

## An audit of the caries status of patients about to start orthodontic treatment

### Précis

An audit of the caries status of patients taken off an orthodontic treatment waiting list demonstrated that 42% required restorative intervention before orthodontic treatment.

### Abstract

**Statement of the problem:** All dental caries needs must be addressed before orthodontic treatment in those deemed eligible for orthodontic treatment under HSE (Health Services Executive) guidelines.<sup>1</sup>

**Purpose of the study:** To evaluate the prevalence of carious lesions in permanent teeth requiring restoration in patients from the North Cork area of HSE South taken off the Cork University Dental School and Hospital postgraduate orthodontic treatment waiting list.

**Materials and methods:** A data collection form was designed and applied to 100 consecutive patients taken off the postgraduate orthodontic treatment waiting list from October 2009. A gold standard based on a similar audit carried out in the UK<sup>2</sup> was adopted.

**Results:** Carious lesions in permanent teeth requiring restorative intervention were found in 42% of patients (48.9% of males and 35.3% of females). Sixty carious lesions requiring restorations were detected on posterior bitewings and 34 on DPTs, in patients where both forms of radiograph were used. Caries were detected in one-third of the 6% of patients who had attended a primary care dentist in the previous six months.

**Conclusions:** A total of 42% of this patient cohort failed the adopted gold standard by exhibiting caries requiring restoration in permanent teeth, with males showing a higher prevalence. A total of 43% of carious lesions detected by posterior bitewing radiographs were not detected on DPTs of the same patients. Six patients had attended a primary care dentist in the six months before being taken off the orthodontic treatment waiting list and two patients were diagnosed with carious lesions that required restoration.

*Journal of the Irish Dental Association* 2011; 57 (3): 156-160.

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## Introduction

It is considered good practice that patients should not begin orthodontic treatment if they have uncontrolled dental disease,<sup>2</sup> as patients with caries are likely to exhibit further deterioration in dental health when orthodontic appliances are fitted.<sup>3</sup> As well as having a satisfactory level of oral hygiene, patients should have all active carious lesions restored. The National Institute of Health and Clinical Excellence (NICE) has published guidelines<sup>4</sup> recommending specific intervals between recalls (range three to 12 months for children) for assessment of dental health status, which are dependent on many factors, including a caries risk assessment as summarised in **Table 1**. Two audits have reported on patients' recent attendance at their

**TABLE 1: Summary of NICE dental recall clinical guidelines**

The recommended interval between oral health reviews should be determined specifically for each patient and tailored to meet their needs on the basis of an assessment of disease levels and risk of or from dental disease. Risk factors in relation to dental caries include:

- ▶ high caries in mothers and siblings;
- ▶ high and/or frequent sugar intake;
- ▶ high and/or frequent dietary acid intake;
- ▶ use of fluoride toothpaste;
- ▶ other sources of fluoride (for example lives in a water fluoridated area);
- ▶ new carious lesions since last check-up;
- ▶ anterior caries or restorations;
- ▶ premature extractions because of caries;
- ▶ heavily restored dentition;
- ▶ low saliva rate;
- ▶ medical conditions such as xerostomia; and,
- ▶ fixed appliance orthodontics.

The recommended shortest and longest intervals between oral health reviews are as follows:

- ▶ the shortest interval between oral health reviews of all patients should be three months;
- ▶ the longest interval between oral health reviews for patients younger than 18 years should be 12 months; and,
- ▶ for practical reasons, the patient should be assigned a recall interval of three, six, nine or 12 months if he or she is younger than 18 years.

The recall interval should be reviewed again at the next oral health review, in order to learn from the patient's responses to the oral care provided and the health outcomes achieved.

**National Institute for Clinical Excellence.** Adapted from: CG 19 Dental Recall: recall intervals between routine dental examinations. London: NICE. Available from [www.nice.org.uk/guidance/CG19](http://www.nice.org.uk/guidance/CG19), 2004. Reproduced with permission.

general dentist.<sup>2,5</sup> Bitewing radiography, which is rarely used by orthodontists,<sup>1</sup> is considered more sensitive in detecting caries than dental pantomograms (DPTs).<sup>6</sup> It should only be used when ALARA (as low as reasonably achievable) principles are followed,<sup>7</sup> and in relation to caries, as frequently as the patient's caries risk assessment indicates.<sup>8</sup> **Table 2** summarises the Faculty of General Dental Practice (FGDP) UK guidelines regarding interval frequencies for posterior bitewings according to the patient's caries risk category.

Clinical audit is part of a continuous quality improvement process that seeks to improve patient care by improving professional practice, as well as the quality of services delivered.<sup>9</sup> The Orthodontic Review Group Report (2007)<sup>1</sup> recommends that clinical audit be introduced, supported and encouraged in all orthodontic units and that the knowledge gained should be shared within units and at clinical meetings. Previous audits carried out in the Republic of Ireland (RoI) and the United Kingdom (UK) have examined the caries status of patients referred for orthodontic assessment.<sup>5,10,11,12</sup> While these audits have established the caries prevalence of patients at orthodontic assessment, there appears to be only one published audit that has reported the prevalence of caries in a cohort of patients taken off an orthodontic treatment waiting list immediately prior to starting orthodontic treatment.

That study, carried out in Sheffield,<sup>2</sup> investigated the prevalence of caries in patients at that time point and compared the number of carious lesions detected on bitewing radiographs with detection rates using DPTs. The current audit was undertaken to ascertain data in these regards at a similar time point within an Irish orthodontic cohort.

**TABLE 2: Summary of the FGDP guidelines\* for the taking of posterior bitewing radiographs**

Risk category	Radiographic guideline
High caries risk	Posterior bitewing radiographs at six-month intervals until no new or active lesions are apparent and the individual has entered another risk category
Moderate caries risk	Annual posterior bitewings unless risk status alters
Low caries risk	Posterior bitewing radiographs at approximately: <ul style="list-style-type: none"> <li>▶ 12-18 months in the primary dentition</li> <li>▶ Two-year intervals in permanent dentition</li> <li>▶ More extended radiographic recall may be employed if there is explicit evidence of continuing low caries risk.</li> </ul>

\*Faculty of General Dental Practice (UK). Pendlebury, M.E., Homer, K., Eaton, K.A. (Eds.). *Selection Criteria for Dental Radiography (2nd Ed.)*. Faculty of General Dental Practice (UK), Royal College of Surgeons of England, 2004.

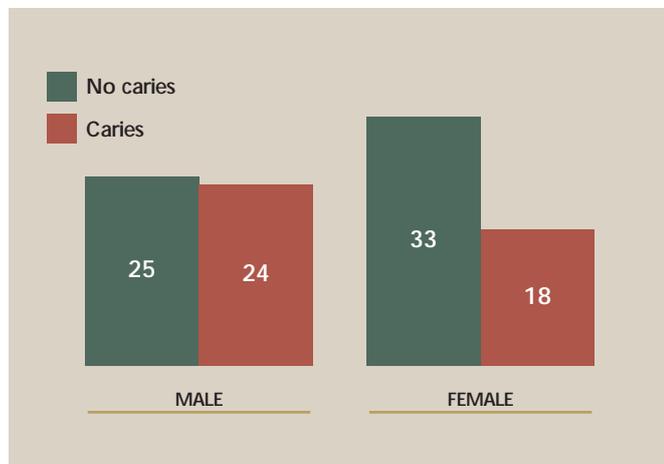


FIGURE 1: Caries distribution among male and female patients (n=100).

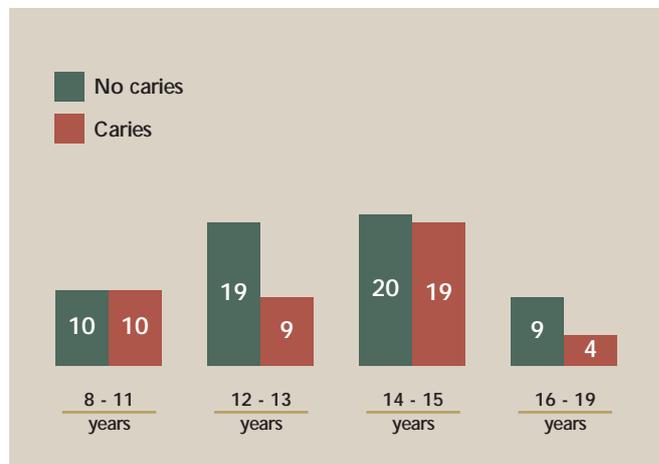


FIGURE 2: Distribution of patients by age grouping and prevalence of caries in each age group (n=100).

#### Aims of the audit

- To investigate the prevalence of caries among patients about to start orthodontic treatment in the Postgraduate Orthodontic Unit, Cork University Dental School and Hospital;
- to compare the number of carious lesions detected using posterior bitewings with the number detected using DPTs; and,
- to make any necessary recommendations for maintaining the dental health of all patients awaiting orthodontic treatment.

#### Standard

The gold standard set was that all patients called from the postgraduate orthodontic treatment waiting list should have all caries diagnosed and managed before orthodontic treatment is started.<sup>2</sup>

#### Materials and methods

The patients for this audit were from the North Cork area of HSE South and were referred to the Postgraduate Orthodontic Unit, Cork University Dental School and Hospital, by primary care dentists working in HSE dental clinics. Patients were assessed in the Unit and placed on the postgraduate orthodontic treatment waiting list if deemed of a sufficiently high treatment need, based on HSE eligibility criteria;<sup>1</sup> they were also advised that they must be caries-free before beginning orthodontic treatment. The referring primary care dentist was informed of the outcome of the assessment and requested to carry out all necessary restorative treatment. For this prospective audit, 100 consecutive patients were evaluated who were taken off the postgraduate orthodontic treatment waiting list from October 2009. Visual inspection for caries was carried out according to recommended practice.<sup>13</sup> If DPT and/or bitewing radiographs were indicated,<sup>8</sup> then these were examined closely using a table-mounted viewer. DPTs were taken with the field of exposure limited only to those structures that required assessment.<sup>7</sup> If the patients were found to have carious lesions that required restorative treatment, they were referred back to the primary care dentist (with a copy of any radiographs taken), with a request to carry out the restorations and

any further investigations or treatment that was appropriate. Patients did not commence orthodontic treatment until all carious lesions were managed.

The following information was recorded on a data collection form:

- gender;
- examination date;
- age at examination;
- whether seen by a general dental practitioner (GDP)/CDS in the previous six months;
- whether bitewing radiographs had been taken in the previous six-month period, if the patient had been seen by a primary care dentist;
- the number of carious lesions requiring restoration (if any) detected visually;
- the number of carious lesions requiring restoration (if any) detected on the patient's DPT (if taken); and,
- the number of carious lesions requiring restoration (if any) detected on the patient's posterior bitewing radiographs (if taken).

Cariou primary teeth and early enamel lesions, which would not be considered for restoration, were excluded from this audit. To check examiner reliability in recording data, the recorded information for every tenth patient was re-entered on a new data collection form and compared with the original one month after the initial data entry.

#### Results

No errors were noted with regard to data entry, indicating high reliability in data recording. Data on 100 patients (51 males, 49 females) with a mean age of 13.6 years (SD 1.99 years) were assessed. Forty-two patients were found to have caries in permanent teeth that required restorative intervention (mean lesion number per patient 2.2, range 1-7) prior to commencing orthodontic treatment. The mean waiting time for orthodontic treatment was 22.1 months (range 16-

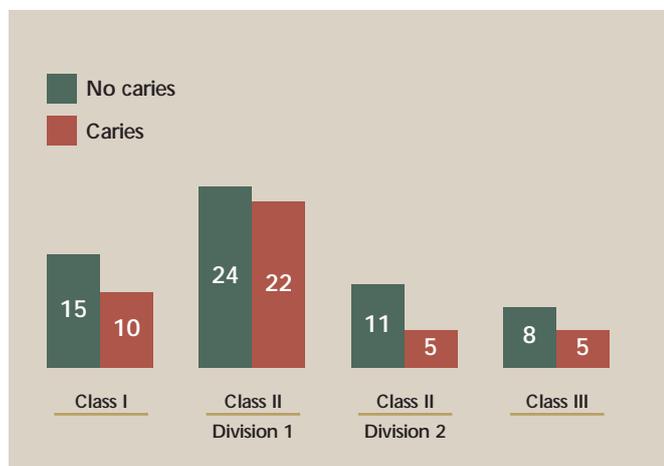


FIGURE 3: Caries distribution according to malocclusion (n=100).

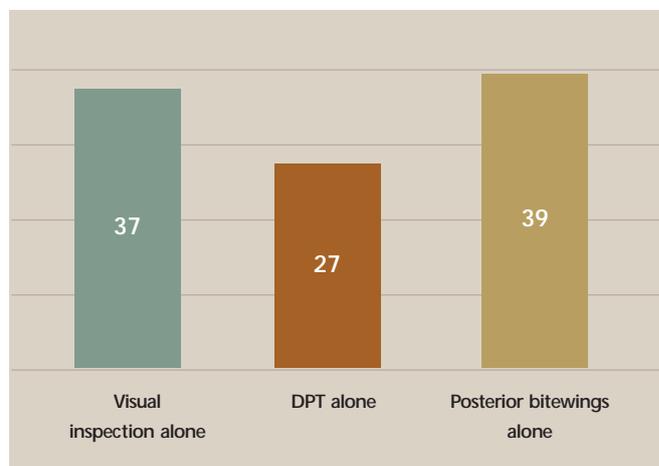


FIGURE 4: Number of patients with caries detection per diagnostic assessment. (Please note that some patients had more than one radiograph).

31 months). Figure 1 shows the caries breakdown according to gender. The distribution of patients by age grouping and the prevalence of caries within each age group is illustrated in Figure 2. Half of 15 year olds were found to be caries free. Figure 3 shows the breakdown of caries distribution according to malocclusion. Posterior bitewing radiography was used in 43 patients and DPTs in 89 patients. In the subgroup of patients where both types of radiography were used, 60 carious lesions requiring restoration were detected on posterior bitewing radiographs while 34 lesions were detected using DPTs. Figure 4 illustrates the number of patients with caries requiring restorative attention if visual inspection, DPT analysis or bitewing radiography was the sole diagnostic tool applied. Of the six patients who had seen a primary care dentist in the previous six-month period, none had a radiograph taken to detect caries and two had carious lesions that required restoration. One of these two patients required restorative intervention in five teeth and the second patient needed restoration of two teeth.

## Discussion

This audit showed that 42% of this patient cohort (48.9% of males and 35.3% of females) taken from the postgraduate orthodontic treatment waiting list exhibited carious lesions that required restorative treatment. All lesions recorded were on permanent teeth only. This figure was disappointing as patients are advised, as were patients in previous orthodontic audits<sup>5,10,11</sup> in the RoI, of the importance of good dental health at the time of orthodontic assessment. It compares to 37% found in a similar audit carried out on 59 patients prior to commencing orthodontic treatment in Sheffield.<sup>2</sup> The gold standard in that audit, as in this, was that all patients should have active caries diagnosed and managed prior to commencing orthodontic treatment.<sup>2</sup> Audits carried out in the RoI and the UK showed that dental caries requiring restoration were detected in 20-47%<sup>5,10,12</sup> of patients referred for orthodontic assessment but one study finding of 37.1%<sup>11</sup> examined permanent molars only. Diagnosis

of caries in three audits<sup>5,10,11</sup> appears to have been without the aid of radiographs, while the Manchester<sup>12</sup> study used DPTs to aid caries diagnosis in an unstated number of patients, so the true caries prevalence may be higher. In the audit presented here, 50% of 15-year-old patients were caries-free, which lies within the 49-57.8% of children found to be caries-free in the Southern Health Board region (the area that includes the HSE South region) in 2002.<sup>14</sup> Class 11 Division 1 (46%) was the most common malocclusion (and had the greatest proportion of caries requiring restoration [47.8%]), which compares to 47.1% reported in the Eastern Health Board audit.<sup>10</sup> In addition, our audit confirms available evidence that DPTs are not as sensitive at detecting caries as posterior bitewing radiographs<sup>6</sup> with 43.3% of the carious lesions detectable by bitewing radiography only. This compares to 50% in the Sheffield audit.<sup>2</sup> No patients in this audit had bitewing radiographs taken in the previous six months, suggesting that posterior bitewing radiographs may not be taken as frequently as guidelines recommend.<sup>8</sup> Time and financial constraints,<sup>12</sup> and concerns about exposure to radiation,<sup>2</sup> have all been suggested as reasons for this.

The Sheffield audit recommended that a recent set of bitewing radiographs should be available prior to starting orthodontic treatment.<sup>2</sup> Two audits reported that 42%<sup>5</sup> and 73%<sup>2</sup> of patients had attended a primary care dentist in the preceding six months, while there was only 6% attendance in the current study. The prevalence of caries in the Sheffield audit in those patients seen by a primary care dentist in the previous six months was 37%, which compares to 33% in this study. With the caries prevalence in the current cohort, more frequent recall for monitoring of caries status would appear to be justified. Public dental health provision in the HSE South area, however, involves targeting primary schoolchildren in second and sixth class (approximately eight and 12 years of age, respectively) for recall and any necessary treatment. Current cuts in funding and recruitment make a more reduced recall interval doubtful and this is likely to impact upon all children's access to dental care required. It is

acknowledged that expansion of the orthodontic services nationally in recent years has strained the primary dental care service.<sup>1</sup> However, close follow-up of those awaiting orthodontic treatment to ensure that all primary care needs are met, would be beneficial to the HSE orthodontic service. The findings of this audit echo the conclusion made by Dowling *et al.*<sup>10</sup> in 1997 that the failure of patients on orthodontic waiting lists to maintain dental health despite being advised to do so warrants further investigation.

### Conclusions

In the patient cohort assessed the following conclusions can be drawn:

- a total of 42% of patients (48.9% of males and 35.3% of females) taken off the postgraduate orthodontic treatment waiting list had carious lesions in permanent teeth that required restorative intervention prior to orthodontic treatment;
- a total of 43% of carious lesions detected by posterior bitewing radiographs were not detected on DPTs of the same patients; and,
- only six patients had attended a primary care dentist in the six months prior to being taken off the orthodontic treatment waiting list and two patients were diagnosed with carious lesions that required restorative intervention.

### Recommendations

- Foster closer links with primary care dentists so that the caries needs of patients are addressed as required prior to being taken off the postgraduate orthodontic treatment waiting list;
- the importance of regular dental review and caries prevention will continue to be stressed to patient and parent at orthodontic assessment and when the patient is about to start orthodontic treatment;
- posterior bitewing radiographs, if not already available, should be taken of patients if clinically indicated prior to commencing orthodontic treatment; and,
- re-audit is recommended at the start of the next postgraduate student intake to evaluate the effect of the changes introduced and to ensure that treating postgraduate students are complying with Unit guidelines to have bitewings, if clinically indicated, at the start of orthodontic treatment.

### Acknowledgement

We are grateful to the Faculty of General Dental Practice for providing permission to use Table 2 (Summary of the FGDP guidelines for the taking of posterior bitewing radiographs).

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