On becoming edentulous. An investigation into the dental and behavioural reasons for full mouth extractions.

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Document Version
Publisher's PDF, also known as Version of record

Publication date:
1987

Link to publication in University of Groningen/UMCG research database

Citation for published version (APA):
Chapter four

PERIODONTAL STATUS AND TOTAL TOOTH EXTRACTION IN A MEDIUM-SIZED CITY IN THE NETHERLANDS

4.1 Introduction

In order to identify the role of periodontal disease in the loss of teeth, the reasons for extraction of single teeth have usually been examined. Many of these studies into the role periodontal diseases play in single tooth extraction have shown that their importance increases with age (1-6). Gingivitis was supposed to progress continuously into periodontitis and ultimately results in loss of teeth. Although different studies have shown varying results, many investigators have shown that in older age groups (between 35 and 50 years old) periodontal disease progressively outstrips caries as the main reason for tooth extraction (1-6). Recently, however, the importance of periodontal disease as a generalized public health problem and its contribution to tooth extraction has been questioned (7-9). This point of view is supported by studies showing that the progression of periodontal disease is generally not as high and linear (10-13) as has been suggested over the last two decades. In fact, advanced periodontal diseases seem to be confined to a relatively small high risk group (14, 15).

To further examine the importance of periodontal disease for tooth loss it is of interest to examine to what extent the

disease contributed to the decision to extract all (remaining) teeth. However, little information is available on the role periodontal diseases play in total tooth extraction. In a survey in Scotland in 1972 Todd & Whitworth (16) found that among people who went straight to full clearance, not a single tooth was classified as in need of extraction because of its periodontal condition. A complicating factor is that other oral health problems, non-disease reasons (16) or social reasons (17) may play also an important role.

A study was set up to identify the relative role of these possible reasons for total tooth extraction. A combined sociodental research project was therefore started in Groningen in 1982. The aims of the project were: - to describe the dental condition (caries and periodontal disease) of patients who underwent total extraction and - to gather information about the social background, knowledge, attitude and behaviour towards oral health and full dentures and the decision process leading to total extraction (e.g. lay referral, professional counseling).

The effect of the latter non-disease- or social factors will be published in the next chapters. The caries status at the moment of total extraction has been described already (18).

The periodontal status at the moment of extraction and its relation to variables such as age, sex and dental attendance will be described in this chapter. Attention will be paid to the question of whether or not periodontal disease was the main clinical condition requiring total tooth extraction.
4.2 Materials and methods

4.2.1 General method

In January 1982 all dental practitioners, a total of 68, in the city of Groningen (170,000 inhabitants) were asked to participate in this study for a period of 1 yr. Ninety-one percent of the dentists participated in this investigation by collecting the extracted teeth and by filling out a short questionnaire concerning the dental status of the patient and their reason for extracting all the teeth. Patients who participated in this study were those who received full dentures in 1982, regardless of whether they already had partial dentures. These patients were asked by the dentist to fill out a questionnaire at home concerning underlying reasons for their decision to have all their teeth extracted. The response rate was 78% of the 134 patients.

The extracted teeth were stored in jars containing a 10% formaline solution (one jar per patient). After identification of the extracted teeth the periodontal status was assessed by measuring the loss of attachment (L.A.). To that end the extracted teeth were stained in basic fuchsin and rinsed in running water (19). Loss of attachment was expressed in terms of the percentage of the root length no longer covered by periodontal fibres. Measurements were made at all four line angles using the Schei-ruler developed for measurement of loss of alveolar bone in radiographs (20). An L.A. measurement of 50% (or higher) was chosen as the level at which advanced periodontal disease was considered to be present.
4.2.2 Reliability of the measurements

Out of the population of 134 persons a random sample of 10 persons was drawn who were re-examined by another investigator (R.S.). In total 544 surfaces were analyzed and compared with the scores of the first two investigators. When using a 5-point scale per surface (0-20% L.A., 20-40% L.A., etc.) there was an inter-examiner agreement of 79%. When using a 2-point scale (0-50% L.A. and 50-100% L.A.) the interexaminer agreement rose to 93%. No systematic differences between the two investigators and R.S. could be demonstrated (Wilcoxon matched-pairs ranked-signs test, n = 526, z = -1.077, NS).

4.3 Results

Most of the surfaces located in the molar and incisal region in the mandible were affected by loss of attachment. The mesiolingual sites of 41 and 31 were especially at risk: in more than 50% of the patients L.A. of 30% or higher was measured. Twenty-seven percent and 24% of the patients had advanced periodontal disease (L.A. >50%) at the mesiolingual sites of 41 and 31 respectively. Teeth 14, 13, 23, 25, 34, 44 and 46 appeared to be least affected by periodontal destruction: at least 85% of the patients had L.A. <30% at these teeth.

More detailed information about the distribution of the percentage of L.A. per tooth is given in Fig 4.1. The highest percentage of L.A. at a site was taken as the score for the whole tooth.

The distribution of periodontal disease among individuals is presented in Table 4.1. Advanced generalized periodontal disease, defined as 50-100% of the teeth with an L.A. measurement of >50%, was found in 17% of the patients. In
Fig. 4.1 Percentage of people and degree of loss of attachment (L.A.) per tooth for maxilla and mandible. A, percentage of the people with L.A. > 50%. B, percentage of the people with L.A. 30-50%. C, percentage of the people with L.A. < 30%.

Table 4.1

Average number of teeth with L.A. >50% and average number of teeth present at the moment of extraction according to the percentage of teeth with L.A. >50% and number of patients

<table>
<thead>
<tr>
<th>Percentage of teeth with L.A. &gt;50%</th>
<th>No. of patients</th>
<th>Average no.of teeth with L.A. &gt;50%</th>
<th>Average no.of teeth present</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>75 (58.1)</td>
<td>- (-)</td>
<td>12.2 (6.4)</td>
</tr>
<tr>
<td>1-25%</td>
<td>18 (14.0)</td>
<td>1.8 (1.3)</td>
<td>13.3 (5.4)</td>
</tr>
<tr>
<td>26-50%</td>
<td>14 (10.9)</td>
<td>3.7 (1.3)</td>
<td>10.1 (3.5)</td>
</tr>
<tr>
<td>51-75%</td>
<td>13 (10.1)</td>
<td>7.7 (4.6)</td>
<td>12.2 (6.8)</td>
</tr>
<tr>
<td>76-100%</td>
<td>9 (7.0)</td>
<td>5.6 (1.7)</td>
<td>6.0 (2.1)</td>
</tr>
<tr>
<td>Total</td>
<td>129 (100.1)</td>
<td>1.7 (3.0)</td>
<td>11.0 (6.5)</td>
</tr>
</tbody>
</table>

1) Third molars excluded.
contrast 58% had no teeth with L.A. >50%. The relationship between age and periodontal disease is shown in Table 4.2.

Advanced periodontal disease below the age of 35 was exceptional: only 3% had L.A. >50% in 50-100% of the teeth, while this figure was 38% in the group 55 yr and older. The same tendency is illustrated more clearly by looking at the number of teeth with L.A. >50%, instead of the number of people with advanced periodontal disease (Table 4.3). Table 4.3 also indicates that, with increasing age, the average number of teeth decreased while the average number of teeth with advanced periodontal disease increased. There was no significant relationship between the number of teeth affected by

Table 4.2

Distribution of patients according to varying number of teeth with advanced periodontal disease (L.A. >50%) and age

<table>
<thead>
<tr>
<th>Age</th>
<th>&lt;50% of teeth with L.A. &gt;50%</th>
<th>&gt;50% of teeth with L.A. &gt;50%</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>&lt;35</td>
<td>33 (89.2)</td>
<td>3 (8.1)</td>
<td>1 (2.7)</td>
</tr>
<tr>
<td>35-54</td>
<td>17 (54.8)</td>
<td>8 (25.8)</td>
<td>6 (19.4)</td>
</tr>
<tr>
<td>55+</td>
<td>9 (26.5)</td>
<td>12 (35.3)</td>
<td>13 (38.2)</td>
</tr>
<tr>
<td>Total</td>
<td>59 (57.8)</td>
<td>23 (22.5)</td>
<td>20 (19.6)</td>
</tr>
</tbody>
</table>

\[
X^2 = 29.71796, 4 df, P<0.001.
\]

') Because information like age was derived from the questionnaire, the total n dropped from 129 to 103 (because of non-response).
Table 4.3

Distribution of teeth according to number of teeth with varying degrees of loss of attachment (L.A.), total number of teeth, average number of teeth with L.A. >50%, average number of teeth present and age

<table>
<thead>
<tr>
<th>Age</th>
<th>No. of patients n</th>
<th>No. of teeth with L.A. of:</th>
<th>Total no. of teeth n</th>
<th>Average no. of Teeth with L.A. &gt;50%</th>
<th>Average no. of teeth present</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0-30% 30-50% &gt;50%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;35</td>
<td>37</td>
<td>485 (87.9) 44 (8.0) 23 (4.2)</td>
<td>552 (100.1)</td>
<td>0.6 (2.6)</td>
<td>15.0 (6.4)</td>
</tr>
<tr>
<td>35-54</td>
<td>31</td>
<td>184 (54.6) 86 (25.5) 67 (19.9)</td>
<td>337 (100)</td>
<td>2.2 (3.5)</td>
<td>10.9 (5.0)</td>
</tr>
<tr>
<td>≥55</td>
<td>34</td>
<td>66 (21.9) 124 (41.1) 112 (37.1)</td>
<td>302 (100.1)</td>
<td>3.3 (3.3)</td>
<td>8.9 (4.7)</td>
</tr>
<tr>
<td>Total</td>
<td>102¹</td>
<td>735 (61.7) 254 (21.3) 202 (17.0)</td>
<td>1191 (100)</td>
<td>1.9³ (3.2)</td>
<td>11.7 (6.0)</td>
</tr>
</tbody>
</table>

Χ² = 372.8, 4df, P<0.00.

¹) Missing data because of non-response to questionnaire.
²) Based on n = 129.
periodontal disease (L.A. >50%) and level of education and sex. The presence of partial dentures made no significant difference to the periodontal condition of the mouth.

The relationship between dental attendance and periodontal disease was examined. Regular dental attenders were those who stated that they had been to the dentist on a regular basis from childhood until the moment of full clearance (18). In the Dutch system this means that they visited the dentist twice a year (21). People were classified as irregular attenders when they had never been to a dentist on a regular basis or had stopped regular dental visits (18). It appeared that, at the moment of extraction, the periodontal condition of irregular dental attenders was better than that of regular attenders (X^2 = 8.5048, 2 df, 0.02 > P > 0.01): 67% of the irregular attenders had no teeth with L.A. >50%, as compared to only 36% of the regular attenders. This significant relationship still existed when age was considered.

Table 4.4 provides information on whether teeth had been extracted because of periodontal disease. Teeth with L.A. >50% were more often caries free or had an adequate filling than teeth with low L.A. (<30%). When the total caries experience is considered it appeared that teeth which were in a relatively good periodontal condition (<30% L.A.) were most affected by caries. When looking at severe, active caries, i.e. teeth which were classified as extraction indicated and teeth with three to five carious surfaces, there was a significant negative relationship with L.A. The relationship between severe caries and L.A. was analyzed for the age groups below 35 yr old, 35-54 yr old and 55 yr and older. It appeared that in the age group >55 years old there was, in contrast to the other two groups, no relationship between severe caries and degree of L.A.

When considering periodontal disease as a (main) reason for total extraction it is not only the "objective" criterion of
periodontal disease (loss of attachment) which is of importance, but also the opinion of the dentist on the necessity of total extraction because of periodontal destruction.

Table 4.4

Distribution of teeth according to number of teeth with varying degrees of loss of attachment (L.A.) and caries-status

<table>
<thead>
<tr>
<th>Caries-status</th>
<th>No. of teeth with:</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>L.A. 0-30%</td>
<td>L.A. 30-50%</td>
</tr>
<tr>
<td>Sound</td>
<td>328 (35.0)</td>
<td>146 (45.3)</td>
</tr>
<tr>
<td>Caries, 1-2 surfaces</td>
<td>137 (14.6)</td>
<td>38 (11.8)</td>
</tr>
<tr>
<td>Caries, 3-5 surfaces</td>
<td>120 (12.8)</td>
<td>24 (7.5)</td>
</tr>
<tr>
<td>Extraction indicated</td>
<td>106 (11.3)</td>
<td>22 (6.8)</td>
</tr>
<tr>
<td>Filled (otherwise sound)</td>
<td>136 (14.5)</td>
<td>67 (20.8)</td>
</tr>
<tr>
<td>Filled (primary caries)</td>
<td>51 (5.4)</td>
<td>15 (4.7)</td>
</tr>
<tr>
<td>Filled (secondary caries)</td>
<td>59 (6.3)</td>
<td>10 (3.1)</td>
</tr>
<tr>
<td>Total</td>
<td>937 (99.9)</td>
<td>322 (100)</td>
</tr>
</tbody>
</table>

1) Third molars excluded.

In an open ended question dentists were asked about their reason(s) for total extraction. In 31% of the cases, den-
tists named periodontal disease as a reason for total extraction (Table 4.5). Their answers with respect to the periodontal condition were compared with the periodontal status of the teeth as indicated by the percentage loss of attachment (Table 4.5). It appeared that in almost 70% of the cases in which dentists did not consider the periodontal condition a reason for extraction, no substantial loss of attachment could be demonstrated. However, in 8% of the cases in which dentists did not name periodontal disease as

Table 4.5

Distribution of patients according to diagnosis of dentists of periodontal disease as a reason for total extraction and varying number of teeth with advanced periodontal disease (L.A.>50%)

<table>
<thead>
<tr>
<th>No. of teeth with L.A. &gt;50%</th>
<th>No</th>
<th>n (%)</th>
<th>No</th>
<th>n (%)</th>
<th>No</th>
<th>n (%)</th>
<th>Total</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No teeth with L.A. &gt;50%</td>
<td>5</td>
<td>(25.5)</td>
<td>6</td>
<td>(33.3)</td>
<td>59</td>
<td>(68.6)</td>
<td>0</td>
<td>(56.5)</td>
</tr>
<tr>
<td>1-50% of the teeth with L.A. &gt;50%</td>
<td>6</td>
<td>(30.0)</td>
<td>6</td>
<td>(33.3)</td>
<td>20</td>
<td>(23.3)</td>
<td>32</td>
<td>(25.8)</td>
</tr>
<tr>
<td>50-100% of the teeth with L.A. &gt;50%</td>
<td>9</td>
<td>(45.0)</td>
<td>6</td>
<td>(33.3)</td>
<td>7</td>
<td>(8.1)</td>
<td>22</td>
<td>(17.7)</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>(100)</td>
<td>18</td>
<td>(100)</td>
<td>86</td>
<td>(100)</td>
<td>124</td>
<td>(100)</td>
</tr>
</tbody>
</table>

X² = 24.85791, 4 df, P<0.001.
the reason for extraction, advanced generalized periodontal destruction was measured. In 29% of the patients whose teeth were extracted because of (serious) periodontal reasons according to the diagnosis of the dentists, no teeth with loss of attachment of 50% or more were present.

4.4 Discussion

At the moment of extraction 1493 teeth were present. This means that based on an average of 28 teeth per person and 129 individuals, 2119 teeth were missing (59%). No information was available about these teeth so that conclusions drawn in this chapter have to be restricted to the teeth present at the moment of extraction. After analysis of the teeth collected it appeared that only a few teeth were unaffected by periodontal disease. Advanced periodontal disease was relatively rare and mainly located on the known high risk surfaces. An L.A. measurement of 50% (or higher) was chosen as the level at which advanced periodontal disease was present. Some support can be found for this choice in the literature. Lindhe & Nyman (22) defined advanced periodontal disease as: evidence of "horizontal" bone loss of more than 1/3 the normal bone height. It is a reasonable assumption that the measurement of L.A. 50% would at least correspond to, or possibly exceed, Lindhe's criterion of bone loss of more than 1/3 the normal bone height.

The opinion of Schaub (7, 9), Schaub & Pilot (8) and Sheiham (personal communication) that the public health significance of periodontal disease should be reappraised because it is not a generalized disease, ultimately leading to tooth loss, but a disease concentrated in a small high risk group with relatively many of their teeth affected, seems to be confirmed in this study. In only 17% of the patients advanced generalized periodontal disease was found (Table 4.1). This group possessed 64% of the teeth with L.A. >50% (Tables 4.1 and 4.4). It is of interest to note that even in the high
risk group, often a fair number of teeth did not show severe periodontal destruction. Also striking is the fact that in patients in whom most of the teeth showed a serious breakdown (about half of the high risk group), on average only a few teeth were present. Whether the missing teeth had been extracted because of periodontal breakdown is not known.

A significant negative relationship was found between severe caries and L.A. with the exception of the group 55 yr and older. An explanation for the absence of a relationship in this group might be the fact that in the oldest age group teeth with severe caries might previously have been extracted. Teeth with severe caries with no or little L.A. (<30%) were extremely underrepresented in this age group: 5% of the total number of teeth in this group. The comparative figure of the group 35-55 yr was 23% and for the group <35 yr old: 42%.

The question of whether teeth have been extracted because of periodontal disease is difficult to answer. Table 4.4 shows that 16% of the total number of teeth extracted were teeth with L.A. >50%. In the age groups <35, 35-54 and >55 yr these percentages were 4, 20 and 37, respectively. Using the figures 4, 20 and 37 as an estimate of the percentage of teeth extracted because of periodontal reasons will probably result in an overestimation, because some teeth were also categorized as indicated for extraction due to caries or had caries and fillings in many surfaces. In these cases it is not clear whether extraction took place because of caries or because of periodontal disease. Nevertheless, even when using the percentages of teeth with advanced periodontal disease, it seems reasonable to assume that periodontal disease, as measured by us with L.A. >50%, did not outstrip caries as the main clinical condition requiring tooth extraction.

Also when looking at the reasons given by the dentists for total tooth extraction, it appeared that only in 31% of the
cases dentists gave, among others, periodontal disease as a reason for total tooth extraction. (Table 4.5)

The number of teeth extracted without severe caries or periodontal breakdown was relatively high (Table 4.4) These extractions could have been carried out as part of prosthetic therapy. Alternatively the beliefs and attitudes of the patients may have played an important role in the total tooth extraction, as suggested by Todd & Whitworth (16). Some evidence for this was found in the present study. In 43% of the cases dentists gave non-disease reasons for total tooth extraction (e.g. 'patient not motivated', 'patient not interested', 'financial problems'). The role non-disease reasons play in total tooth extraction will be described in a separate chapter.

Finally, the impact of regular dental visits on periodontal health is, as in the case of caries, debatable (18). When analyzing the relationship between regular dental attendance and caries experience, there is no clear evidence that regular dental visits have a substantial beneficial effect on the condition and longevity of the natural dentition (18). However, there was some evidence that irregular attenders had by nature a better dental condition than regular attenders. Whether the same applies to their periodontal condition is not known. If so, conclusions about the beneficial effect of regular dental attendance on periodontal health have to be drawn very cautiously because of the difficulty of comparing two groups with different disease susceptibilities. Whatever the implications of these considerations may be, the fact remains that 9 out of all 28 regular attenders finally ended up in the group with advanced periodontal disease.

Whether (successful) periodontal treatment had been carried out by the dentists in the past is not known. So, in theory, it is possible that without dental interference even more people might have lost their teeth for periodontal reasons. Because of the high caries experience of these patients and
because of the fact that periodontal therapy has not been applied on a large scale by Dutch dentists (9), this explanation is not very likely. A possible plausible explanation for this fact is that the Dutch Sick-fund system does not provide sufficient remuneration for periodontal treatment.
References


