

## Gerodontology – how big is the challenge in Ireland?

### Précis

Changing patterns of ageing and oral disease require new policies for managing the oral health of older adults. This paper makes suggestions as to how this could be approached.

### Abstract

Population trends suggest that the Irish population is ageing, and that this population will have substantial treatment needs. These patients will be better informed than previous generations, and will demand treatment aimed at preserving a natural dentition. This will impact upon delivery of oral healthcare and manpower planning needs to consider how to address the increased demand for dental care. Poor oral health is associated with systemic health problems, including cardiovascular disease, respiratory disease and diabetes mellitus. It also has a negative impact upon quality of life, and the World Health Organisation has encouraged public healthcare administrators and decision makers to design effective and affordable strategies for better oral health and quality of life of older adults, which, in turn, are integrated into general health management programmes. Treatment concepts such as minimally invasive dentistry and the shortened dental arch concept are discussed in the context of these demographic changes and recommendations.

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### Oral healthcare delivery context in the 21st century

Currently available evidence from population surveys indicates that the proportion of adults over the age of 60 years is expanding rapidly across the European Union countries, including the Republic of Ireland.<sup>1</sup> This trend mirrors the arrival of the 'baby boomer' generation into early old age. As the population ages, dental health surveys indicate that the proportion of older adults retaining natural teeth into old age is increasing.<sup>2,3</sup> The trend of increasing tooth retention (as opposed to total tooth loss, which has been steadily decreasing over the past 30 years) has been welcomed as a sign of improving dental health. However, chronic dental and oral diseases such as dental caries and periodontal disease continue to be a significant health problem among older adults in Ireland.<sup>2</sup> Furthermore, the influence of cigarette smoking on periodontal and oral mucosal disease has

been documented and the need for dentists to give smoking cessation advice is recognised.<sup>4</sup>

The natural history of pathological processes affecting teeth indicates that the effects of these diseases are progressive and cumulative. As stated by Petersson,<sup>5</sup> this rapidly changing global disease pattern is closely linked to changing lifestyles, which include diets rich in sugars, widespread use of tobacco and increased consumption of alcohol. These lifestyle factors also significantly impact on oral health, and oral diseases qualify as major public health problems owing to their high prevalence and incidence in all regions of the world. Like all diseases, they primarily affect the disadvantaged and socially marginalised populations, causing variable degrees of pain and suffering, impairing function and impacting on quality of life. Traditional treatment of oral diseases is extremely costly even in industrialised countries, and is

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unaffordable in many cases. Accordingly, a major challenge for the dental profession will be to plan oral healthcare for older adults that is affordable, readily accessible and that positively impacts on their quality of life.

In a recent publication, the World Health Organisation has highlighted the paucity of research into the oral health needs of older adults.<sup>6</sup> Building and strengthening research capacity in public health are highly recommended by the WHO for effective control of disease and the socioeconomic development of any given country. The WHO Oral Health Programme encourages public healthcare administrators and decision makers to design effective and affordable strategies for better oral health and quality of life of older adults, which, in turn, are integrated into general health management programmes. This has yet to occur in the Republic of Ireland, but the national oral health policy review offers the opportunity for this to be considered further.

A further concern relates to people living in institutionalised care, such as voluntary homes and private nursing homes. The quality of oral healthcare for institutionalised elderly patients has been described as poor, and characterised by lack of access to appropriate assistance with basic needs such as oral hygiene procedures. This may also reflect the notion that oral health issues are not prioritised relative to other health issues. However, in reviewing the evidence currently available, MacEntee<sup>7,8</sup> has argued that the health gain in providing good oral healthcare to frail older people would be significant, and has urged that this issue be addressed with concerted effort by oral healthcare professionals and administrators. Approximately 20,000 adults live in such homes in Ireland, and have limited access to dental care. It seems likely that this number will increase given life expectancy trends. Many of these will suffer from debilitating conditions such as Alzheimer's disease, and require dentistry outside of traditional primary care settings. Elderly patients in nursing homes often have poor oral health because of difficulties in maintaining a sufficient level of personal oral hygiene and difficulties in accessing professional dental care. Hence, a relationship between poor oral hygiene and bacterial pneumonia or lower respiratory tract infections has been suggested in the literature.<sup>9</sup> Given their special needs, consideration must be given to how access to affordable care can be improved for this vulnerable group of patients. The aims of this paper are two-fold:

- 1) to discuss the impact of poor oral health on the elderly in light of research findings over the past 10 years; and,
- 2) to describe a minimally invasive approach to restoration of partially dentate elderly patients.

#### Oral health status of Irish adults over 65 years of age

The most recent population survey of Irish adults was published in 2007,<sup>2</sup> and the data suggest that the policy of systemic water fluoridation has had an impact. Since the previous oral health survey in 1989, there has been a significant reduction in caries prevalence. However, this ranges from 34% in 16 to 24 year olds, to 5% in 65+ year olds, suggesting that the older adults in Irish society have not benefitted to the same extent as younger adults from fluoridation of water supplies. In terms of caries prevalence, there is significant regional variation and treatment needs are higher for medical card

holders than for those not in possession of a medical card. Caries experience in the 65+ age group continues to be high, with a mean DMFT (decayed, missing, filled teeth) score of 25.9 in Irish adults. At present, the mean DMFT of 35 to 44 year olds is 15, with the difference suggesting ongoing caries experience requiring management going into old age. On the positive side, there is less untreated disease now compared with 1989, and the F component is now larger relative to the D and M components. However, as a consequence, the burden of maintenance of restorations is also likely to increase over time. Periodontal disease is prevalent in older adults, and significantly associated with cigarette smoking. Among those wearing partial dentures, approximately one-third of those examined had disease of the teeth and/or periodontal tissues that required treatment. In terms of tooth retention, the percentage of 35 to 44 year olds with 20 or more natural teeth rose from 68% in 1989 to over 90% in 2002. As this cohort will be the 'future' elderly, it seems reasonable to suggest that there will be a large decrease in edentulous patients in the future. The survey also suggests that there is a change in attitude of Irish adults towards their oral healthcare. When questioned about their attitudes to oral healthcare, those adults under the age of 65 years were:

- a) more likely to choose restoration over extraction of teeth;
- b) more likely to be unhappy with the prospect of wearing partial dentures; and,
- c) more likely to be unhappy to lose all natural teeth.

In summary, these nationally representative data suggest that treatment need is relatively high, and management will be driven by patients' desire to maintain teeth and avoid dentures if possible. The cohort of patients currently over the age of 65 years has not had the benefit of a lifetime of exposure to fluoridation, and therefore their disease experience differs from the 35 to 44 year old cohort. The prevalence of disease continues to be high, and a lot of work will include the repair/replacement of restorations in teeth affected by dental caries. These data suggest that our ageing population will present significant management challenges to the dental profession and healthcare policy makers in Ireland. In considering this issue, it is important to consider the benefits of good oral health, and how this can be achieved, and the burden of maintenance reduced.

#### Impact of oral disease on health

It is unfortunate that oral disease and subsequent tooth loss have not been recognised as a significant healthcare problem outside of the dental profession. A recent editorial in *The Lancet*<sup>10</sup> highlighted that cardiovascular and respiratory diseases shared common risk factors (e.g., smoking, glycaemic control and diet) with oral diseases, and that prevention of oral disease was critical. It was argued that oral healthcare was a relatively neglected issue, and needed to be addressed. Over the past 10 years, a growing body of evidence has been made available from population surveys and clinical trials, which highlights the importance of good oral health in the context of general health. In addition, systemic diseases and their treatment can have adverse effects on the oral cavity through an increased risk of dental disease, reduced salivary flow and loss of oral comfort.

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However, there is increasing evidence of more substantive relationships between oral disease and cardiovascular disease, diabetes mellitus and respiratory disease. Given that there is certainly a unidirectional, and possibly a bidirectional, link between oral and general health, the benefits of a disease-free mouth to older adults are considerable.

Periodontal disease is an inflammatory condition of the structures supporting natural teeth caused by plaque bacteria. The gingival microvasculature provides a potential path of entry for periodontal pathogens to the general circulation and such bacteria have been found in atheromatous plaques.<sup>11,12</sup> Pro-inflammatory mediators including C-reactive proteins, which play an important role in atherothrombosis, are also elevated in the presence of periodontal inflammation. Evidence is also emerging that improvements in oral health and treatment of periodontal disease can improve endothelial function.<sup>13</sup>

Type 2 diabetes mellitus is a well-recognised risk factor for periodontal disease as the formation of advanced glycation end products within the periodontal tissues are thought to promote an exaggerated inflammatory response. Epidemiological evidence illustrates that periodontal disease is more prevalent and more severe in people with diabetes compared with the general population. Periodontal inflammation produces a number of cytokines in the inflamed tissues, which antagonise insulin. Signalling molecules, including tumour necrosis factor, interleukin 1 and interleukin 6 can enter the general circulation via the periodontal microcirculation and produce their effects at distant sites. With reduced wound healing also a consequence of diabetes mellitus, the enhanced inflammation of the tissues can lead to marked periodontal destruction.<sup>14,15</sup> Recent evidence has suggested that the presence of periodontal inflammation may itself contribute to poor glycaemic control. Such a view is supported by studies, which illustrate that control and treatment of periodontal disease improves glycaemic control and diabetic outcomes.<sup>16</sup>

In a recent position paper, the American Dietetic Association<sup>17</sup> stated that: "Oral health and nutrition have a synergistic bidirectional relationship. Oral infectious diseases, as well as acute, chronic, and terminal systemic diseases with oral manifestations, impact the functional ability to eat, as well as diet and nutrition status. Likewise, nutrition and diet may affect the development and integrity of the oral cavity, as well as the progression of oral diseases".

The loss of natural teeth is related to diminished nutritional intake, especially in older adults. In studies of nutrition in adult populations, poor quality diets have been reported in adults missing natural teeth and wearing partial and complete dentures.<sup>18-20</sup> The reasons for this are thought to be difficulty in chewing hard foods such as raw vegetables and fruit and decreased sense of taste. Conversely, there is some limited evidence that improvement of dentition and oral health generally has very positive effects on these parameters. In the UK National Diet and Nutrition Survey of people aged 65 years and over, Sheiham *et al*<sup>20</sup> reported on the oral health of the participants in the survey. A consistent finding in their report was that dentate individuals had higher daily intake of protein, fibre, calcium, iron and vitamin C

than their edentulous counterparts. This has implications for general health in adults, as poor diet may lead to deficiency of nutrients, and illnesses such as osteoporosis, atherosclerosis and bowel disease. Although nutritional state is influenced by factors such as age, socio-economic status and general health, it would appear that dental status is an important co-factor. Poor nutritional status is apparent in elderly edentulous adults, particularly those living in institutions. Although there are many factors that influence food selection, it seems likely that preservation of a critical number of natural, disease-free teeth is a significant factor facilitating a healthy diet. These UK findings have been confirmed in other studies of frail older people, including in Finland<sup>21</sup> and Brazil.<sup>22</sup> The risk of malnutrition in frail older people is such that Poulsen and co-workers<sup>23</sup> have recently recommended that oral examination should be part of routine hospital admission procedures for geriatric admissions.

In an Irish context, studies undertaken in the Cork Dental School and Hospital have shown that edentulous patients are at moderate risk of poor nutrition status. In one of these studies,<sup>24</sup> 35 independently living edentulous patients (23 female, 12 male) ranging in age from 52-77 years (median 65 years) agreed to take part in a study of the impact of new dentures on diet and quality of life. Prior to treatment, all subjects completed a questionnaire, which contained a number of validated social resources, oral health-related quality of life and the short form of the Mini Nutritional Assessment (MNA). Three-quarters of the sample felt that they had no nutritional problems. However, approximately 70% reported that they had changed their food choices because of dental problems. The mean MNA score pre treatment was 6.23 ( $\pm 1.48$ ), which would be in the medium risk range. The post-treatment MNA score remained very similar to the pre-treatment score, suggesting that provision of new complete dentures had not altered food consumption behaviour.

In a separate study,<sup>25</sup> we assessed the nutrition status of partially dentate adults (including adults wearing partial dentures) and found that the mean short form MNA score was 8.41 ( $\pm 1.04$ ). This suggests that partially dentate adults are at a lower risk of poor nutrition status than edentulous adults, thus emphasising the benefit of retaining a functional natural dentition.

### Impact of oral disease on quality of life

As populations age and lose teeth, their quality of life may be expected to change, particularly with respect to the way that their oral condition impacts on day-to-day activities. This may happen as a direct result of altered function due to tooth loss, but possibly also as a result of changes in perceptions and values that occur with increasing age. A number of other factors may modify this process, for example the social and cultural norms to which populations are exposed. Quality of life is affected in some way by oral health in the majority of people. Understanding the relationship between age-related dental and cultural influences and quality of life has relevance if we wish to measure oral health inequalities within and between populations. A recently published study used nationally representative population datasets to explore the relationship between age, tooth loss and oral health-related quality of life.<sup>26</sup> It reported that age and tooth loss are



**FIGURE 1a:** Shortened dental arch in an older adult. Sufficient contacts on anterior and premolar teeth remain to provide adequate oral function without a prosthesis.



**FIGURE 1b:** Shortened dental arch extended using bi-lateral, cantilevered resin-bonded bridgework.

closely associated, but have independent effects on oral health-related quality of life. Tooth loss (which is associated with increasing age) is associated with more negative impacts, while increasing age independently results in fewer. In all of the populations and sub-populations studied, a complete or almost complete natural dentition was associated with the best oral health-related quality of life.

#### Dental care of older patients – new treatment concepts

It would thus appear that good oral health is not just about teeth, and is important and relevant to the broader domains of health and quality of life. Our aim should be to encourage good oral health, and to facilitate maintenance of a healthy dentition. In the past, oral healthcare for older adults was dominated by tooth extraction and provision of dentures, and this may no longer be acceptable to older adults. A number of studies have suggested that partially dentate adults are not happy with the prospect of wearing dentures to replace missing teeth.<sup>27,28</sup> In addition, removable partial dentures are associated with higher risk of root caries and periodontal inflammation. Compliance with wearing partial dentures has proved to be variable, with non-wearing of dentures reported to be as high as 40% in some studies.<sup>28</sup> Accordingly, there is a need for research to further determine the type of care most acceptable to older adults, and which reduces the burden of dental disease attributed to the provision of partial dentures. Some researchers have suggested that older adults have different functional needs to young patients and therefore do not need a complete natural dentition. Furthermore, the WHO suggested that a goal for oral health in the year 2000 should be that adults retain for life a healthy, functioning dentition of at least 20 teeth and not require an oral prosthesis to replace missing teeth.<sup>29</sup> The so-called shortened dental arch (SDA) concept has been proposed as a means of providing a functionally acceptable dentition<sup>30</sup> (Figure 1a). These functionally oriented treatment strategies aim to reduce the burden of maintenance for older adults, and have been advocated

as a means of providing a natural, functional dentition. Where necessary (for example, to help stabilise a maxillary complete denture), shortened dental arches can be extended using either cantilevered bridgework (Figure 1b) or implant-retained crowns. A recent randomised clinical trial has compared the outcomes of restoration of lower shortened dental arches by removable partial dentures and those lengthened by cantilevered, resin-bonded bridgework.<sup>31</sup> The authors reported that patients in both groups were equally satisfied with treatment but, critically, the incidence of new disease was significantly lower in the group provided with resin-bonded bridgework. They also reported that the burden of mechanical maintenance was much higher in the partial denture group.<sup>32</sup> The implication of this is that a more conservative approach to replacement of teeth (i.e., application of the shortened dental arch concept) can provide satisfactory oral function at substantially less biological price to the dental and periodontal tissues. This is the only available randomised trial with long-term follow-up data, and it would be helpful if this study could be repeated in other settings.

A further issue has been the constant repair cycle, and the burden of replacement of restorations over the course of a lifetime. Caries continues to be a significant challenge in older adults, and prevalence of root caries has risen in line with tooth retention trends. Our knowledge of the caries process has advanced now to the extent that we have the ability to reverse early carious lesions using chemotherapeutic agents such as topical fluoride or chlorhexidine. The concept of 'extension for prevention' is now outdated, and current concepts of caries management are focused on repair rather than replacement of failing restorations in teeth. The availability of more predictable bonding of adhesive materials to teeth has been a major step forward and should significantly reduce the need for amalgam restorations. Unfortunately, some remuneration systems (e.g., the DTSS) seem to regard adhesive materials as 'cosmetic', and thus they are not allowed as a restorative material for posterior teeth.



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FIGURE 2: Excavation of caries with a minimally invasive technique. This cavity will be restored with direct composite resin.



FIGURE 3c: Biotene™ system for prevention of caries for the patient with xerostomia shown in Figures 3a and 3b.



FIGURE 3a (above), 3b: Caries management in a patient with xerostomia using ART. Teeth 32 and 33 have been restored with resin modified glass ionomer cement.



FIGURE 4a (above), 4b: Use of the shortened dental arch concept and ART for an elderly patient (74 years of age). Adhesive restorations placed in 22 and 23 present for six years. Resin bonded bridge replacing 24 present for nine years.

This is a limited view, and needs to be reviewed by policy makers. The 'minimally invasive dentistry' (Figures 2, 3a, 3b) concept is intuitively much more suited to the needs of older patients, and should be encouraged in any review of the existing remunerative schemes. At its

most basic level, atraumatic restorative treatment (ART) offers a suitable alternative for patients whose circumstances make attendance at a dental surgery difficult or impossible. ART involves the removal of dental caries tissue with hand instruments only and filling of the

resultant cavity with an adhesive restorative material such as glass ionomer cement or resin-modified glass ionomer materials. Many studies have reported good survival rates of ART in permanent and primary teeth in children, and to a limited extent in older adults, compared to conventional techniques with amalgam.<sup>33,34</sup> In addition to that, the ART concept is considered to be a patient-friendly approach as it does not require the use of rotary handpieces or local anaesthesia. Where there is evidence of xerostomia ('dry mouth'), a variety of topical agents is now available to help reduce caries risk and improve oral comfort. One such example is the Biotene™ system, which includes mouthwashes, gels and toothpastes containing bioactive enzymes designed to protect teeth and soft tissues (Figure 3c). The patient shown in Figures 4a and 4b typifies the use of minimally invasive dentistry in an elderly patient. He has been missing the maxillary molar teeth for many years, but did not feel the need to replace them. However, when the left maxillary first premolar was extracted, he disliked the impact this had on his appearance. He had a low caries risk, but has had some cervical caries treated conservatively using ART. Given that he had a good standard of oral hygiene, and had no objective or perceived need to wear a removable partial denture, it was decided to limit treatment goals to replacing tooth 24. This was achieved using cantilevered, resin-bonded bridgework retained on 25. He was very satisfied with the outcome, and this bridge has been *in situ* for approximately nine years with no further intervention required.

The potential impact of population demographics and trends in oral health status should be considered in any future manpower planning. There has been a patient-led shift in the paradigm for care of older patients away from dental extractions towards conservation of teeth. It therefore seems likely that demand and need for dental treatment will rise, and the burden of maintenance of ageing dentitions will sharply increase in the foreseeable future. The need for dental care in residential homes for frail elderly people will rise, and the potential role for dental hygienists and therapists in the management of these patients needs to be considered. These trends must influence the content of undergraduate teaching curriculae, and access to care provided in outreach clinical facilities by supervised dental students has been used elsewhere for this agenda. Some elderly patients will have special needs, and the role of this developing speciality (special needs/care dentistry) in the management of these patients needs to be defined in an Irish context.

## Conclusion

Clearly, the ageing population presents a new challenge to the dental profession and policy makers. Good oral health is important, and removal of risk factors and control of oral disease is likely to have positive impacts on health in general. Recently developed treatment concepts for elderly patients need to be embraced to ensure that a functional, natural healthy dentition is achieved for as many of our older adults as possible, and to shift the focus of care towards prevention of further disease and reducing the burden of maintenance. This includes evidence-based oral health promotion strategies, individualised prevention advice and minimally invasive

treatment of dental caries and restoration of missing teeth.

The recommendation is also based on the premise that oral healthcare programmes for older adults must address their specific needs, recognise diversity in demand, and be readily accessible and affordable for public fund providers.

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