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ROOT CARIES

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ROOT CARIES

INFORMATION FOR DENTAL PRACTITIONERS

There has been an increase in life expectancy and a concomitant reduction in tooth loss around the world, which may have placed older adults at a higher risk of developing gingival recession. Gingival recession accompanied by ageing, previous periodontal infections or toothbrushing-related trauma accumulated over the years, has put root surfaces at risk of developing root caries.¹⁻⁸ Compared with the enamel encasing the crown, the cementum enveloping the root surface has less mineral content.^{7,8} Therefore demineralisation occurs much faster in the root than in the crown. There is also some evidence to suggest that caries can develop subgingivally.^{1,2} Compared with coronal caries, root caries is considered a different disease entity in terms of aetiology.



Figure 1. Advanced root caries lesions (circled)

The prevalence of untreated root decay among Australian adults aged 15+ years was 6.7%, and 17.3% among those aged 75+ years in 2004-06^{3,9}, whereas in New Zealand, 9.5% and 29.3% of adults aged 18+ and 75+ years, respectively, had untreated root decay in 2009.¹⁰ In both countries people who usually visited a dental professional for a problem were more likely to have untreated root caries than those who usually visited for a check-up.^{9,10}

It has also been reported that institutionalised older adults in both Australia and New Zealand have higher levels of untreated root decay than their community-dwelling counterparts.^{11,12} Such high levels of root decay among these older adults could be a reflection of cognitive impairment, functional dependency and/or complex medical conditions.^{3,11}

Diagnosis of root caries

Root caries usually occurs in middle-aged to older adults and presents as a yellow to brown discolouration with soft and rough surfaces. Traditionally, inactive lesions are considered to be darker in colour and harder when probed, while active lesions are soft, leathery and lighter in colour.^{3,7,8} In many patients however, the activity of any given lesion can only be assessed by observation over a period of time. As such, the length of time between recall appointments needs to be carefully considered in each case. Root caries usually does not present with any symptoms, however, some patients in the advanced stage of the disease may experience pain and discomfort.¹³

Root caries lesions on buccal and lingual root surfaces can be relatively easy to identify, however, the same cannot be said of interproximal lesions and subgingival lesions. A good radiograph is a prerequisite for the diagnosis of early root caries lesions. Older adults should undergo regular screening for root caries as the symptoms are often absent or almost negligible, if present.



Figure 2. A radiograph showing root caries lesions (circled)

Source: Thomson EM and Johnson ON. Essentials of Dental Radiography for Dental Assistants and Hygienists, Ninth Edition, Pearson Education, Inc., 2012.

Risk indicators for root caries

Root caries is measured as untreated root decay/decayed root surfaces (root DS), filled root surfaces (root FS) and decayed and filled root surfaces (root DFS).⁴⁻⁸ Accordingly, risk indicators for root caries can be categorised depending on how root caries is measured.

Risk indicators for root DS⁴⁻⁶

- Being older
- Being male
- Having lower socio-economic status
- Brushing teeth infrequently
- Having poor oral hygiene
- Visiting a dental practitioner only for a problem
- Smoking
- Dry mouth

Risk indicators for root FS and root DFS^{4-6,14}

- Being older
- Living in a metropolitan area
- Visiting a dental practitioner frequently (last dental visit less than one year ago)
- Visiting a dental practitioner for a check-up
- Dry mouth
- Wearing a partial denture
- Smoking

Many studies have discussed the association of smoking as well as older age with high levels of root caries, measured as both root DS and root FS/DFS.^{4,6,15-17} One explanation for this association could be gingival recession, while another could be the direct effect of smoking on root caries. Gingival recession increases with age^{3,18-23} and is higher in smokers than non-smokers.^{20,24} Gingival recession exposes the root surfaces to the oral cavity, and increases the risk of developing root caries.²⁵ Moreover, smoking could contribute to lowering the buffering capacity of saliva,²⁶ increasing the risk of decay. Smoking has also been associated with increased levels of *mutans streptococci* and *lactobacilli*,²⁷ which in turn could increase the risk of root caries.

Being male increases the risk of untreated root caries, probably due to generally high-risk behaviours and low utilisation of health services among men.²⁸ Having a routine check-up may be an effective way of promoting good oral health and avoiding disease, as dental practitioners can monitor dental health, suggest preventive treatment or detect disease in its early stages.^{5,29} It may also explain why visiting a dentist only for a problem is associated with an increased level of untreated root caries.

Poor oral hygiene and infrequent tooth brushing were associated with higher untreated root caries.³⁰ Sugar availability and dental plaque are well-known etiologic agents for dental caries.^{5,31} Toothbrushing mechanically removes plaque and fluoridated toothpaste acts in altering the balance between demineralisation and remineralisation, thus creating a preventive effect against root caries. Some studies have also revealed that root caries is socially patterned.⁴⁻⁸ People in a low socio-economic position bear most of the root caries burden. A low socio-economic position has been associated with less healthy behaviours and limited access to dental services, either treatment or preventive. A combination of these factors could increase the risk of having untreated root caries lesions.

When root caries measurements include filled root surfaces, it seems that the behaviour related to treatment or dental visits is important. People who visit a dental practitioner frequently (last dental visit less than one year ago) and those visiting a dental practitioner for a check-up have an increased chance of getting root surfaces treated. There is no differentiation between caries-related or non-caries-related filled root surfaces as reported in a study where up to 55% of restorations were placed because of wear rather than root caries.³² These filled root surfaces reflect a treatment decision by the dental practitioner, as well as a dental treatment option selected by the patient. When treated root surfaces were included, people from metropolitan areas showed higher root caries experience than those from non-metropolitan areas.⁴ This could be explained on the basis that people from metropolitan areas are more likely to use dental services than their non-metropolitan counterparts for treatment of both decayed and worn root surfaces.³³

Research has shown that coronal caries trajectories are related to those for root caries in the middle-aged.³⁴ Thus, establishing habits early, to prevent coronal caries, will also benefit root caries prevention, as both conditions share many common risk factors.

Progression of root caries

Like coronal caries, the development of root caries continues throughout life. It has been estimated that untreated root caries (root DS) increases by 0.07 surfaces each year while treated (root FS) or decayed/filled root caries (root DFS) increases by 0.11 surfaces each year.⁵ Root caries increases continuously even

among healthier older adults aged 60+ years.⁵ This finding has also been supported by a systematic review and meta-analysis of studies on root caries.³⁵

Prevention and treatment of root caries

Maintenance and/or improvement of oral hygiene is the first step towards prevention of root caries from the individual perspective.^{3,7,8} Given that cariogenic bacteria acting on dietary sugars is the main aetiological factor for both coronal and root caries, it is essential to provide dietary advice to people, particularly to control their sugar intake. Routine use of fluoride toothpastes and drinking fluoridated tap water have also shown promising results.³⁶ Specific measures like use of electric toothbrushes and chemical plaque control measures may be advocated, particularly for medically compromised people and those with impaired manual dexterity. Prevention of root caries goes hand in hand with controlling gingival recession and periodontal disease. Accordingly, the importance of explaining the correct brushing techniques to people, including the use of soft rather than hard or medium bristled toothbrushes, and training them on the proper use of such techniques cannot be understated.

However, the ability to carry out daily living activities and cognitive functions diminish with ageing³⁷ and age-related diseases such as dementia,^{3,10,11} resulting in functional limitations among older adults. This could disrupt normal daily living activities including normal oral hygiene and use of dental services. Thus, an awareness of root caries risk indicators and prevention should be also promoted among the carers of older adults.

Treatment strategies for root caries rely on the clinical examination and are determined by the size, type, extent and location of the lesion, aesthetic requirements as well as the physical condition of the patient. Early lesions which are accessible and cleansable could be treated conservatively with fluoride varnish. Professionally applied high-fluoride varnish or gel and/or professionally recommended use of high-fluoride toothpaste has been successful in arresting/controlling root decay.³ Advanced lesions may also benefit from the remineralising effect of fluoride treatment and may consequently require less removal of tooth structure during restoration or may even avoid restoration altogether. Glass-ionomer cements or composite resins have been commonly used for restoring root surface cavities.^{3,23} However

the majority of such restorations have failed due to poor visibility, as well as access to the cavity and inadequate moisture control, during the restorative procedure.³ Accordingly, it may be recommended that active root surface cavities, which cannot be cleaned properly by the patient, be restored with a fluoride-releasing material using minimally invasive approaches such as the atraumatic restorative technique (ART).³

Future directions

Research across generations in Australia has confirmed that over 22 years, the current generation of older adults who were 60+ years old in 2013-14 have retained more natural teeth and developed more gingival recession but less root caries than the previous generation of older adults who were aged 60+ years in 1991-92.³⁸ Those who have retained a greater proportion of their teeth may be considered as “healthy survivors”. Research has suggested that a “maturation” effect may occur once a root surface has been exposed to the oral cavity for a period of time.¹ If root caries lesions do not occur within a period of time after the root is exposed to the oral cavity, they may never occur.^{1,39} This success in preventing root caries might have been caused by a combination of effective population-based programs such as the expansion of water fluoridation and/or the increased adoption of healthy behaviours by individuals. Preventive efforts should target health behaviours, especially among disadvantaged population groups, as well as continue the upstream approach of water fluoridation programs.

Summary

- About one in fifteen and one in eleven Australian and New Zealand adults, respectively, are afflicted with root caries whilst the prevalence of root caries is highest among older adults aged 75+ years, in both countries.
- Risk indicators for root caries can be related to the way root caries is measured: root DS, root FS or root DFS.
- Being older, male or of a lower socio-economic status, brushing teeth infrequently, having poor oral hygiene, visiting a dental practitioner only for a problem, smoking and dry mouth are associated with root DS while being older, living in a metropolitan area, visiting a dental practitioner frequently, visiting a dental practitioner for a check-up, dry mouth, wearing a partial denture and smoking are associated with root FS/root DFS.

- The first step towards prevention of root caries is maintenance and/or improvement of oral hygiene, including the use of fluoride toothpastes and reducing sugar intake, which should also go along with controlling gingival recession and periodontal disease.
- Both coronal caries and root caries share common risk factors and hence early intervention for coronal caries could benefit root caries prevention.
- The current generation of older adults has less root caries than the previous generation: this success lies in a combined effect of population-based programs such as the expansion of water fluoridation and/or the increased adoption of healthy behaviours by individuals.

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