A clinical audit of denture cleanliness in general dental practice undertaken in the West Midlands

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IN BRIEF

- Suggests a method for grading the severity of denture hygiene, as currently there is no consensus on denture hygiene assessment.
- Highlights the trends in denture hygiene and current popular methods of denture plaque control.
- Stresses the importance of patient education in effective denture hygiene management.

PRACTICE

VERIFIABLE CPD PAPER

The aims of the study were to develop a method of quantifying denture cleanliness and evaluate the quality of clinical record keeping; record baseline denture cleanliness for 30 patients; introduce denture hygiene instruction (DHI); and then re-assess the patients for improvement and enhanced record keeping. A retrospective analysis of denture hygiene instruction record keeping was undertaken (n = 30). A bespoke denture cleanliness index (DCI) was developed for assessing denture cleanliness (best score 0, worst score 4). Baseline DCI scores were taken and individual DHI was delivered. Patients were reviewed and scored after 1 month, together with a further analysis of record keeping. At baseline, 16% (n = 5) of patients had DCI scores of ≤2, improving to 90% (n = 27) after 1 month, demonstrating short term improvement in denture cleanliness. Only 20% (n = 6) of patients had evidence of a record of DHI within their notes at baseline, improving to 100% at recall. The bespoke denture cleanliness index (DCI) worked well as a simple objective clinical measurement and patient education tool. Provision of tailored DHI resulted in the general improvement of denture cleanliness after 1 month. The authors recommend that where denture hygiene has been issued, this should be recorded in the records as 'DHI' within the clinical notes, in a manner analogous to the recording of oral hygiene.

INTRODUCTION

It is standard practice in the UK for dentists to assess and make a record of the oral hygiene status of their patients as being either good, moderate, or poor; using a number of techniques and indicators such as the basic periodontal examination, and plaque and bleeding scores. However, they seldom make a record of the extent, good or bad, of the denture hygiene for those patients that wear dentures. For the purpose of denture hygiene assessment, a number of different methods of quantifying denture hygiene have been suggested but none have gained widespread acceptance.[1–3]

According to the Adult Dental Health Survey 2009, nearly one in five adults (19%) wore removable dentures, either complete or partial, with up to 45% of those aged between 65 and 74, and 70% of those aged 70 or older wearing dentures; the proportion of people wearing dentures was found to increase with age.[4]

The oral cavity contains a number of different surfaces and areas that bacteria can colonise and where plaque can accumulate and develop. A denture presents an additional such environment, which is inherently porous, hard, and non-shedding in nature, and which can facilitate further bacterial growth and development of plaque.[5] An issue also arises if there are surface defects or other flaws in the denture which are either (a) inherent and due to the fabrication process or (b) acquired due to general use or from cleaning. Surface imperfections and roughness can increase the surface area on which bacteria can adhere and potentially colonise.[5–7]

Plaque build-up on dentures is linked to the quality of both oral and denture hygiene carried out by patients. Many studies in this area have shown that plaque biofilm builds up on removable prostheses, and that certain pathogens may even preferentially colonise dentures rather than oral soft tissue.[8–11] It has been suggested that respiratory pathogens may even preferentially colonise dentures rather than oral soft tissue.[8]

A study looked at the microbiological composition of denture plaque in dependant elderly patients, and found evidence of potential respiratory pathogens in the denture plaque in 65% of the cases tested (89 cases out of 138 dependent elderly examined).[11]

Dentures may act as a reservoir of colonisation by microorganisms that could contribute to localised and possibly even systemic disease in susceptible and high-risk patients.[8,10,11]

It is well documented that partial denture wearers are at higher risk of developing periodontal disease and dental decay of the teeth directly adjacent to the dentures. Denture hygiene and cleanliness is important in order to prevent the accumulation of plaque, development of calculus, prevent malodour and staining, and reduce the risk of denture-related stomatitis.[5] Studies have shown that the majority of denture wearers do not demonstrate adequate denture hygiene, and some continue to wear their dentures at night despite this being linked with poor oral health compared to those who take their dentures out at night.[12–14]

Patient education remains one of the best tools to help prevent the onset of diseases that can occur due to poor denture hygiene; mechanical plaque control, good denture

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Refereed Paper
Accepted 20 May 2014
DOI: 10.1038/sj.bdj.2014.757
©British Dental Journal 2014; 217: 231–234

wearing habits, and regular visits to the dentist remain are the best ways of minimising and treating denture related pathology such as denture-related stomatitis. The most common method of plaque control still involves using a brush with soap and water or a denture paste.[5,12–16]

Methods in mechanical plaque control can involve using a brush with soap and water or a denture paste, and/or using ultrasonic baths. Chemical methods of plaque control include the use of: hypochlorite based solutions, alkaline peroxide, or acid based solutions where the dentures are soaked according to the manufacturer's instructions.

In the United States, The American College of Prosthodontists published guidelines for denture hygiene in complete denture wearers based on the best available evidence, and they stated that the most important aspect to achieving good oral hygiene and general health is the careful removal of the plaque biofilm.[17]

At present in the UK there is no clearly defined or regularly used standard for denture hygiene, nor is there a widely accepted method for scoring denture hygiene which is simple, quick, and cost effective.

In this paper we present our findings from an audit conducted in general practice using a denture hygiene index, called the denture cleanliness index (DCI), which was developed for the purposes of the audit, in order to rectify the situation.

METHOD

This audit was conducted in a single general dental practice by two examiners (PM and ZA). A pilot study was initially conducted in order to determine: the appropriateness of the proposed data sets required for the audit, which disclosing solution to utilise for the DCI scoring system, suitability of the initial concept of the DCI scoring system, and what our proposed standard for the audit should be.

The proposed standard for our audit was as follows: acceptable denture hygiene would be defined as a DCI score of 2 or less, and this should be the case for 90% or greater of patients observed. Denture hygiene instructions should be recorded in 100% of clinical notes.

In order to maintain simplicity of methodology, only acrylic dentures were considered. Thirty denture wearing patients were selected, including both complete and partial, and independently examined by one of two clinicians; with informed consent obtained from each participant.

Both clinicians were instructed on how to use the DCI scoring system; scoring of dentures was cross-checked and disputes resolved by discussion.

Table 1 Denture cleanliness index (DCI)

0	Clean denture. No plaque is visibly seen, no staining, no plaque detectable.
1	Denture is visibly clean. Little staining (<25% fit surface stained)
2	Denture has visible plaque and/or debris. Moderate staining of fit surface (25-50% fit surface stained)
3	Denture has visible plaque and/or debris. Severe staining of fit surface (>50% fit surface stained)
4	Denture has visible calculus deposit, on any surface.
*	Visible defects in denture, in addition to any of the above score. (Defects defined as those which are potentially plaque retentive, those which require repair or remake of denture)

Baseline DCI scores were taken and recorded for the first cycle of the audit and patients were given tailored denture hygiene instructions according to the DCI score they were designated.

Patients were then reviewed after 1 month for the second audit cycle, where their DCI scores were taken and results compared to the first audit cycle.

The methodology for the denture cleanliness index used in the audit was as follows:

A liquid plaque disclosing dye (Plaqsearch, Malmö, Sweden) was applied on the denture fit surface and then visually inspected in order to designate a DCI score.

Staining was limited to the fit surface as this was deemed the easiest and simplest surface to apply the dye, as well as being the surface of the denture most likely to accumulate plaque.[18] and thus the area of most interest when determining the effectiveness of denture cleanliness.

The scoring system itself is numerical in nature and semi-quantitatively grades the severity of denture hygiene according to the amount of staining present on the fit surface.

The scores range from 0 (the best) up to 4 (the worst) and are designated according to the denture cleanliness index criteria in Table 1:

The severity of staining was defined as follows:

- Little = (<25% fit surface with plaque)
- Moderate = (25-50% fit surface with plaque)
- Severe = (>50%).

The asterisk notation was used purely for the purposes of indicating which dentures required/did not require physical alterations to them.

Denture hygiene instructions were given to patients according to the rubric in Table 2.

Table 2 Suggested intervention based on DCI score

DCI Score	Suggested intervention
0	No intervention required, reinforce current denture hygiene
1	Denture hygiene reinforcement
2	Denture hygiene reinforcement, patient information leaflet
3	Denture hygiene reinforcement, patient information leaflet and denture hygiene kit
4	Intervention by clinician to clean dentures, denture hygiene reinforcement, Patient information leaflet and denture hygiene kit
*	Consider denture reline or remake (depending on severity of defect)

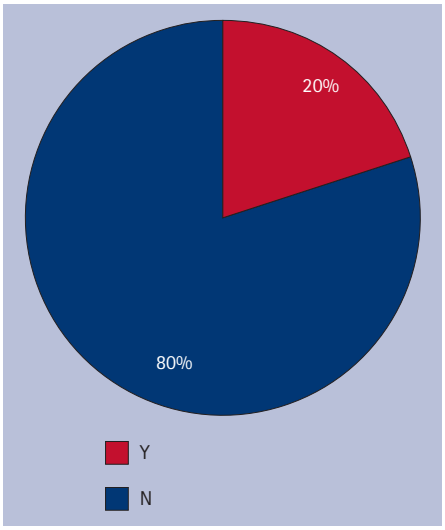

Fig. 1 First cycle retrospective analysis of record keeping

A proprietary denture hygiene care kit (GlaxoSmithKlein, Brentford, Middlesex), was given to patients with DCI scores 3 and above during the first cycle of the audit. The denture kits were a generic sample pack and contained one of each of the following items: a denture brush, a sample of branded effervescent tablets, a sample tube of branded denture adhesive cream, one instructional leaflet for using the tablets and adhesive, and one plastic denture container.

RESULTS

Record keeping

First cycle results can be seen in Figure 1, which show that 80% of the patients had no evidence in their dental notes regarding ever being given denture hygiene instructions; only 20% had written records of instructions being given.

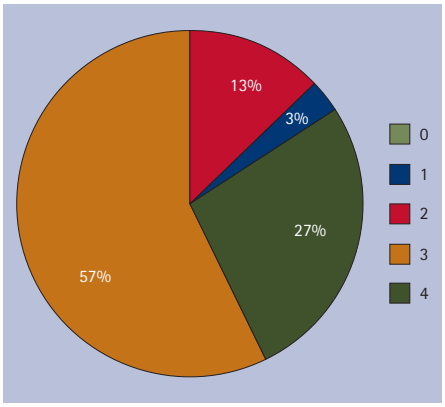

Fig. 2 First cycle results for DCI scores (baseline)

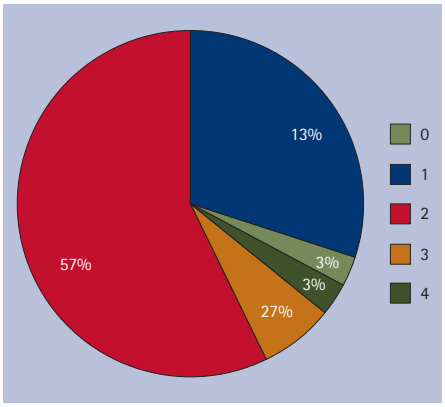

Fig. 3 Second cycle results for DCI scores (one month review)

Of the 20% whose notes included reference to denture hygiene instructions being given, there was no standardisation in the instructions given/written in their notes.

Upon reviewing the results of the second cycle of the audit, there was a large improvement in record keeping with 100% of patient notes containing information regarding denture hygiene instructions being delivered.

Denture cleanliness

The vast majority of patients (84%) had scores of 3 or greater, which is very poor when compared to our proposed standard (Fig. 2).

As a result a combination of clinician led patient education as well as involving the rest of the dental team, such as the nurses, was used in order to help patients understand how to look after their dentures.

After review, there was a dramatic improvement in patient DCI scores, 90% of patients had denture cleanliness scores of 2 or less (Fig. 3).

DISCUSSION

Good denture hygiene in patients wearing removable prostheses is an important factor contributing to oral health and wellbeing. Our audit highlights the importance of clinician-led intervention in helping patients to maintain good standards of both oral and denture hygiene.

The first audit cycle highlighted that patients at the practice unfortunately had poor levels of oral hygiene; the reasons for this were difficult to ascertain exactly. However, there were a number of contributing factors such as: lack of evidence of denture hygiene in notes and hence no evidence of denture hygiene instructions being given to the patients, lack of standardisation in giving denture hygiene instructions, and lack of patient education in the area of denture hygiene. This cycle also indicated that the quality of record keeping was inadequate and there was a need for this to be standardised. It was suggested that the following phrase should be written in the clinical notes: 'Denture hygiene instructions (DHI) were demonstrated and explained to and by the patient'.

Only one patient did not improve from their initial DCI score of four when reviewed in the second audit cycle. This was due to issues with their manual dexterity and they had considerable difficulty in using the denture brush to keep their denture clean. This patient was given secondary tailored denture hygiene instructions, with an emphasis of chemical cleansing methods, as well as given examples of various aids available to those with manual handling difficulties.

The DCI scoring system provided a simple method of quickly determining the denture hygiene status of patients in general dental practice, as well as providing a means of visual illustration in order to educate and highlight any areas of concern to our patients. A number of different methods of evaluating denture hygiene have been previously proposed.

Taiwo and Arigbede[1] used their own method for evaluating the denture hygiene of elderly patients in Ibadan, Nigeria, which looked at plaque coverage of the denture fit surface and relied on the use of either visual or tactile information. Their method demonstrated situations where denture hygiene was poor and allowed them to make a general assessment of the state of denture hygiene for their cohort.[1]. Wefers[2] presented their denture hygiene index, which looked at plaque accumulation across the entirety of the denture, splitting the fit, polished, and occlusal surfaces of the denture into different regions for evaluation.

Currently there is no generally accepted method for evaluating denture hygiene that is simple, quick, and cost effective to conduct.

Quantifying the presence of denture biofilm is an important step in order to evaluate the quality of denture hygiene, given its association with known oral pathology such as denture stomatitis.[19]

Mechanical method of denture hygiene remains a very popular method among the older age group of denture wearers, as well as chemical effervescent alkaline peroxide solutions.[18] However, issues regarding access and cost of denture cleaning chemicals and a lack of adequate information limit their use.[19]

Current literature states that brushing with water alone favours the accumulation of plaque biofilm, and therefore it is important that an adjunct is utilised when mechanical methods alone are used; these can include denture creams and toothpastes. Moreover the concomitant use of mechanical and chemical denture cleaning methods results in greater improvement in denture cleanliness when compared with either method alone.[19–21]

There is potential also for patients to be seen by their hygienist on a regular basis in order to have both periodontal and denture hygiene checks, and potentially hygienists could be encouraged to take a more active role in denture hygiene instruction and maintenance.

More research will be required to refine the DCI scoring system, assess its clinical effectiveness as a tool for denture hygiene evaluation and patient education tool, and determine the effects of clinical intervention on denture hygiene in a larger cohort size.

CLINICAL RELEVANCE

Dentures are medical devices that require a set of instructions on how to look after and keep them clean. We recommend that in the clinical notes there should be a sentence that highlights denture hygiene instructions (DHI) have been explained and demonstrated to the patient, in a manner analogous to the way oral hygiene instruction is written down as OHI.

CONCLUSION

The bespoke denture cleanliness index worked as a simple objective clinical and patient education tool and this led to an improvement in patient DCI scores following tailored DHI, albeit within a short timeframe.

The importance of both good denture hygiene and oral hygiene needs to be stressed to all denture wearing patients in order to reduce the likelihood of denture-related pathology.

Dental hygienists could take on a more active role in helping to provide denture hygiene instructions together with oral hygiene instructions for patients at regular intervals.

CONFLICT OF INTEREST

There is no conflict of interest from any of the authors present. No funding was sought or supplied by GSK.

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