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What's new for the clinician?

Summaries of and excerpts from recently published papers

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1. Evidence summary: The relationship between oral diseases and diabetes

D'Aiuto F, Gable D, Syed Z, Allen Y, Wanyonyi KL, White S, Gallagher JE.

Recent data from the International Diabetes Federation (IDF) estimates that 7 % of South Africans between the ages of 21 and 79 years have diabetes.[1] Based on the latest population estimates for South Africa, this means that 3.85 million South Africans in this age group may have diabetes. However, these statistics only shed light on the surface of a much deeper problem. To fully appreciate the current statistics on the prevalence of diabetes in South Africa, one needs to look back. In 2010, the prevalence of type 2 diabetes in South Africa was estimated at 4.5 %.[1] Thus, a 155 % increase in six years!

The majority of people with diabetes can be classified as having Type 1 or Type 2. Type 1 diabetes is an autoimmune disease, whereby tissues are attacked by the body's own immune system. The condition tends to occur at a younger age and it is essential that it is treated with insulin. Type 2 diabetes is eight to nine times more common than Type 1. It occurs as a result of a combination of lack of response to insulin (insulin resistance), and a lack of insulin production. It tends to occur in later life and in the early stages may be treated with oral medication.

Both Types 1 and 2 diabetes have been associated with many oral diseases. Observational studies have suggested diabetic links with periodontal diseases (including peri-implant disease), caries (with its risks of tooth loss), oral mucosal disease (including oral infections), oral cancer, salivary dysfunction and oral dysaesthesias, including taste disturbances. However, with all the studies investigating these associations there has been little consensus with respect to the overall effect of diabetes mellitus on oral health and vice versa. D'Aiuto and colleagues[2] undertook a rapid review of articles published between 2005 and 2015, investigating the relationship between diabetes and oral health. A rapid review is a synthesis of the most current and best evidence to inform decision-makers. It combines elements of systematic reviews with a streamlined approach to summarise available evidence in a timely manner.

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REVIEW METHODS

A search strategy was developed using syntax and MeSH terms for three electronic databases: Cochrane, PubMed, OVID (Embase, MEDLINE [R] and PsycINFO). Inclusion criteria were systematic reviews/meta-analyses involving diabetes and oral health, published in the ten-year period, involving human research and requiring that the full text be available in English. Only systematic reviews and/or meta-analyses of observational and experimental studies were included in the final results. Two independent searches were undertaken, screening papers by title and abstract for relevance and duplication. Each researcher reviewed their search results and excluded papers that were not systematic reviews/meta-analyses, were not related to diabetes and any aspect of oral health, and were not available in English despite contacting the authors. After the final selection the searches were combined and duplicates removed. The researchers discussed all papers before final agreement on those which were to be included for the rapid review.

The following information was extracted from each paper: author, year, title, journal, population studied, oral disease/intervention, definitions used, methods, comparison/intervention and controls, outcomes, results, authors' conclusions, quality and quality justification; all shown in the data extraction table. From a total of 2,406 papers initially identified, there were 30 articles identified by the review for inclusion. Quality assessment was undertaken for each systematic review using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) and AMSTAR [Assessing the Methodological Quality of Systematic Reviews) tools to ascertain risk of bias. An AMSTAR assessment was carried out on all papers with the methodological quality of the review being rated as 'High' with a score between 11 and eight, 'Moderate' between seven and four, and 'Low' between four and zero. The quality of all papers was confirmed by

group discussion. Of the 30 systematic reviews, 12 were deemed to be of high quality, 14 of moderate quality and four were of low quality. Common AMSTAR quality issues were a) lack of an a priori design or question, b) no quality appraisal, c) missing tables, and d) no duplicate study selection.

Within the theme identified by this review, reviews related to investigation of a) glycaemic control and periodontal therapy and b) the risk of oral cancer in patients with diabetes were considered of high quality, while articles on the association between dental implant therapy, osseo-integration and diabetic neuropathy, with oral diseases or therapy were of low quality.

RESULTS

The results were reported in nine sections, each relating to an oral disease or condition investigated. Each section contained evidence of any association between the oral disorder and diabetes and also on the impact of oral therapy on diabetes and diabetes management on oral health.

1. Periodontitis and diabetes

There is high quality evidence that diabetes (Type 2) is a risk factor for periodontitis. There is some moderate quality evidence that while the extent of periodontitis, that is, percentage of surfaces/sites affected is similar between patients with or without diabetes, measures of severity including greater clinical attachment loss and pocket probing depths are greater in patients with diabetes. Patients with diabetic complications, most specifically diabetic neuropathy, appear to have poorer oral health, including periodontitis, than those without neuropathy. However, there is little evidence that the presence of periodontitis: a) promotes development of Type 2 diabetes and b) adversely affects glycaemic control and diabetes complications in patients with diabetes.

In summary, the authors found that while there is strong evidence that diabetes is a recognised risk factor for periodontitis, more research was needed to ascertain the impact of periodontitis on the development and progression of diabetes.

2. Periodontal therapy and glycaemic control

One high quality Cochrane systematic review provided evidence that in patients with Type 2 diabetes, intensive periodontal therapy involving scaling and root planning reduced HbA1c (a marker of glycaemic control) by 0.29% (3-4 mmol/l) for up to three months; however, after six months there was no evidence that this reduction was sustained. Modest improvements in glycaemic control, as demonstrated by a reduction in Hb1Ac, were supported by seven other moderate quality systematic reviews.

One of the reviews reported evidence that after three months follow-up, periodontal treatment substantially lowered Haemoglobin A1c (HbA1c), compared with no treatment (–0.36%, 95%CI, 0.52% to 0.19%, P <0.0001). These findings were accompanied by substantial and statistically significant reductions in pocket probing depth (PPD) and clinical attachment loss (CAL) between study groups (PPD 0.42 mm, 95%CI: 0.60 to 0.23, P <0.00001; CAL 0.34 mm, 95%CI: 0.52 to 0.16, P = 0.0002). Consistent with the 2015 Cochrane review, there was no substantial change of HbA1c levels after six months.

In summary, it was found that there was merit in performing periodontal therapy in patients with Type 2 diabetes with regards to a short term improvement in metabolic control. Further research was needed to demonstrate that this benefit is sustained over longer follow-up and translates into reduction of diabetes complications.

3. Periodontal therapy and systemic/surrogate markers

One high quality review suggested that periodontal treatment reduced markers of systemic inflammation in patients with diabetes ie: serum levels of TNF- α and CRP. Another review reported no significant improvements in lipid fractions (total cholesterol, triglycerides and high and low density lipoprotein cholesterol [TC, TG, HDL, or LDL]) in patients with diabetes and chronic periodontitis who received scaling and root planing (SRP).

Lastly, five different reviews suggest that different types of periodontal treatment: surgical or non-surgical, with or without the use of adjunctive antibiotics, antiseptics, or oral hygiene instructions do not appear to produce different effects on glycaemic control in patients with diabetes.

4. Tooth loss and diabetes

Patients with diabetic complications, most specifically diabetic neuropathy, appear to have more tooth loss than those without neuropathy. This finding is consistent with the view that diabetes and its complications are associated with poorer oral health.

5. Caries and diabetes

Conflicting evidence on the association between diabetes and increased prevalence of caries was found. Greater levels of dental plaque were noted in patients with diabetes and this may have implications for future risk of caries. Furthermore, children with Type 1 diabetes are at increased risk of periodontal diseases as evidenced by greater dental plaque levels, gingival inflammation and bleeding.

6. Dental implants and diabetes

There is limited evidence that poor metabolic control is associated with peri-implant disease and weak evidence of higher marginal bone loss around dental implants in patients with diabetes with unspecified metabolic control. There is equivocal evidence that patients with diabetes have higher failure rates of dental implants and no evidence that diabetes is a contraindication to dental implant placement; however, some evidence supporting a delay in implant osseo-integration based on glycaemic control, was identified.

7. Oral surgery and diabetes

While there is evidence that people with diabetes are more likely to suffer complications of surgery in other areas, specific evidence that diabetes is associated with post-operative complications in the oral cavity is lacking.

8. Oral squamous cell carcinoma and diabetes

A high quality systematic review suggests that Type 2 diabetes is associated with an elevated risk of oral cancer and precancerous lesions. Patients with Type 2 diabetes have a higher case mortality on diagnosis of oral cancer, independent of tobacco, alcohol and obesity factors with a relative risk of 1.41(95%CI: 1.16–1.72) when comparing patients with diabetes to people without diabetes, with no evident heterogeneity among studies.

9. Saliva and diabetes

Patients with diabetes complications, most specifically diabetic neuropathy, appear to have greater mouth dryness than controls. There is limited evidence on the role of diabetes in increasing the risk of salivary dysfunction. There is some recent, limited and weak, evidence that salivary protein markers may be used to monitor glycaemic control accurately as a less painful alternative to capillary blood glucose measurements.

CONCLUSIONS

The evidence reviewed to form the conclusions for this rapid review demonstrated that there are oral manifestations of diabetes, including effects on oral health, notably periodontitis, oral cancer risk, and that diabetes may affect the success of dental implants. More evidence is required before advising clinicians of any contraindications to perform implants in diabetic patients. There is strong evidence of Type 2 diabetes being a risk factor for periodontal diseases and weak evidence in relation to Type 1. There is weak evidence in relation to dental caries experience in children. Limited evidence exists of periodontitis being a risk factor for diabetes; however, there is a growing body of evidence that professional periodontal treatment (that is, scaling and root planning as a minimum) results in a modest improvement in glycaemic control in the short-term but this is not sustained beyond three months.

IMPLICATIONS FOR PRACTICE

The current evidence suggests a number of associations between oral diseases and diabetes. There is limited evidence to support major changes to medical or dental therapy; however, regular periodontal/oral care may benefit glycaemic control in patients with periodontitis and diabetes. At present, diagnosis of diabetes should not require a change to dental therapy, such as restricting use of dental implants. Greater awareness of the impact of diabetes on oral health and vice versa is needed among medical and dental health professionals.

Reference

1. Diabetes in South Africa: Assessing the data with fear and trembling. Available at https://www.cdediabetes.co.za/uploads/images/files/Diabetes%20in%20South%20Africa.pdf [Accessed July 2017]
2. D'Aiuto F, Gable D, Syed Z, Allen Y, Wanyonyi KL, White S, Gallagher JE. Evidence summary: The relationship between oral diseases and diabetes. British Dental Journal 2017; 222: 944-8.

2. Effect of continuous ultrasonic irrigation [CUI] versus syringe irrigation [SI] on postoperative pain in mandibular molars with nonvital pulps.

Middha M, Sangwan P, Tewari S, Duhan J.

Pain is a common adverse effect of endodontic treatment. Postoperative pain is usually attributed to mechanical, chemical and microbial causes.[1] The bacterial flora is also primarily responsible for pulpal and periradicular diseases. Thus, eradication of bacterial population from the root canal or at least its significant reduction is essential for the successful management of endodontically involved teeth.[1]

Mechanical instrumentation techniques, in isolation, are incapable of rendering the root canals free of bacteria. The intricacies of the root canal system hinder its complete debridement as these areas are inaccessible to mechanical instrumentation and continue to harbour bacteria, necrotic tissue and debris. Thus, irrigation forms an integral part of chemo-mechanical preparation by facilitating the removal of bacteria, debris and necrotic tissue, especially from areas beyond the reach of root canal instruments.[1] Sodium hypochlorite is by far the most widely accepted root canal irrigant because of its pronounced antimicrobial activity and ability to dissolve organic matter, but its efficiency in root canals is limited by a number of factors. First, conventional syringe irrigation techniques deliver solutions no more than 0–1.1 mm beyond the needle tip, thereby limiting irrigant penetration.[1] Canal intricacies further limit the penetration of irrigant solution.[1] Also, vapour lock that results due to air entrapment in the apical third of root canals hinders the exchange of irrigants and affects their debridement efficacy[1] and studies have demonstrated that root canals still have detectable levels of cultivatable bacteria following chemo-mechanical procedures using sodium hypochlorite as an irrigant.[1] As a consequence, various supplementary approaches have been proposed to improve the distribution and exchange of root canal irrigants. One such technique is ultrasonic activation of the root canal irrigant.

There are two methods of delivery of the irrigant during ultrasonic activation: continuous and intermittent flush. During intermittent flush, a syringe is used to inject the irrigant into the root canal, after which the irrigant is activated by an ultrasonically oscillating instrument. Nascent chlorine, which is the active component responsible for tissue dissolving and antimicrobial action of hypochlorite, is consumed rapidly in such a case.[1] Further, the amount of irrigant that is activated is small, thereby limiting its debridement efficacy.[1] It is, therefore, conceivable that those methods of delivery which provide continuous replenishment of root canal irrigant may be more efficient. Middha and colleagues from India[1] reported on a randomized controlled trial that sought to compare postoperative pain after the use of continuous ultrasonic irrigation (CUI) and of syringe irrigation (SI). The null hypothesis tested was that there is no significant difference in postoperative pain with the use of either of the irrigation protocols.

MATERIALS AND METHODS

Patients with mature permanent, mandibular molars with non-vital pulps and radiographic evidence of apical periodontitis were included. Exclusion criteria included patients younger than 18 years of age, pregnant, diabetic, immunocompromised, previously accessed teeth, teeth having subgingival caries, teeth which were difficult to isolate,

history of antibiotic consumption within past month, history of analgesic intake within the past 24 h or teeth in which vital tissue was encountered on accessing the pulp chamber.

Patients were randomly assigned to one of the two groups based on the irrigation protocol: continuous ultrasonic irrigation and syringe irrigation. An equal proportion allocation ratio was followed, and envelopes containing concealed codes were assigned sequentially to the eligible patients. It was ensured that both the patient and the operator were unaware of the treatment protocol assigned until completion of chemo-mechanical preparation.

Endodontic procedure in all the patients was performed by a single operator using a standard protocol, under local anaesthesia and with rubber dam isolation. Coronal enlargement was performed with low-speed Gates-Glidden drills of size 1–3 to obtain straight-line access to the apical third of root canal. The working length (WL) was determined with an electronic apex locator at a length at which the flashing bar was between 'APEX' and '1'. It was then confirmed radiographically to verify that the file tip was within 0.5–1.5 mm of the radiographic apex. The canals were enlarged three sizes larger than the first apical binding file at the WL with 0.02 taper stainless steel hand files, followed by the step-back technique with each successively larger file placed 0.5 mm coronal to the previous one. Canal patency was maintained by passing a size 10 stainless steel file 0.5–1.0 mm beyond the WL. In both the groups, the canals were irrigated with 5 mL of 5.25% sodium hypochlorite (NaOCl) solution after every change of instrument, using a 27-gauge needle. After shaping, the canals were irrigated with 5 mL 17% EDTA for one minute.

In the CUI group, the Proultra PiezoFlow (Dentsply) was used for activation of the irrigating solution according to manufacturer's recommendations. The needle was operated using Satelec P5 Piezoelectric Ultrasonic Unit at power setting of five. The stopper on the PiezoFlow needle was set 1 mm short of binding in the canals, but no more than 75% of the working length. A syringe containing 15 mL of 5.25% NaOCl was attached to the Piezoflow activation needle and the inactive needle was inserted in the canal, and irrigant flow was started before activation. During activation, the needle was moved up and down passively in the canal, whilst maintaining the insertion depth to the stopper setting. In the SI group, canals were flushed with 15 mL of 5.25% NaOCl using a 27-gauge needle placed 2 mm short of working length.

After final irrigation, the canals were dried with sterile absorbent points and filled with calcium hydroxide paste using a lentulospiral. The tooth was then temporarily restored with Intermediate Restorative Material (IRM, Dentsply).

A visual analog scale (0–100 mm) was used to evaluate pain levels. The VAS was thoroughly explained to the patients, who were then instructed to place a mark on the horizontal VAS line corresponding to the level of preoperative pain before the administration of local anaesthesia. At the end of the first appointment, all patients were instructed to record the level of pain at days 1, 2, 3, 4, 5, 6 and 7 on the VAS pain score charts provided after the treatment. Each patient was prescribed Ibuprofen 400 mg with the instructions to take only one tablet, if needed, within the 0–4 hour time interval after the treatment and then one every eight hours in the event of pain. They were also requested to keep a record of their analgesic intake. The pain score chart was collected at the second appointment scheduled after one week.

RESULTS

All 70 patients (36 males and 34 females) who consented to participate in the study returned their VAS forms. Random allocation of subjects resulted in 35 patients (19 males and 16 females) in the CUI group and 35 patients (17 males and 18 females) in the SI group. The mean age of patients in the CUI group was 27.0 ± 5.1 years whilst it was 27.4 ± 6.4 years in the SI group. There were no significant differences regarding the patients' age (P=0.944) and gender (P=0.632) between the groups.

Pre-treatment pain prevalence was 82.8% with only 12 patients of 70 (seven in CUI group and five in SI group) reporting no pain prior to initiation of endodontic treatment. The statistical analysis did not reveal any significant difference in level of preoperative pain between groups (P = 0.604). The incidence of pain 24 hours following chemo-mechanical preparation was 41.4%, with less pain incidence reported in the CUI group (31.4%) as compared with the SI group (51.4%). There was a statistically significant difference in postoperative pain intensity only on the first postoperative day between the two groups although the mean pain levels were generally higher in the syringe irrigation group as compared to the ultrasonic group at all tested time intervals (Days 2, 3, 4, 5, 6, 7). The average pain score reported on day 1 (24 hours) was 5.82 SD 9.4 and 13.40 SD 15.5 in the CUI and SI groups respectively. The highest pain score recorded was 56 in the CUI group and 82 in the SI group whilst the lowest pain score recorded was nine in the CUI group and 11 in the SI group. Regression analysis revealed a significant association of mean postoperative pain at 24 hours with the irrigant protocol used and the level of preoperative pain, whilst no association was observed with patient's age and gender. Overall, 20.0% of the patients (7 of 35) in the CUI group and 31.4% (11 of 35) in the SI group required analgesics for pain control (P = 0.274). Also, no significant difference was observed in the mean number of analgesic tablets consumed between the CUI (mean = 0.40 ± 0.88) and SI groups (mean = 0.68 ± 1.34) (P = 0.386).

CONCLUSION

The researchers concluded that although a statically significant difference was observed between CUI and syringe irrigation on the first postoperative day following chemo-mechanical preparation, there was doubt whether this difference was clinically relevant.

IMPLICATIONS FOR PRACTICE

This study highlighted that although a statistically significant result was observed at day 1, this was not true for days 2 to 7 and the difference in the mean scores were not CLINICALLY relevant. By implication, these data suggests that although CUI will achieve lower pain scores than SI, from a clinical point of view, these differences may be too small to actually influence patient or clinician choice. Certainly, from a clinical aspect, both methods are equivalent in terms of the pain outcome.

Reference

1. Middha M, Sangwan P, Tewari S, Duhan J. Effect of continuous ultrasonic irrigation on postoperative pain in mandibular molars with nonvital pulps: a randomized clinical trial. International Endodontic Journal, 2017 ; 50:522–30.