Recommendations by Dental Staff and Use of Toothpicks, Dental Floss and Interdental Brushes for Approximal Cleaning in an Adult Swedish Population

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Purpose: The aim of the present study was to evaluate the recommendations relating to the use of approximal cleaning aids given by dental hygienists and dentists, the self-care practices in a Swedish population and the ability to remove dental plaque.

Materials and Methods: A structured questionnaire was randomly distributed to 500 dental hygienists and 500 dentists and a similar questionnaire was distributed to 1000 randomly selected individuals, divided equally into the following age groups: 15 to 20, 21 to 40, 41 to 60 and > 60 years. A clinical examination evaluating the ability to remove approximal dental plaque was also carried out in a total of 60 regular users of approximal cleaning aids. Plaque was scored before and after cleaning with a toothpick, dental floss or an interdental brush.

Results: The response rate was 82%, 79% and 68% for the three groups. The results reveal that dental hygienists give more detailed information about a majority of the aspects that are related to the use of approximal cleaning aids compared with dentists (P < 0.01 or P < 0.001). The majority of the dental staff give recommendations to children and adolescents firstly to prevent dental caries and to older individuals to improve periodontal health. The use of different approximal cleaning aids on a daily basis varied with respect to age group (2% to 42%); dental floss dominated in the younger age groups and interdental brushes in the two oldest groups. In the clinical study, the largest plaque reduction was produced by the interdental brush (83%), followed by toothpicks (74%) and dental floss (73%).

Conclusions: The present study indicated the importance of individual recommendations related to the use of approximal cleaning aids.

Key words: approximal caries, choice of products, interproximal cleaning aids, oral hygiene, questionnaire, self-care practices

The effective removal of dental plaque lifelong is essential for both dental and periodontal health. Toothbrushing and other mechanical cleaning procedures that are performed on a regular basis are regarded as the most important factors for controlling plaque formation. In the case of dental caries, frequent exposure to fluoride is also essential and the use of fluoride-containing dentifrice is the single factor that has contributed most to the decline in caries since the middle of the last century (Bratthall et al, 1996; Marinho et al, 2003; Twetman et al, 2003). Despite the good cleaning properties of different toothbrushing techniques, neither of these methods has been found to be able to provide interdental cleanliness (Kinane, 1998; Löe, 2000). It has therefore been regarded as important to develop products that are specifically aimed at optimal cleaning of the interproximal areas. Currently, the three main approximal cleaning aids are toothpicks, dental floss and interdental brushes, and variants of the products within each category can be found in the market. To prevent
caries on approximal surfaces, it is also important to administer fluoride in this area. Apart from the techniques that are aimed at optimal cleaning of the whole dentition, we have previously shown good fluoride-releasing capacity in both fluoridated toothpicks and dental floss (Särner et al, 2003). Both products have been found to re-mineralise initial enamel lesions (Särner et al, 2005). In addition, an interdental brush, dipped in an NaF-gel, results in high approximal fluoride concentrations (Särner et al, 2008).

Large variations have previously been found in toothbrushing behaviour, including brushing technique, frequency of brushing and brushing time (Bradnock et al, 2001; Christensen et al, 2003). It is estimated that around 80% to 90% of the population in the industrialised countries brush their teeth once or twice a day (Saxer and Yankell, 1997) and an increase in daily brushing frequency over a 30-year period has been found (Hugoson et al, 2005). Fewer data are available with regard to the use of interproximal cleaning aids. Toothpicks are used by 28% of an adult Danish population (Christensen et al, 2003) and by less than 15% of a Swedish population aged 20 to 40 years (Hugoson et al, 2005); the latter figure has, however, decreased compared with earlier years. Little is still known about the factors that influence the choice of products or how frequently they are used. The aim of the present investigation was therefore to evaluate the recommendations relating to approximal cleaning aids given by dental hygienists and dentists, the self-care practices in a Swedish population and to clinically evaluate the ability to remove approximal dental plaque when using toothpicks, dental floss and an interdental brush.

**MATERIALS AND METHODS**

A cross-sectional study design focusing on approximal oral hygiene was used in the present study and consists of three series: (I) a self-administered anonymous questionnaire sent to dental hygienists and dentists, (II) a self-administered anonymous questionnaire sent to patients of different age groups and (III) a clinical examination evaluating the ability to remove approximal dental plaque.

**Series I. Questionnaire to dental hygienists and dentists**

Potential subjects for this section comprised 500 dental hygienists and 500 dentists (Table 1). The dental hygienists were randomly selected from a register belonging to the Swedish Dental Hygienist Society, whereas the dentists were randomly selected from a register belonging to the Swedish Association of Public Dental Officers and the Swedish Association of Private Dental Practitioners.

The data were collected using a self-administered anonymous questionnaire, mailed to the subjects, together with a coded envelope to be used to return the document. If no answer was received within 2 weeks after the first questionnaire was distributed, a reminder was sent. The structured questionnaire consisted of 23 semi-closed questions. Of these, 14 questions focused on recommendations relating to approximal cleaning aids and the criteria for recommendations with respect to different age groups. The dental personnel were asked to use a 10-cm line (VAS scale) to mark the effect from ‘no effect’ to ‘large effect’, of dental floss and toothpicks to prevent dental caries and gingivitis/periodontitis. The following five sociodemographic variables, sex, age, years in practice, location of employment and number of staff at the clinic, were also included in the questionnaire. The questionnaire was in a pilot study tested against respective dental profession groups.

**Series II. Questionnaire to patients**

A total of 1000 subjects were included in this section (Table 1). They were divided into four age groups with 250 subjects in each group: 15 to 20 years, 21 to 40 years, 41 to 60 years and > 60 years. They were randomly selected from a population register belonging to the local area of Västra Götaland in the southwest of Sweden. The subjects were selected according to the following criteria: age and sex (50% men and 50% women).

A self-administered anonymous questionnaire, comprising a total of 21 semi-closed questions, was mailed to the subjects in accordance with the method described for Series I. Of these 21 questions, 16 focused on the recommendations related to general oral health care and approximal oral hygiene habits and the recommendations related to oral hygiene received. The following five sociodemographic variables sex, age, geographical location and information about visits to dentist and dental hygienist were also included. The questionnaire was in a pilot study tested on individuals in respective age groups.

**Series III. Clinical evaluation of approximal oral hygiene**

A total of 60 individuals divided into three groups participated in this clinical section: 20 users of
dental floss, 20 users of toothpicks and 20 users of interdental brushes. They were randomly selected from among patients who visited the public dental clinic in Mölnlycke and the adult clinic at the Dental School, Gothenburg, Sweden during a 2-month period. The inclusion criteria were as follows: (1) within the last 5 years, the subjects should have received information and instructions pertaining to the use of individual approximal cleaning aids and (2) they should be regular users of the individual products. They were asked to refrain from approximal cleaning for 24 h before their visit to the clinic. Prior to the study, they received both verbal and written information about the study and informed consent was obtained from the subjects.

The visible plaque index was registered for all approximal surfaces in the maxilla and mandible (teeth 17 to 27 and 47 to 37). The plaque index was assessed according to a dichotomous system with plaque/no plaque after staining the plaque with Diaplack® (Wallco AB, Kista, Sweden). Assessments were carried out before and after using the individual approximal cleaning aid, after which the mean plaque reduction for each individual was calculated (%). The patients were observed by one of the investigators (BS) and their skills were assessed using the following three variables: (1) motor function, (2) technique and (3) overall capability. The skill for each variable was graded in one of the following five categories: (1) ‘very good’, (2) ‘good’, (3) ‘acceptable’, (4) ‘poor’ and (5) ‘very poor’. After the clinical evaluation, the subjects were asked to complete a self-administered questionnaire with 11 closed questions related to their use of the individual approximal cleaning aids.

**Ethical considerations**

The study protocol was approved by the Ethics Committee at the University of Gothenburg (Dnr. 482-06). Separate code lists were prepared...
for the questionnaires that were sent to the dental hygienists, dentists and patients. The code was marked only on the envelope and was used to identify those subjects who had not returned the first questionnaire. Therefore, this questionnaire was destroyed as soon as this part of the study was completed. Consequently, no name of any individual appeared at any time in the subsequent processing of the data, and the confidentiality of the study population was respected throughout the study. A letter explaining the purpose of the present study was sent to all subjects, together with both the first and second documents.

**Statistical analyses**

Statistical analyses of the collected data were performed using SPSS version 14.0 (Statistical Package of Social Sciences). Both a descriptive and an analytical approach were used for data analysis. Bivariate analyses were performed using the chi-square test for statistical evaluation of proportions. A value of \( P < 0.05 \) was considered statistically significant. The correlation of toothbrushing and the use of approximal cleaning aids was analysed using Pearson’s coefficient.

There were a few questions to which more than one answer could be given. For some of the questions, the subjects could also add alternatives other than the ones given in the questionnaire. Thus, prior to statistical analyses, new categories were formed for some of the questions. The internal dropout rate varied for the different questions and was therefore marked in the different tables. Statistical comparisons for each question were made for the actual number of respondents.

**RESULTS**

**Subject response and sociodemographic variables (Series I, II and III)**

In Series I, a total of 412 and 398 questionnaires were returned from the dental hygienists and dentists, respectively (Table 1). Of these, seven questionnaires had to be excluded from the two professional groups as they were blank (n = 2), the persons were not working any longer (n = 4) or the questionnaire contained too many incorrect answers (n = 1). This resulted in a final response rate of 82% for the dental hygienists and 79% for the dentists. The mean age was 43 (range 22 to 65 years) for the dental hygienists and 48 years (range 24 to 70 years) for the dentists, respectively. The majority of the dental hygienists (61%) worked at the public dental health clinic, whereas the percentage of dentists was the same for the two working environments (49%), that is, working at the public and private dental health clinics. The majority of dental hygienists had ≤ 20 years in practice (64%), whereas the majority of dentists had > 20 years in practice (61%).

In Series II, the total number of returned questionnaires varied between 150 and 182. As a result, the total response rate for the whole group was 67%. Of these, seven questionnaires had to be excluded as they were blank (n = 3), the respondents wore full prostheses (n = 2), were mentally retarded (n = 1) or were suffering from dementia (n = 1). The mean age of the individuals in the three younger age groups was close to the theoretical median age of the respective group, and individuals in the entire age span were included in the individual groups. The mean age of the individuals in the oldest age group was 70 years (range 61 to 93 years). The percentage of women was higher in the three lowest age groups (55% to 59%), whereas men dominated in the oldest age group (55%). The majority of the individuals lived in the city and the fewest in rural areas—50/16, 62/13, 55/18 and 52/19 per cent (%), respectively (presented from the lowest to the highest age group).

The mean age of all of the subjects who participated in the clinical evaluation of approximal oral hygiene in Series III was 55 years (range 20 to 81) and the distribution according to sex was 50 women and 10 men.

**Questionnaire to dental hygienists and dentists (Series I)**

The specific information about the use of approximal cleaning aids which was given to the patients is presented in Table 2. For four of the six variables, dental hygienists more frequently gave specific recommendations about use when compared with dentists (\( P < 0.01 \) or \( P < 0.001 \)). The largest difference between the two professional groups was found for the length of time (min) the product should be used (35% versus 25%; \( P < 0.01 \)) and when, in relation to toothbrushing, approximal cleaning should be performed (75% versus 62%). For dental hygienists, a numerical increase in the number of recommendations was found in conjunction with an increase in the number of years in practice; a correlation was
only found for the length of time a product should be used \((r = 0.15; P < 0.01)\). No correlation was found with respect to the type of clinic or age.

Recommendations that were given with respect to the type of approximal cleaning aid varied extensively among the five age groups (Table 3). The most common recommendation for the youngest age group (0 to 6 and 7 to 19 years) was the use of dental floss, whereas a combination of two or more products was most frequently recommended for all other age groups. Dental floss dominated up to 19 years, whereas an interdental brush was most commonly recommended to the elderly. For the age group 0 to 6 years, the most common other recommendation was the regular use of a toothbrush of smaller size. Only minor numerical differences were observed when comparing the recommendations given by dental hygienists with those given by dentists. No correlation was found with respect to the type of clinic or years in practice.

The main reason for recommending interproximal cleaning aids was protection from dental caries in the case of preschool children and children/adolescents, whereas for the three oldest age groups, recommendations generally related to the prevention of gingivitis and periodontitis (Table 4). For the elderly (> 65 years), recommendations relating to periodontal health (gingivitis, deep periodontal pockets and periodontitis) were given by 60% of the dental hygienists and 51% of the dentists. Recommendations relating to other oral conditions were given by between 0.4% and 18% of the individuals, mostly

### Table 2 Distribution (%) of the different aspects mentioned by dental hygienists and dentists when recommending approximal cleaning aids

<table>
<thead>
<tr>
<th>Recommendation regarding</th>
<th>Dental hygienists</th>
<th>Dentists</th>
<th>(P) value*&lt;sup&gt;2&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
<td>NA&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Choice of product (toothpick, dental floss and interdental brush)</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Time point during the day to be used</td>
<td>75.7</td>
<td>24.0</td>
<td>0.5</td>
</tr>
<tr>
<td>How to be used</td>
<td>99.8</td>
<td>0.2</td>
<td>0</td>
</tr>
<tr>
<td>How often to be used</td>
<td>100</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>How long to be used (min)</td>
<td>34.8</td>
<td>64.2</td>
<td>1.0</td>
</tr>
<tr>
<td>When, in relation to toothbrushing, approximal cleaning should be performed</td>
<td>74.8</td>
<td>23.8</td>
<td>1.5</td>
</tr>
</tbody>
</table>

<sup>1</sup>NA = No answer.  
<sup>2</sup>Bivariate analyses (chi-square test).  
ns = not significant.

### Table 3 Type of approximal cleaning aid recommended for the different age groups by dental hygienists (DH) and dentists (D) (%)

<table>
<thead>
<tr>
<th>Cleaning aid</th>
<th>Preschool children (0–6 years)</th>
<th>Children/adolescents (7–19 years)</th>
<th>Adults (20–40 years)</th>
<th>Adults (41–65 years)</th>
<th>Elderly (&gt; 65 years)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DH</td>
<td>D</td>
<td>DH</td>
<td>D</td>
<td>DH</td>
</tr>
<tr>
<td>Toothpick</td>
<td>0.2</td>
<td>0.8</td>
<td>0.2</td>
<td>0.5</td>
<td>1.0</td>
</tr>
<tr>
<td>Dental floss</td>
<td>17.9</td>
<td>14.5</td>
<td>46.6</td>
<td>52.5</td>
<td>0</td>
</tr>
<tr>
<td>Interdental brush</td>
<td>0</td>
<td>0.5</td>
<td>0</td>
<td>0</td>
<td>0.2</td>
</tr>
<tr>
<td>Single-tufted toothbrush</td>
<td>14.5</td>
<td>10.4</td>
<td>1.2</td>
<td>1.8</td>
<td>0</td>
</tr>
<tr>
<td>Other product</td>
<td>6.4</td>
<td>6.6</td>
<td>0.5</td>
<td>0.8</td>
<td>0</td>
</tr>
<tr>
<td>Combination (&gt; 1 product)</td>
<td>4.9</td>
<td>3.0</td>
<td>45.1</td>
<td>30.4</td>
<td>92.6</td>
</tr>
<tr>
<td>No recommendation</td>
<td>16.4</td>
<td>17.8</td>
<td>3.7</td>
<td>4.1</td>
<td>0</td>
</tr>
<tr>
<td>No answer</td>
<td>39.5</td>
<td>46.4</td>
<td>2.9</td>
<td>9.9</td>
<td>0.5</td>
</tr>
</tbody>
</table>
against bad breath. No major differences were found when comparing the data for the dental hygienists with those given by dentists.

General oral hygiene and approximal oral hygiene are discussed by 94% and 84%, respectively, of all dental hygienists and by 77% and 52%, respectively, of all dentists ($P < 0.05\%$). Approximal oral hygiene is discussed more frequently by dental hygienists working in private clinics compared with those working in the public dental health service ($P < 0.01$). The majority of the dental hygienists recommend that approximal cleaning aids be used before toothbrushing (53%).

The effect of dental floss, when evaluated on a VAS scale, was considered to be superior in preventing caries among both dental hygienists (6.9 ± 2.3, mean ± SD) and dentists (5.9 ± 2.5) when compared with toothpicks (5.1 ± 2.5 and 4.4 ± 2.4, respectively) ($P < 0.05$). No statistically significant differences with regard to the two vehicles were observed in relation to gingivitis/periodontitis for the two dental profession group.

**Questionnaire to patients (Series II)**

The majority of patients in all of the age groups reported that they cleaned their teeth twice a day or more; the highest percentage was reported for the 15- to 20-year age group (92%), whereas the lowest percentage was reported for individuals aged > 60 years (82%, $P < 0.05$) (Table 5). Between 1% and 3% of the subjects in each group answered that they only brushed ‘once or a few times a week’. The majority of individuals in each group used a combination of toothbrush and any of the approximal cleaning aids once a day or more often: 57%, 76%, 76% and 81% for the 15- to 20-year, 21- to 40-year, 41- to 60-year and > 60-year age groups, respectively. With regard to the type of toothbrush used among the four age groups, the manual toothbrush (63% to 86%) dominated the use of electric toothbrush (4% to 18%) or a combination of the two (10% to 22%).

The frequency of the use of the three interproximal cleaning aids is shown in Table 5. Some individuals used more than one product. The toothpick was most commonly used by individuals aged > 41 years ($P < 0.001$), dental floss by subjects aged 41 years ($P < 0.01$) and the interdental brush by individuals aged > 60 years ($P < 0.01$). Approximal cleaning was more frequently performed by those individuals who brushed their teeth twice a day or more frequently. These three approximal cleaning aids were mostly used in the evening (44% to 63%), but their
use both in the morning and during the daytime increased gradually with increasing age. Taking all four age groups together (n = 500), approximal cleaning aids were used more often after brushing (45%), compared with before brushing (30%) or not in relation with brushing (25%). The most common place for cleaning the teeth was the bathroom (48% to 69%).

Recommendations relating to use had been given to 69% to 81% of the subjects and the individuals had received information about products for approximal cleaning from both dental hygienists and dentists. Instructions on a model or in the mouth of the patient had been received by 53% to 70% of the individuals in the four age groups; the two younger groups had mainly been given this information by dentists and the two older groups by dental hygienists.

**Clinical evaluation of approximal oral hygiene (Series III)**

The plaque-reducing capacity (%) of the approximal surfaces was significantly higher for interdental brushes (83 ± 8) compared with toothpicks (74 ± 12) and dental floss (73 ± 10) (P < 0.05). All 60 subjects showed ‘very good’ or ‘good’ skills in handling all three interproximal cleaning aids (Fig 1). For motor function, ‘very good’ applied to 70-90% of the

| Table 5 Distribution (%) of oral hygiene performance and use of approximal cleaning aids (toothpick, dental floss and interdental brush) for the different age groups |
|-------------------------------------------------|-----------------|-----------------|-----------------|-----------------|
| Cleaning aid/frequency (%)                      | 15–20 years     | 21–40 years     | 41–60 years     | > 60 years      |
| Oral hygiene performance                        | (n = 154)       | (n = 149)       | (n = 179)       | (n = 177)       |
| Less than once a day                            | 3.2             | 0.7             | 0.6             | 2.2             |
| Once a day                                      | 3.9             | 13.3            | 6.7             | 15.8            |
| Twice a day                                     | 86.4            | 77.3            | 82.1            | 62.7            |
| More often than twice a day                     | 5.8             | 8.0             | 10.6            | 19.2            |
| **Use of toothpick**                            | (n = 155)       | (n = 148)       | (n = 179)       | (n = 175)       |
| Seldom/never                                    | 74.2            | 61.3            | 39.1            | 30.5            |
| Once a week                                     | 22.6            | 26.7            | 32.9            | 26.0            |
| Once a day                                      | 2.6             | 7.3             | 16.2            | 21.5            |
| Twice a day or more                             | 0.6             | 3.3             | 11.1            | 20.9            |
| **Use of dental floss**                         | (n = 155)       | (n = 149)       | (n = 179)       | (n = 171)       |
| Seldom/never                                    | 62.6            | 42.7            | 50.8            | 62.1            |
| Once a week                                     | 29.7            | 42.7            | 31.8            | 19.8            |
| Once a day                                      | 6.4             | 9.3             | 13.4            | 8.5             |
| Twice a day or more                             | 1.3             | 4.7             | 3.9             | 6.2             |
| **Use of interdental brush**                    | (n = 153)       | (n = 148)       | (n = 177)       | (n = 166)       |
| Seldom/never                                    | 92.2            | 92.0            | 82.7            | 58.2            |
| Once a week                                     | 3.2             | 4.0             | 6.1             | 14.1            |
| Once a day                                      | 1.3             | 0.7             | 7.3             | 15.2            |
| Twice a day or more                             | 1.9             | 1.3             | 1.1             | 6.2             |

**Fig 1** Distribution of the 60 individuals (20 per group) according to the individual plaque reduction (%) after using toothpicks, dental floss or an interdental brush. The mean value for each group is also shown.
individuals in the three groups, whereas the cor-
responding figures for ‘very good’ for technique and
overall capability were 50% to 70% and 75% to 80%,
respectively. The majority of the individuals reported
that they had been instructed by a dental hygienist
on how to use the product (60% to 75%). For all three
products, the majority (90%) of the individuals used
the product in the evening. The treatment was largely
carried out in the bathroom (70% to 85%), with the low-
est figure reported for toothpicks. In comparison with
the other two groups, the users of toothpicks reported
that they more frequently changed the place of clean-
ing their teeth. The majority of the individuals most fre-
cently purchased products at a pharmacy (55% to
75%).

DISCUSSION

This cross-sectional study focuses on oral hygiene
with specific reference to the approximal area from
the perspective of both the dental profession groups
and the patient. The results are based on answers
drawn from a structured questionnaire that was sent
to both study groups. Despite the overall high
response rate for both categories, a fairly large vari-
ation in response to the individual questions was
observed, with a particularly large number of non-
responders in the oldest age group (> 61 years).
This may, at least in part, have influenced the results
and interpretation of the data. The percentage of
non-responders was equal among men and women.
In the case of the patient group, more subjects who
are concerned about their oral health may have vol-
unteered. It is not known whether all of the question-
naires were completed by the subject to whom they
were addressed or if any close relative assisted in
answering the questions. This may be particularly
valid for the youngest and oldest participants. It
may also be difficult for some individuals to remem-
ber by which dental profession group oral hygiene
information and instruction have been given. Further-
more, regular oral hygiene is a well-established
social behaviour and some over-reporting of oral
hygiene practices among the individuals in the four
age groups may have taken place.

One interesting result was the finding that recom-
mendations relating to interproximal cleaning were
primarily given to prevent dental caries in the two
youngest age groups, whereas dental caries is not
in focus for the oldest age groups. Recommend-
tions against gingivitis, deep periodontal pockets
and periodontitis dominated particularly in the oldest
age group. However, the recommendation to reduce
the level of plaque by dental hygienists and dentists,
which varied between 9% and 19% for the different
age groups, is considered to be important for both
diseases.

It is only in fairly recent times that there has been
an increase in the interest focused on the behaviour
associated with oral hygiene. Dental hygienists were
found to give more specific recommendations per-
taining to the use of approximal cleaning aids—not
only what to use but also how these products should
be used. These aspects may be more in focus in the
undergraduate studies of dental hygienists. Further-
more, the number of years in practice in the present
study was higher for dentists compared with dental
hygienists, which may also contribute to the differ-
ence found. No information is available about atten-
dance at continuing education courses for either of
the two professions.

Toothbrushing twice a day or more was reported
by between 81% (> 60 years) and 92% (15 to
20 years), which is about the same as that previously
reported by a Swedish adult population (Hugoson
et al, 2005). The finding that women brushed their
teeth more often than men within all of the age
groups is also in line with other Scandinavian studies
(Sakki et al, 1998; Christensen et al, 2003), as
is reduced regular brushing in older age groups
(Christensen et al, 2003; Hugoson et al, 2005).
The daily use of approximal cleaning aids varied
extensively among the four age groups. The mean
daily use of toothpicks for all individuals was 21%,
which is slightly lower than the figure that has
recently been self-reported (28%) by an adult Danish
population aged 16 to 65+ years (Christensen et al,
2003). However, the large variation with respect to
age that was found for this population corresponds
well with both the Danish (Christensen et al, 2003)
and Swedish (Hugoson et al, 2005) age cohort data.
The use of dental floss and interdental brushes in
the present study was lower compared with the fig-
ures reported for toothpicks. The figures relating to
dental floss also correspond well with those of
previous studies (Petersen and Nortov, 1994;
Christensen et al, 2003).

One interesting observation was the fairly similar
use reported for all three approximal cleaning aids
in the youngest age group. However, a poor corre-
lation was observed for dental floss and interdental
brushes when comparing the self-reported daily use
and the recommendations given by health profes-
sionals. The discrepancy in the figures shows that a
large number of factors may influence the final out-
come. Apart from anatomical variations, socioeco-

not for publication
Moreover, differences in preventive strategy and the service that is offered may influence the situation. It has previously been reported that self-care in health and disease is affected not only by living conditions but also by the structure and function of the oral health service system (Petersen, 1990).

A higher approximal plaque reduction was obtained by regular users of interdental brushes in comparison with the use of toothpicks and dental floss when comparing the pre- and post-plaque levels found in the present study. The plaque-removal efficacy of different types of dental floss has previously been evaluated (Terézhalmy et al, 2008), but no information could be found in the literature with regard to the relative cleaning capacity of these three different approximal cleaning aids. The data of the present study show that, for a regular user, it is easier to clean the approximal area with an interdental brush. Only three commonly used techniques for approximal cleaning—wooden toothpicks, dental floss and interproximal brushes—were evaluated clinically. However, interdental cleaning devices also include products such as plastic toothpicks and single-tufted brushes. It is important to remember that no one method for interdental cleaning suits all of the patients or all of the sites within one and the same subject. Furthermore, to date, little is known about the behavioural factors when giving advice on the use of tools for approximal cleaning and approximal fluoride administration. The selection and small number of subjects for this part of the present study (n = 60) may limit the generalisation of the present findings. To make a full evaluation of their comparative effectiveness, a large sample size, a variety of products and the cleaning when used in combination with a toothbrush should preferably be studied.

The daily oral hygiene practised at home is the most important factor in the prevention of dental caries and periodontitis. These data are primarily based on the information retrieved from a questionnaire. In future studies, it is important to evaluate the products in a realistic clinical situation. Previous studies have shown that patients are not always aware of their exact performance (Zeedyk et al, 2005). The time spent on brushing has been found to be a great deal shorter than that recommended or the time the individual him/herself thought. Furthermore, a large variation in cleaning in different parts of the mouth has been observed (Macgregor and Rugg-Gunn, 1979). In the long term, the optimisation of the use of interproximal cleaning aids for home care use, preferably fluoride-containing products, will hopefully reduce the prevalence of approximal dental caries.

A daily self-care routine practised at home is regarded as the most important part of oral health prevention. Acceptable maintenance and a satisfactory outcome require subjects to be aware of the risks that threaten their oral health and the measures for self-management (Widström, 2004). In the present study, recommendations for products that should be used for approximal cleaning were given to the majority of the participants (69% to 81%) and instructions for use to slightly fewer (53% to 70%). However, these figures are higher than those previously reported from the UK (Kelly et al, 2000) and Lithuania (Vysniauskaitė and Vehkalahti, 2007) with regard to imparting guidance on flossing. Both dentists and dental hygienists play an important role in the present work. The role of dental hygienists in the dental team and as health educators is becoming increasingly important, especially in the developed countries (Öhn, 2004). The majority of the present subjects regarded their oral health care providers, dentists to a slightly larger extent than dental hygienists, as their main source of information on products and techniques that should be used. When it came to product choice, both advertisements and ‘other’ were listed as sources of information. The possibility that different media, now and in the future, may play an important role in this respect cannot be excluded (Mårtensson et al, 2004).

Although toothbrushing is regarded as the most important oral hygiene measure, the regular use of approximal cleaning aids in combination with fluoride is important to make all tooth surfaces plaque free and administer fluoride to the area. The present study sheds some light on some of the factors influencing the recommendation and use of approximal oral hygiene products. It also indicates the importance of individual recommendations related to the use of approximal cleaning aids.

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