bone [5-9].

There is a dearth of studies on the outcomes of minor oral surgical procedures such as tooth extractions for diabetic patients. Many dental surgeons cite factors such as delay in wound healing and greater risk of developing postoperative infections. Under such circumstances, physician reference is warranted resulting in unnecessary delays in the treatment and prolonged requirement of antibiotics putting the patients at a further risk of experiencing adverse side effects including antibiotic resistance which can negatively affect the quality of life.[2,4] The requirement for antibiotics, its dosage and duration to alleviate post extraction sequelae is unclear.

This article aims to evaluate the glycemic influence and use of adjuncts on socket healing in diabetic patients and the necessity for antibiotics.

Methodology

Electronic databases like Medline (through PubMed), Google Scholar and EBSCO were utilized to search the literature. Relevant articles of last 11 years i.e. between 2012 and 2023 with keywords relating to diabetes, dental extractions, post extraction complications, wound healing, socket healing, antibiotic prophylaxis were searched. Research with relevant information and published in English language was considered for inclusion.

RESULTS

As a general practice, dentists evaluate the glycemic control in diabetics most commonly by random blood glucose levels followed by glycosylated hemoglobin values before the extraction of teeth as given in (Table 1).

Table 1: Evaluation Of Glycemic Control Of Diabetics In Various Studies

Sl.No	STUDIES/ YEAR	FBS	PPBS	RBS	HbA1c
1	Gadicherla et al [1] (2020)			✓	✓
2	Huang et al [2] (2015)			✓	
3	Fernandes et al [3] (2015)			✓	✓
4	Muzaffar et al [4] (2016)			✓	✓
5	Asoka S et al [5](2022)			✓	
6	Sasa marin et al [6] (2020)			✓	✓
7	Mugilan et al [7](2020)			✓	
8	Mozzati et al [8](2014)			✓	
9	Ghanem, M et al [9](2022)				✓
10	Vinuta Hegde et al [10](2017)			✓	
11	DJ Power et al [11](2018)			✓	
12	Aronovich et al [12] (2010)			✓	✓
13	A. Mahmood et al [13](2021)			✓	
14	Maftei, G.-A.et al [14] (2021)				✓
15	Feras Sulaiman et al [15] (2021)			✓	
16	B. Krishnan et al [16](2020)			✓	✓
17	Pozzani VRP et al [17](2012)	✓	✓		
18	MH. Akhavan Karbassi et al [18] (2015)	✓			
19	Zhang et al [19](2015)	✓	✓		✓
20	Raza Khan et al et al [20](2021)	-	-	-	-
21	Bhawani Gupta et al [21] (2017)			✓	
22	Y. S. Khader et al [22] (2010)	✓			✓
23	Agani et al [23] (2022)			✓	

FBS: Fasting Blood Sugar
PPBS: Post Prandial Blood Sugar
RBS: Random Blood
HbA1c: Glycosylated hemoglobin

There is ambiguity in literature to justify the antibiotic prophylaxis in diabetic patients post extraction and with limited evidence of patients developing oral complications. In few studies, no antibiotics were given after extraction and no complications were noted as depicted in (Table 2).

Table 2- Administration Of Antibiotics In Various Studies

Antibiotic Prophylaxis	Pre extraction	Post extraction
Huang et al [2] (2015)		YES- If there was infection
Fernandes et al [3] (2015)	X	X
Mugilan et al [7](2020)		YES
Mozzati et al [8](2014)		YES- If there were complications
Ghanem, M et al [9](2022)	YES -1 hour before	YES- 5days
Vinuta Hegde et al [10](2017)		YES -5 days
DJ Power et al [11](2018)		YES-Presence of infection
Aronovich et al [12] (2010)		YES
A. Mahmood et al [13](2021)	YES- 1 hour before	
B. Krishnan et al [16](2020)		YES- If there were complications
Pozzani VRP et al [17](2012)	YES- 1 hour before if there is infection	YES- Presence of infection
MH. Akhavan Karbassi et al [18] (2015)		X
Y. S. Khader et al [22] (2010)	X	X

YES - Antibiotics administered
X – No Antibiotics administered

Antibiotics are routinely administered for simple extraction of teeth to prevent any post extraction infections. Administration of a single antibiotic 1hr before extraction is sufficient to reduce any post operative complications.

Many studies have carried out research to evaluate the efficacy of multiple agents used in post extraction sockets as an adjunct in healing (Table 3)

Table 3- Various Agents Used In The Extraction Socket

AGENTS	EFFECT IN HEALING
Hyaluronic acid	Improved wound healing
Plasma-rich growth factor	Improved wound healing Accelerated socket closure (epithelialization) Tissue maturation
Platelet rich fibrin	Significant soft-tissue and hard-tissue healing
Curcumin	Improved soft tissue healing
Coenzyme-q10/Collagen hydrogel	Facilitates bone formation and healing

DISCUSSION

Healing of bones is accomplished by the interaction of osteoblasts and extracellular matrix, influenced by different growth factors such as transforming growth factor β3, insulin-like growth factors, and bone morphogenetic proteins needed to facilitate the healing process and repair [4]. Bone healing and resorption rate can also be influenced by diabetes mellitus.

In type II diabetic patients, no statistically significant difference was noted between them and healthy patients in the outcomes of wound healing and complications post extraction of teeth [2]. In patients with optimal control of diabetes, extractions can be performed safely with minimal complications [1]. As there is similar healing between healthy patients and diabetic patients on oral hypoglycemics, same protocol can be followed for both groups.[10]

Type 1 -insulin-dependent and Type 2 well controlled diabetic patients, have good healing following dental extractions with a minor degree of post extraction complications [11]. Glycemic level is not a risk factor for developing post-extraction complications in diabetics as it has no influence in the wound healing[1,4,12]. Diabetic patients undergoing extraction of teeth when administered prophylactic antibiotics before the procedure have low incidence of post-operative complications [13]. Antibiotics should not be given as a standard regimen after extraction of teeth which have no signs of an acute infection.[2]

Saliva of the diabetic patients usually contains decreased glutathione and melatonin which act as a scavenger for free radicals. The salivary immune biochemical markers are modified in diabetic patients corresponding to their HbA1c levels, and are probable indicators of wound healing[14].Administration of epinephrine and norepinephrine in simple tooth extraction in type II diabetic patients did not significantly increase or decrease their blood glucose levels [15].In studies conducted to evaluate the benefits of adjuncts in post extraction socket, statistically significant difference was found in socket closure, wound healing scores proving the anti-inflammatory action with hyaluronic acid gel [6]. Pain reduction and socket closure was evident with the usage of curcumin indicating its analgesic effects [7]. Platelets gels like Plasma-Rich Growth Factor and Platelet Rich Fibrin contain growth factors that accelerate the healing, with additional action as a barrier membrane and scaffold for soft tissue regeneration [5,8]. Collagen and coenzyme Q10 hydrogels have shown reduction in pain with anti-inflammatory action with evidence of bone formation [9].

CONCLUSION

It can be inferred that routine antibiotic prophylaxis in diabetics is not required for simple extractions. The level of glycemic control does not influence the socket healing or increase the risk of developing complications post extraction of teeth. The application of agents improved the healing in the extraction socket by hastening socket closure and bone regeneration in diabetic patients.

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