

The effects of oral health on erectile dysfunction



Dental therapist **Lauren Connolly** conducted this literature review in the final year of her degree at the University of Highlands and Islands.

Introduction

An estimated 322 million men worldwide will be affected by erectile dysfunction (ED) by the year 2025.¹ Physical aetiologies such as trauma, hormonal problems or atherosclerosis of the blood vessels supplying the penis, as well as psychological causes like anxiety and depression, result in 'the inability to get or maintain an erection'.² Atherosclerosis of the blood vessels is often associated with other common systemic diseases such as periodontal disease, hypertension and diabetes.

Poor oral health (OH) prolongs exposure to dental biofilm, resulting in an increased presence of gram-negative anaerobic bacteria; by-products of these bacteria are known to cause tissue damage and initiate immune and inflammatory responses. Periodontal diseases (PD) such as gingivitis and periodontitis are inflammatory conditions caused by these bacteria. It is believed that bacteria and their by-products make their way into systemic circulation due to a compromised epithelium

barrier function associated with gingival inflammation.³

Periodontitis and ED share many of the same risk factors, including, but not limited to: smoking, diabetes, cardiovascular disease (CVD), age and obesity. There has been an increase in evidence linking ED to periodontitis over the past decade.

It is well documented that successful periodontal treatment has been shown to improve systemic conditions, such as reduced HbA1C levels in diabetic patients.⁴ With similar links between periodontitis and conditions such as ED and diabetes, it can be hypothesised that periodontal treatment may also improve ED.

Aim

This review aims to collate and strengthen current evidence by focussing on studies including groups of males over the age of 18, in order to answer the question: 'Does poor oral health contribute to the incidence and/or severity of erectile dysfunction in

the male population compared to those with optimum oral health?' In turn, this will enable dental care professionals (DCPs), and the wider health care profession as part of a multidisciplinary team (MDT) approach, to discuss the subject with male patients and perhaps use it to encourage positive behaviour changes, improving symptoms of both ED and periodontitis.

Methodology

Electronic searches were conducted between August–November 2020 on the following databases: Web of Science (WoS), SCOPUS, PubMed, NHS Knowledge Network and the Cochrane Library. Boolean logic and truncators were applied to search the following terms 'erectile dysfunction' AND 'periodontitis' OR 'oral health'. Reference sections of any papers published between 2018–2020 were then screened to identify additional records that were relevant.

A total of 338 records were identified, reducing to 11 following initial screening

processes and critical appraisal using the AXIS tool,⁵ and the Critical Appraisal Skills Programme (CASP).⁶

Results

Although each of the studies were conducted differently, making it more difficult to compare results, it was clear three common themes emerged:

■ Periodontitis is a risk factor for erectile dysfunction

Seven of the 11 studies concluded that men suffering periodontitis were at higher risk of ED than those without periodontitis. A recent meta-analysis pooled samples from two cross-sectional and three case-control studies and found patients with periodontitis to have an increased risk of ED. Subgroup analyses were performed to reduce heterogeneity of results and found an odds ratio (OR) of 4.15 for the cross-sectional design and a 2.44 OR for case-controls; 3.07 OR for Asians; 2.64 OR when adjusted for confounding factors and 5.944 OR without adjusting for these; 4.15 OR for moderate quality studies and 2.44 OR for high quality studies. Overall, the meta-analysis suggested men with periodontitis were 2.85 times more likely to suffer ED.⁷

■ Severity of periodontitis relates to severity of erectile dysfunction

In three studies, results showed an association between the severity of periodontitis and severity of ED. Sharma, Pradeep and Raju reported a higher prevalence of periodontitis in the groups with worsening ED symptoms, with periodontitis present in a total of 81% of patients diagnosed with severe ED.⁸ Oguz *et al.* also report a high association between ED and severity of ED with a 3.29 OR.⁹ More recently, a cross-sectional study by Uppal, Bhandari and Singh showed that average periodontal pocket depths (PPD) worsened in line with severity of ED, with significant differences showing between PPD of patients with mild and moderate ED, compared to those with severe ED.¹⁰

■ Periodontal treatment improves erectile dysfunction

Two of the RCTs focused on looking at periodontal treatment and the effects this can have on patients suffering with ED. Eltas *et al.* noted improved clinical findings when assessing periodontitis at both recall intervals, as well as a significant increase in the international index of erectile function (IIEF) scores between baseline and readings at the second follow up, taking the average ED diagnosis

from moderate to mild, which shows non-surgical periodontal therapy can be effective in reducing symptoms of ED.¹¹ El-Makaky, Hawwam and Hifnawy took a slightly different approach and assessed levels of the inflammatory marker TNF- α before and after periodontal treatment.¹² Improvements were found in all aspects of oral health, from participants' oral hygiene routine including toothbrushing and flossing, to oral hygiene and PPDs. On top of this, TNF- α levels were reduced in both blood serums and saliva, resulting in increased IIEF scores. Patients initially in the 'severe ED' bracket were now only experiencing moderate symptoms.

were blinded to the randomisation sequence; thus, reducing operator bias. Two of the RCTs accounted for allocation bias and reported use of statistical software or computer-generated lists to randomly assign groups therefore eliminate this risk.^{11,12} Eltas *et al.* also made a conscious effort to ensure both the control and treatment groups were balanced.¹¹ Oguz *et al.* fail to mention any methods of randomisation, or provide a follow up, which could introduce bias and reduce validity of their results.⁹ All participants in the study by El-Makaky, Hawwam and Hifnawy were also receiving ED treatment in the form of oral phosphodiesterase type 5 inhibitors which may affect the integrity of their results as these

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Discussion

Systematic reviews and meta-analysis are considered the strongest form of scientific evidence; therefore, it was important to include these in this review. Both systematic reviews and the systematic review and meta-analysis reached similar conclusions. The review by Zhou *et al.* was the only one including meta-analysis to collate results of their findings.⁷ Whilst their findings are in line with all other studies, the confidence intervals have broad ranges which suggests further information is required to confirm the results.

Previous reviews have only included one or two RCTs, due to a lack of availability in the current evidence. However, this current review highlights a third, more up to date RCT relevant to this topic which aims to strengthen the previous reviews. Periodontal examiners in two of the RCTs were single blinded to the ED status of participants.^{9,11} This is not accounted for in the study conducted by El-Makaky, Hawwam and Hifnawy,¹² however it is worth noting their study differed to the others as they were looking at the effects of TNF- α levels, and laboratory specialists involved in testing this

could contribute to improvement in IIEF scores in patients, making it harder to confirm true success of non-surgical periodontal therapy (NSPT) as a means of improving ED.¹² Interestingly, Oguz *et al.* also found an association between the number of decayed, missing and filled teeth (DMFT) and ED, which could strengthen the link between poor oral health in general and ED.⁹ DMFT rates could also be considered as a result of lack of motivation and poor self-esteem, which are common side effects of ED.¹³ Although this is just an assumption, it highlights the benefit of tailored, holistic preventative advice for dental patients.

Both case-controls demonstrated similar results, but flaws were apparent, reducing their validity. Martin *et al.* reported a statistical power of 88% as a result of the sample size in their case-control study, and also reported increased risk of ED for periodontitis compared to other common comorbidities.¹⁴ However, missing results when assessing biochemical variables between the study groups, may weaken the integrity of the links identified between periodontitis and ED. Keller, Chung and Lin failed to consider and adjust for smoking, which is known to

contribute to ED, which could explain the higher OR in their results.¹⁵

Participants in the cohort study by Sharma, Pradeep and Raju were already diagnosed with ED prior to the study; examiners then used coloured penile doppler ultrasound as well as a sexual health inventory for men (SHIM) questionnaire to diagnose true vasculogenic ED; this was the only paper to assess ED in this way.⁸ Although the paper found a positive correlation between periodontitis and ED, it was the only paper to report insignificant results. However, when combined with results from all other studies, the association between the conditions can be strengthened.

A cross-sectional study conducted by Uppal, Bhandari and Singh found significant results when linking severity of periodontitis to severity of ED,¹⁰ which contrasts with results found in a previous study.⁸ Chou *et al.* didn't address the severity of periodontitis when assessing the links to ED in a younger group of males, instead they just noted whether the condition was present or not.¹⁶ Single-blinding was again conducted ensuring the dentist was unaware of IIEF-5 scores to reduce observation bias. Results here were in line with other studies. Interestingly this study found a lower ED risk in smokers compared to non-smokers, which contrasts with common beliefs that smoking increases risk of ED.

All studies in this review had a 100% recall rate, and follow-ups in the relevant studies were at similar intervals, and in line with SDCEP guidelines for follow up after NSPT, minimising any risk of recall bias.¹⁷

It is worth noting that many of these studies used varying questionnaires to assess ED. Periodontitis was also recorded differently between the studies using varying combinations of clinical attachment loss (CAL), PPD, plaque indices, bleeding on probing (BoP), recession and radiographic bone loss. Whilst all questionnaires used were well known, validated methods of assessing the presence and severity of ED, and all periodontitis diagnoses were confirmed by a DCP, the variety between studies limits the transferability of the results. The tools used to screen for the presence of ED can provide information on the severity of the condition but are unable to differentiate between the aetiological cause of the condition. Of all papers screened by the author, the study by Sharma, Pradeep and Raju is the only one to determine true vasculogenic ED via coloured penile doppler ultrasound.⁸ This could be considered as another limitation of the review as without information on the cause of ED,

it could be considered coincidence that the majority of studies found associations between periodontitis and ED.

Conclusion

The evidence available shows a direct association linking periodontitis and ED. However, the type of relationship remains unclear. Further studies, particularly RCTs which account for all confounding factors and include a long-term follow up, are required to establish whether the relationship is causal or not. Future studies should take the same approach as the one taken by Sharma, Pradeep and Raju, as coloured penile doppler helps to 'isolate vasculogenic ED from other causes',⁸ which may help strengthen the link between the two conditions. In the meantime, it is important for DCPs to continue to adopt a holistic approach to patient care, focussing on prevention to reduce instances of PD, in turn reducing patient risk of not only ED, but many other systemic diseases.

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