DIABETIC CONTROL AND PERIODONTAL HEALTH IN THE IMPLANT PATIENT

EVIDENCE BASED DENTISTRY ROUNDS

PERIODONTICS

6A-2

09-30-2020

ROUNDS TEAM

- **Group Leader:** Dr. Cimmrmancic
- **Specialty Leader:** Dr. S. Rawal
- **Project Team Leader:** Katherine (Binka) Von Arx
- **Project Team Participants:** Daniella Eglash; Rachel Thornton; Jessica Short

PATIENT

- 72 years old
- Female
- Hispanic
- ”Here for a cleaning”
- Pt pays daily visits to her father in hospice and takes on the responsibility of much of his care/supervision. Pt is often tired, stressed, and lacking in time for recreation
- Self-professed chocoholic and talented salsa dancer

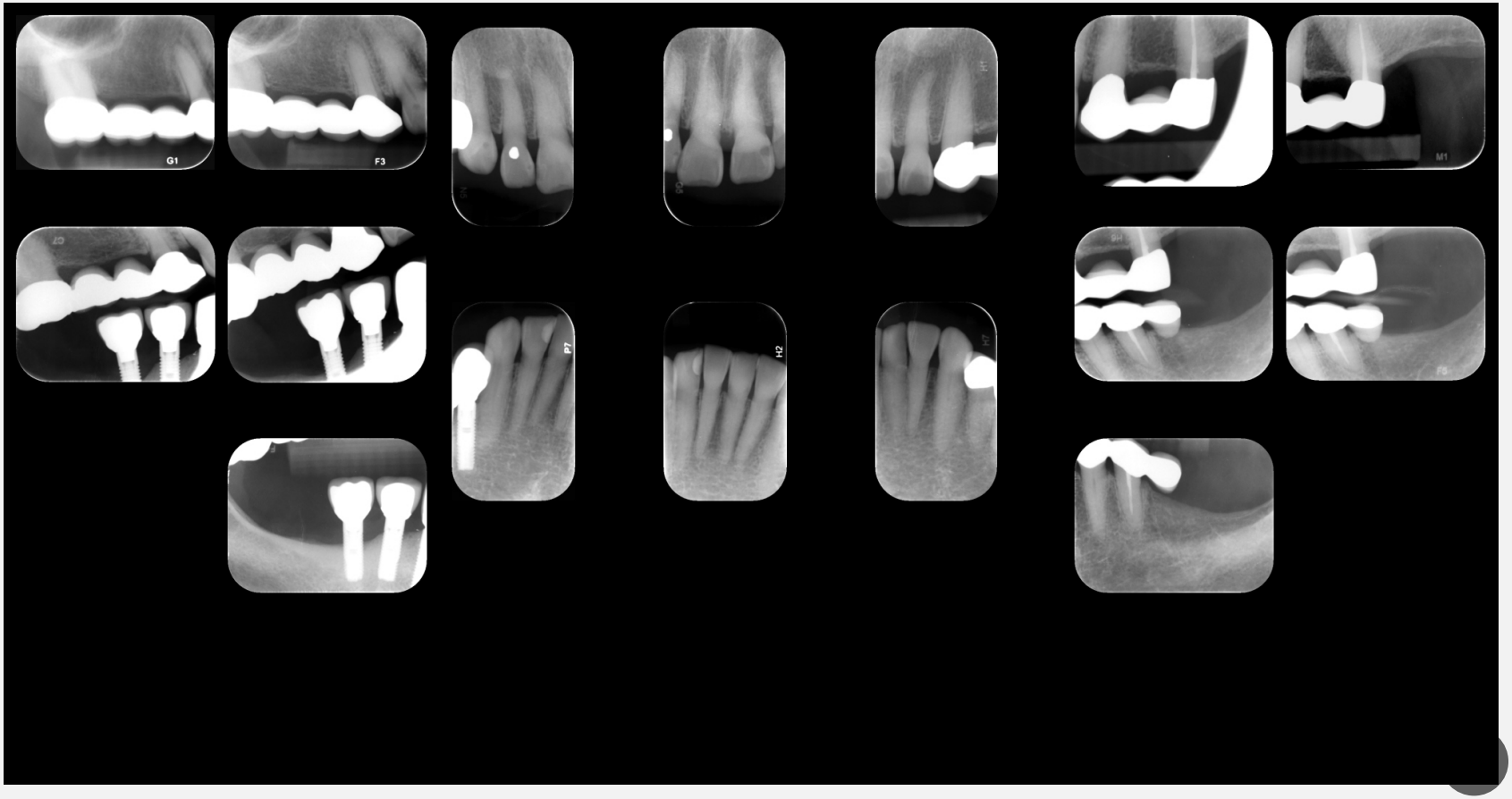
MEDICAL HISTORY

- Current & past:
  - Diagnoses: Hypertension, GERD, Osteoarthritis
  - Conditions: Herniated disc, frequent urination, overactive gag reflex
  - Medications:
    - Rosuvastatin calcium 10mg daily
    - Vitamins B12, D2
    - Sertraline 50 mg daily (antidepressant)
    - Losartan 50 mg daily
    - Hydrochlorothiazide 25.5 mg daily
  - Medical Consults: Pending medical consult for official diabetic diagnosis
  - Treatment considerations: Hx of mini stroke (2015)

DENTAL HISTORY

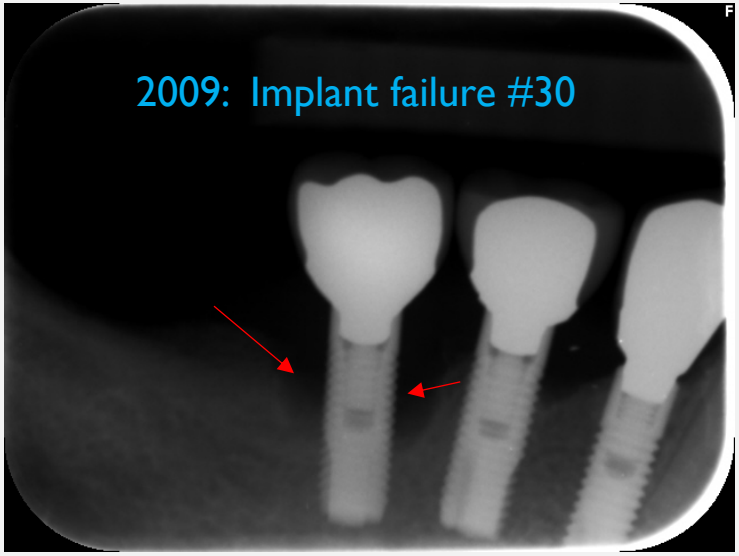
- 2008: Implants placed at sites #28, #29, #30
- 2009: Surgical repair of peri-implantitis #30
- 2010: Begin 3-month perio maintenance
- 2015: Surgical debridement of implants #29, #30
- 2018: Pt is stable and placed in D2 recall
- April 2019: Peri-implantitis diagnosed #28, #29, #30
- Sept 2019: Diabetes suspected

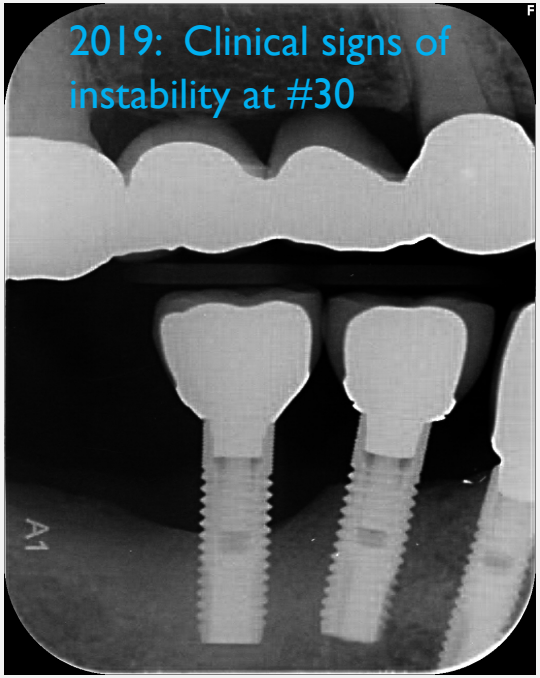
RADIOGRAPHS: 2019 FMX



RADIOGRAPHIC FINDINGS

- No immediate radiographic concerns
- Implants placed circa 2008
- Continuous monitoring of #28, #29, #30





CLINICAL PHOTOS

Problem Area

CLINICAL FINDINGS

- Occlusal wear on implant crown #28
- Leaky MI resin restoration #7
- Bilateral mandibular tori
- Gingivitis
- Ketone breath

SPECIFIC FINDINGS

- Extensive BOP, generalized 4 & 5mm PD, and generally erythematous gingiva
- Ketone breath

PERIODONTAL CHARTING

Note: generalized BOP and unacceptable PD outside the problem area

																	MOBILITY
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																	PLAQUE
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Problem Area

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																	MOBILITY

DIAGNOSIS

- Peri-implantitis at sites #28, #29, #30
- Early chronic periodontitis, ADA Stage 2
- Pre-diabetes (Pending official diagnosis)

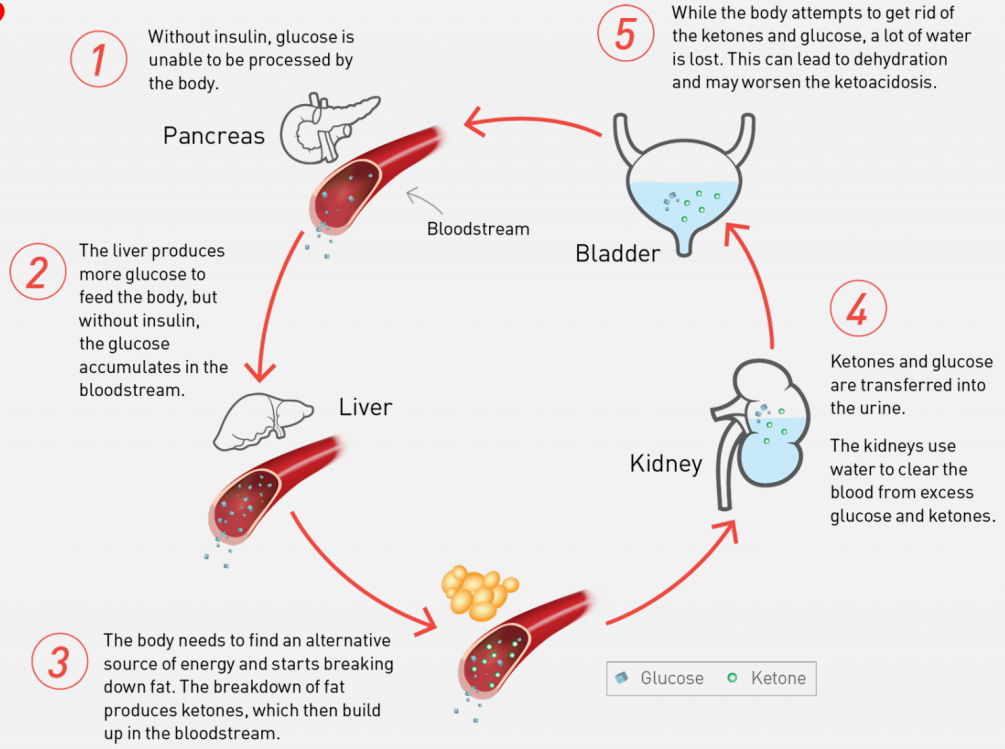
PROBLEM LIST

- Peri-implantitis at sites #28, #29, #30
- Extensive gingivitis
- Pre-diabetes, likely contributing to decline of gingival tissues

D1 BASIC SCIENCE

What is Diabetic Ketoacidosis?

- Glucose is unable to enter cells due to lack of insulin
- Breakdown of fat for energy
  - *Ketones in bloodstream*



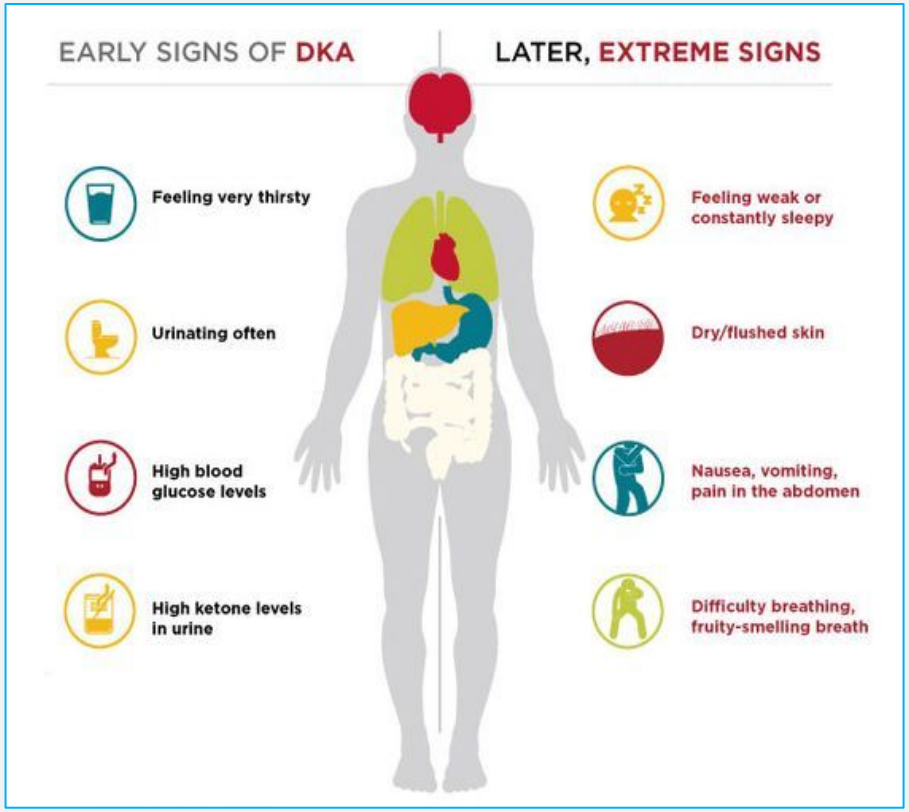
"DKA (Ketoacidosis) & Ketones." *DKA (Ketoacidosis) & Ketones | ADA*, American Diabetes Association, www.diabetes.org/diabetes/complications/dka-ketoacidosis-ketones.

https://tinyurl.com/yxbsqx6y

D1 BASIC SCIENCE

What is Diabetic Ketoacidosis?

- Causes:
  - Illness
  - Prolonged strenuous exercise
  - Skipping meals
  - Low blood sugar



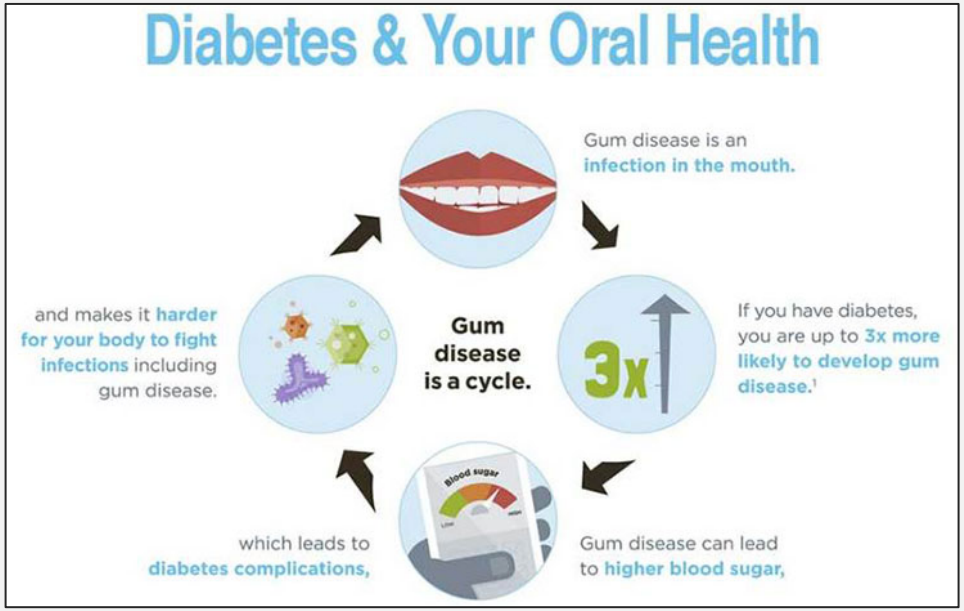
https://www.diabetes.org/diabetes/complications/dka-ketoacidosis-ketones

D2 PATHOLOGY

- ***What is the pathogenicity of Diabetes Mellitus?***
  - Pancreas makes insulin>Insulin helps glucose into cells>Glucose binds Hb to be able to reach target cells all over
  - **DM: "The ultimate metabolic disorder"**
    - Blood glucose levels are above normal b/c no insulin to lower it, *IE* high HbA1c
      - Type I – Pancreas is not making enough insulin
      - Type II – Body can't use its own insulin as well as it should

D2 PATHOLOGY

- Xerostomia
- Fruity/ketone breath
- Burning sensation in mouth
- Impaired wound healing
- Infection
- Parotid gland enlargement
- Gingivitis and/or periodontitis



Jankins, Daniel B (2018, July 10). Diabetes and Oral Health. In *DEIN 7130: Oral Medicine and Diagnosis 1: Summer 2020* [Powerpoint slides].

Bryan, L. B. (2019, October 11). Non-surgical periodonal therapy. In *DEIN 7114: Introduction to Clinical Practice 1: Fall 2019* [Powerpoint slides]. "Oral Health Topics: Diabetes." *American Dental Association*, www.ada.org/en/member-center/oral-health-topics/diabetes.

D3 PICO

- **Clinical Question:** ***How does diabetes affect stability of dental implants?***

PICO FORMAT

P: **Patient with both diabetes and peri-implantitis**

I: **Glycemic control**

C: **Uncontrolled HbA1C levels vs. controlled HbA1C levels**

O: **Extent of peri-implantitis**

PICO FORMATTED QUESTION

- Among patients with both diabetes and peri-implantitis, how do controlled HbA1C levels affect the extent of peri-implantitis, compared to uncontrolled HbA1C levels?

CLINICAL BOTTOM LINE

- Glycemic control of diabetes reduces the severity of peri-implantitis.

SEARCH BACKGROUND

- **Date(s) of Search:** 9/17/2020
- **Database(s) Used:** Pubmed
- **Search Strategy/Keywords:** Dental Implants, diabetes mellitus, hyperglycemia, osseointegration, periodontal bone loss, glycemic control, systemic disease

SEARCH BACKGROUND

- **MESH terms used:**

dental implants, diabetes mellitus, glycated hemoglobin A, oral hygiene, osseointegration, periodontal disease, peri-implantitis, cytokines/biosynthesis, diabetes complications

ARTICLE 1 CITATION, INTRODUCTION

- **Citation:** Javed, F., & Romanos, G. E. (2009). Impact of diabetes mellitus and glycemic control on the osseointegration of dental implants: a systematic literature review. *Journal of periodontology*, *80*(11), 1719–1730. https://doi.org/10.1902/jop.2009.090283

- **Study Design:** Systematic Review

- **Study Need / Purpose:** To see if patients with diabetes are good candidates for dental implant therapy and how hyperglycemia/glycemic control influences osseointegration.

ARTICLE 1 SYNOPSIS

- Method
  - Review of 18 articles – 10 were clinical studies, 8 were experimental (mostly on DI rats)
  - Quantifying bone adjacent to implants using histologic/histomorphometric techniques
  - Compared implant survival rates through periodontal inflammation, resonance frequency analysis, electronic mobility testing, life-table methods, and radiographs
  - Monitored serum glycemic levels via standard techniques
- Results
  - 7 studies showed that diabetes negatively affected osseointegration
  - 11 studies reported that successful osseointegration can be accomplished in individuals with diabetes with an optimal serum glycemic control

ARTICLE 1 SYNOPSIS

- Conclusions
  - Under optimal glycemic control, diabetics can have periodontal bone height similar to healthy individuals
  - Similar rates of implant success of patients with well-controlled diabetes and those without diabetes
  - Immediate loading can successfully osseointegrate implants in subjects with well-controlled diabetes
- Limitations
  - Some of the studies only looked at patients with well-controlled diabetes and healthy individuals
  - Did not define well what was considered "well-controlled" and "not well-controlled" diabetes in the various studies

ARTICLE 1 SELECTION

- **Reason for selection**
  - Explores the influence of glycemic control on implants
  - Includes many studies in the systematic review
- **Applicability to your patient**
  - Shows that implant osseointegration and implant survival may successfully occur under good metabolic control
- **Implications**
  - Diabetic management is important to peri-implant health
  - Importance of keeping up with periodontal therapy and oral hygiene throughout the process

ARTICLE 2 CITATION, INTRODUCTION

- **Citation**: Naujokat, H., Kunzendorf, B., & Wiltfang, J. (2016). Dental implants and diabetes mellitus-a systematic review. *International journal of implant dentistry*, *2*(1), 5. https://doi.org/10.1186/s40729-016-0038-2
- **Study Design**: Systematic Review
- **Study Need / Purpose**: To see if diabetic patients with dental implants have a higher complication rate in comparison to healthy controls.

ARTICLE 2 SYNOPSIS

- **Method**
  - 22 articles were used in the systematic review
  - Independent scientist conducted search under specific criteria followed by quality control
- **Results**
  - Patients with poorly controlled diabetes had lower stability in the first 2-6 weeks (after 1 year no difference)
  - Number of patients suffering peri-implant inflammation increases with HbA1c values
  - Well- controlled diabetic patients (mean HbA1c = 7.2%) had the same overall survival rate as controls in conventional implant therapy
  - 4 studies conclude better implant survival and less peri-implant complications in well-controlled group, 3 studies had no difference
  - Khandelwal treated exclusively poor glycemic control patients – can still have successful implants
  - Preoperative antibiotics provided only 4.5% higher survival for implants in healthy patient, while it provided even greater (10.5%) in Type II diabetic patients

ARTICLE 2 SYNOPSIS

- **Conclusions**
  - Delayed osseointegration in patients with poorly controlled diabetes – after 1 year no difference
  - Overtime, peri-implantitis becomes more of a concern for patients with diabetes – importance of recall and keeping up with oral hygiene/progression of gingivitis
  - Good glycemic control improves osseointegration and implant survival
  - To improve implant survival/reduce postoperative complications, prophylactic antibiotics/chlorhexidine mouth rinses are recommended
- **Limitations**
  - Included incomplete reported data like type of diabetes therapy, quality of glycemic control, and duration of disease
  - No consistent definition of "well-controlled" diabetes
  - Mostly looks at patients with well-controlled diabetes

ARTICLE 2 SELECTION

- **Reason for selection**
  - Focus question directly correlated with our PICO question
  - Looked directly into glycemic control and had evidence on antibiotic use
- **Applicability to your patient**
  - How glycemic control might affect the patient's current implants
  - Importance of glycemic control and other methods the patient can use to lower risk of peri-implantitis
- **Implications**
  - Patient is pre-diabetic with current peri-implantitis. Her current oral health trajectory puts her at significant risk for future failed implants if left unchecked.

LEVELS OF EVIDENCE

☐ **1a** – Clinical Practice Guideline, Meta-Analysis, Systematic Review of Randomized Control Trials (RCTs)

☐ **1b** – Individual RCT

☒ **2a** – Systematic Review of Cohort Studies

☐ **2b** – Individual Cohort Study

☐ **3** – Cross-sectional Studies, Ecologic Studies, "Outcomes" Research

☐ **4a** – Systematic Review of Case Control Studies

☐ **4b** – Individual Case Control Study

☐ **5** – Case Series, Case Reports

☐ **6** – Expert Opinion without explicit critical appraisal, Narrative Review

☐ **7** – Animal Research

☐ **8** – In Vitro Research

STRENGTH OF RECOMMENDATION TAXONOMY (SORT)

☐	**A** – Consistent, good quality patient oriented evidence
☒	**B** – Inconsistent or limited quality patient oriented evidence
☐	**C** – Consensus, disease oriented evidence, usual practice, expert opinion, or case series for studies of diagnosis, treatment, prevention, or screening

CONCLUSIONS: D3

How does the evidence apply to this patient?

- The evidence suggests that this pre-diabetic patient should monitor her HbA1C level in addition to adhering to periodontal maintenance to improve her chances of implant survival
- Good glycemic control improves success of implant osseointegration and survival of implants, and lowers risk of peri-implantitis
- Oraly hygiene maintenance can help with implant osseointegration/success of implants

Based on the above considerations, how will you advise your D4?

- Continue to provide patient with OHI and perio maintenance
- Make sure patient has controlled HbA1C

CONCLUSIONS: D4

Based on your D3's bottom line recommendations, how will you ***advise*** your patient?

- Educate pt. on link between peri-implantitis and DM
- Med consult to determine need for medical management of DM
- Advise limiting dietary simple sugars to keep blood sugar WNL

How will you ***help*** your patient?

- Continue 3-month perio maintenance with close monitoring of peri-implant health and reinforcement of proper implant OHI
- Facilitate multi-disciplinary treatment by open communication with both periodontist and general physician

DISCUSSION QUESTIONS

- **Q:** "Does the success of implants differ between patients who have type I vs type II diabetes? If so, which type of diabetes show a higher success rate of implant stability?"
- **A:** Does success rate differ? In short, no. The bottom-line factor with DM as it relates to implant stability is how well-controlled the diabetes is. Most high-quality research examining this question shows no difference in implant success rate between DM 1 & 2, provided level of diabetic control is comparable.

Moraschini V, Barboza ES, Peixoto GA. The impact of diabetes on dental implant failure: a systematic review and meta-analysis. Int J Oral Maxillofac Surg. 2016 Oct;45(10):1237-45. doi: 10.1016/j.ijom.2016.05.019. Epub 2016 Jun 11. PMID: 27297836.

DISCUSSION QUESTIONS

- **Q:** "Do we care more about the current glucose level or HbA1c levels to determine stability?"
- **A: HbA1c level** is a 3-month average measurement of amount of glycated, live RBC's in the bloodstream. Long-term averages are intrinsically more diagnostic for conditions that present chronically and with a certain level of severity, and they're less diagnostic for conditions which are fluctuant and mild in nature, as such conditions may "cancel out" over the long run. Our patient is suspected to be pre-diabetic, in which case **FPG (Fasting Plasma Glucose)** or **2HPG (2-Hour Plasma Glucose)** may be significantly more diagnostically sensitive than HbA1c.

Karnchanasorn, Rudruidee et al. "Comparison of the Current Diagnostic Criterion of HbA1c with Fasting and 2-Hour Plasma Glucose Concentration." *Journal of diabetes research* vol. 2016 (2016): 6195494. doi:10.1155/2016/6195494

THANK YOU