Retention: Type, duration and need for common guidelines. A survey of Norwegian orthodontists

Vaska Vandevska-Radunovic, DDS, MSc, PhD¹
Lisen Espeland, DDS, PhD²
Arild Stenvik, DDS, PhD³

Aims: To survey retention protocols and need for practical retention guidelines among orthodontists in Norway and to compare the results with similar studies in other countries. Methods: A questionnaire was mailed to all members of the Norwegian Association of Orthodontists. It included questions about their background and their current retention protocol, as well as their perceived need for common retention guidelines. Results: The response rate was 77.7% (69.3% males and 30.7% females). The most common maxillary retainer was a combination of a fixed and removable retainer, followed by a clear thermoplastic retainer. In the mandible, a fixed retainer bonded to all anterior teeth was most common (66.4%). Retention in the maxilla lasted 2 to 3 years (34.7%) or 3 to 5 years (23.8%). In the mandible, 41.5% of the orthodontists left the retainer in place for >5 years. When retention lasted more than 3 years, 70% of the orthodontists left the responsibility for retainer checkups to the patients or the general practitioners. The main reason for choosing a certain retention protocol was clinical experience (57.4%). Only 3.5% of the orthodontists based their protocols on information from the literature. Half of the orthodontists, significantly women, expressed a need for common retention guidelines. Conclusions: In Norway, bonded retainers alone were reported to be most commonly used in the mandible, while bonded retainers used in combination with a removable retainer appear to be the most commonly used appliances in the maxilla. This is similar to the most frequently used retainers in other countries, but there are disparities in duration and follow-up protocols. Most female orthodontists desire common retention guidelines. ORTHODONTICS (CHIC) 2013;14:e110–e117. doi: 10.11607/ortho.964

Key words: retention protocols, orthodontic retainers

Maintenance of the orthodontic treatment result and prevention of relapse require the use of some type of retention appliances.¹ ² More than 100 years ago, Norman Kingsley wrote that “the success of orthodontia as a science lies in retention devices.”³ Despite scientific and technological developments since that time, retention remains a source of controversy among professionals, and there is no agreement about the type, duration, or follow-up for a common retention protocol.⁴
A systematic review that evaluated the effectiveness of different retention strategies after orthodontic treatment revealed that there are no evidence-based guidelines as to the type of retainer or the duration of retention that could prevent relapse and maintain a long-term stable result.\(^5\) The authors stressed the need for high-quality research in this field. Several randomized controlled trials have been carried out, assessing the effect of different retention procedures. In the short term, no study could show any clinically significant differences in retention capacity between various retention methods.\(^6\)–\(^9\)

Research on the effectiveness of different retention methods requires knowledge about the most commonly used retention protocols. So far, there have been four survey-based studies on this topic, conducted in Australia/New Zealand,\(^10\) the Netherlands,\(^11\) the United Kingdom,\(^12\) and the United States.\(^13\) Results from these surveys show certain similarities between the countries when it comes to the type of maxillary and mandibular retention devices, but show disagreements when it comes to duration of retention, follow-up, and need for common guidelines.

The purpose of this study is to survey retention protocols among orthodontists in Norway and compare the results with similar studies in other countries. Furthermore, it was of interest to examine the perceived need for common guidelines related to retention type, duration, and follow-up.

**METHODS**

A postal questionnaire with an addressed, pre-stamped return envelope was sent to all orthodontists listed by the Norwegian Association of Orthodontists (NAO) in November 2009. No follow-up reminder was sent. Pilot testing of the survey questionnaire was performed on 10 experienced orthodontists, and their comments were incorporated in the final version of the survey. They were also members of the NAO, but were excluded from the test sample. The final version of the questionnaire consisted of 14 questions, 1 concerning the background of the participants (gender, years in practice as a specialist, number of days per week in practice, place where speciality was obtained) and 13 concerning the retention protocol used. The requested information about the retention procedures may be grouped as follows:

- The most commonly used type of retainers
- Duration of retention and scheduling of follow-up appointments
- Information provided to the patients
- Factors influencing the choice of and/or changes in retention protocols
- Manufacturing of orthodontic retention devices

At the end, the participants were asked if they felt there is a need for common guidelines regarding retention procedures. Space was also provided for additional comments if desired.

Percentages, frequencies, and chi-square tests were used to analyze the data. The statistical analyses were performed using the Statistical Package for Social Sciences (SPSS, IBM).

**RESULTS**

**Sample characteristics**

Of the 193 questionnaires that were mailed, 150 forms were completed and returned (77.7%). Forty-six (30.7%) of the respondents were women, and 104
(69.3%) were men. The majority obtained their speciality training in Norway (58.1% in Oslo and 33.1% in Bergen), while 8.8% were educated abroad (not specified). As for the number of years in orthodontic practice, 58.7% had worked >20 years, and 41.3% had worked <20 years. Most of the orthodontists worked 5 days per week (47.9%), 32.6% worked 4 days per week, while the remaining 19.5% worked 3 days or fewer per week.

Retention procedures
All orthodontists used some form of retention. The most commonly used retainer in the maxilla was a combination of a fixed and removable retainer, followed by a clear thermoplastic retainer only, and then a Hawley retainer (Fig 1a). In the mandible, a fixed retainer bonded to all anterior teeth was most common (Fig 1b). Maxillomandibular retention (e.g., activators or positioners) was used by less than 20% of the orthodontists.

Most orthodontists kept maxillary retainers for 2 to 5 years and mandibular retainers for more than 5 years (Table 1). Permanent retention was preferred more frequently in the mandible (18.4%) than in the maxilla (8.2%) (see Table 1). Patients that were given removable retainers had more follow-up appointments during the first year than patients with fixed retainers. Thereafter, the number of annual appointments was reduced, and most orthodontists recalled their patients once a year. In cases in which retention lasted longer than 3 years, 30% of the orthodontists recalled their patients themselves. However, in more than 40% of the cases, patients themselves were responsible for retention follow-up. The remaining 30% were left to the general dentists for monitoring.

### Table 1 Duration of retention in the maxilla and mandible

<table>
<thead>
<tr>
<th>Retention time</th>
<th>Orthodontists (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Maxilla</td>
</tr>
<tr>
<td>&lt; 2 years</td>
<td>15.0</td>
</tr>
<tr>
<td>2 to 3 years</td>
<td>34.7</td>
</tr>
<tr>
<td>3 to 5 years</td>
<td>23.7</td>
</tr>
<tr>
<td>&gt; 5 years</td>
<td>18.4</td>
</tr>
<tr>
<td>Permanent</td>
<td>8.2</td>
</tr>
</tbody>
</table>
All orthodontists informed their patients about retention, both before the start of orthodontic treatment and before retention. The information was oral (54%), oral and written (38%), and written only (8%). The patients were informed about the type and duration of retention as well as the use of the retention appliance and were given hygiene instructions. They were also given instructions about what to do in case of retainer breakage.

The original malocclusion was reported to be the most important factor influencing the choice of retainer type, followed by the end result, oral hygiene, and patient’s age (Table 2). The main reason for choosing their current retention protocol was based on clinical experience and specialty training (Table 3). Half of the orthodontists had not made any changes in retention procedures over the past 5 years. The changes that were made concerned either the type of retention appliance (19.1%), duration of retention (14.3%), or both (16.6%).

Removable appliances, eg, vacuum-pressed and Hawley retainers, were mainly made in the orthodontist’s office either by the orthodontist or by the assistants. The fixed retainers were mainly made and bonded by the orthodontist but sometimes were bonded by assistants.

Almost 50% of the surveyed orthodontists wanted common retention guidelines, while 18% did not. The remaining 32% were neutral. It appeared that opposition to common retention guidelines was due to the fear of litigation if these guidelines were not adhered to. Indeed, even those orthodontists who were positive to the implementation of guidelines did not want them to be too limiting.

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Factors influencing the choice of retainer type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factors</td>
<td>Orthodontists (%)</td>
</tr>
<tr>
<td>Original malocclusion</td>
<td>95.2</td>
</tr>
<tr>
<td>End result</td>
<td>54.4</td>
</tr>
<tr>
<td>Oral hygiene</td>
<td>49.7</td>
</tr>
<tr>
<td>Patient’s age</td>
<td>43.5</td>
</tr>
<tr>
<td>Periodontal health</td>
<td>34.0</td>
</tr>
<tr>
<td>Patient’s motivation</td>
<td>33.3</td>
</tr>
<tr>
<td>Oral habits</td>
<td>27.9</td>
</tr>
<tr>
<td>Wisdom teeth</td>
<td>23.1</td>
</tr>
<tr>
<td>Tooth morphology</td>
<td>8.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 3</th>
<th>Factors influencing the decision for the retention protocol in use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor</td>
<td>Orthodontists (%)</td>
</tr>
<tr>
<td>Clinical experience</td>
<td>57.4</td>
</tr>
<tr>
<td>Specialty training</td>
<td>27.7</td>
</tr>
<tr>
<td>Literature</td>
<td>3.5</td>
</tr>
<tr>
<td>Courses</td>
<td>5.0</td>
</tr>
<tr>
<td>Colleagues</td>
<td>6.4</td>
</tr>
</tbody>
</table>
Female orthodontists were significantly more in favor of having common guidelines than male orthodontists (Table 4). They also differed in their choice of retainer in the maxilla, using a combination of a fixed and a removable retainer significantly more often than their male colleagues ($P < .05$) (Table 5). The length of clinical experience had a significant effect on the choice of retention appliance in the mandible. Orthodontists working >20 years in practice more commonly used retainers bonded to canines only, while those working <20 years preferred retainers bonded to all anterior teeth (Table 6).

**DISCUSSION**

It has been shown that postal surveys yield a significantly higher response rate than web-based surveys.$^{14,15}$ Therefore, a postal version of the questionnaire was chosen and sent to all members of the NAO, without any reminders. The overall response rate was 77.7%, which is similar to or higher than that achieved in corresponding studies.$^{10,12,13}$ The percentage of male and female respondents is similar to the membership in the orthodontic society, thus, the response rate and sex distribution do not compromise the validity of the survey outcome.
A combination of a fixed retainer and a removable retainer was the most commonly used retention appliance in the maxilla, closely followed by a clear thermoplastic retainer alone. Only 18% of the orthodontists in Norway opted for a Hawley retainer. Fixed maxillary retainers were also most commonly used in the Netherlands, while surveys from Australia/New Zealand, United States, and United Kingdom report that the majority of the orthodontists used removable retainers. In most countries the preferred type of removable appliance seemed to be the clear thermoplastic/vacuum-formed retainer, except for in the United States, where Hawley retainers were used twice as often as the clear ones. Several investigations have compared the retention capacity of different removable appliances in the maxilla. The results show that at up to 1 year, relapse is unlikely to be affected by the choice of removable retainer, given that dental changes were clinically insignificant between the groups.6–8,16 Nevertheless, when it comes to patient preference and cost-effectiveness, it has been shown that clear retainers are superior to Hawley retainers.17,18 This may explain why most orthodontists prefer to use invisible rather than Hawley retainers.

Fixed retainers, bonded either to canines or to all anterior teeth, were the most common choice in the mandible and were used by more than 80% of the orthodontists. A similar percentage has been reported in the Netherlands. Although bonded lingual retainers were also the most popular retention choice in Australia/New Zealand, the United States, and the United Kingdom, fewer orthodontists in these countries used them, and they often used them in combination with a removable appliance. It has been shown that fixed retainers are as effective in preventing relapse as removable ones, and minor incisor irregularities might be expected even with a fixed retainer in place.19–21 In the long term, however, bonded retainers are shown to have a negative effect on periodontal health, promoting inflammation,22 plaque and calculus accumulation, and gingival recessions.23 Therefore, good esthetics and ease of use when there is poor patient compliance seem to be the advantages that can explain the popularity of fixed retainers.24,25

The results of the survey show that most orthodontists choose a regular retention period of 2 to 5 years in the maxilla and more than 5 years in the mandible. Permanent retention was preferred much more often in the mandible (18.4%) than in the maxilla (8.2%). Because no direct question concerning the type of retainer and length of retention was asked, it can only be speculated that fixed retainers were kept longer and, once in place, were more likely to stay permanently than the removable ones. The rationale for such a decision might be uncertainty regarding possible relapse and a desire for maintaining a good treatment result as long as possible. In the Netherlands11 and in the United Kingdom12 fixed retainers were kept permanently by 84% of the orthodontists and in the United States by 75.9%.13 Permanent retention with removable retainers was suggested by 84% of the American orthodontists.13 Australian and New Zealand orthodontists tended to use permanent retention in either a very low percentage or a very high percentage of the cases, indicating significant differences in their views.10

In cases in which retention lasted for more than 3 years, only 30% of the Norwegian orthodontists recalled their patients; the majority transferred the responsibility for retention checkups to the patients (40%) or to the general dentists (30%). Surveys from other countries do not report about routines for retainer checkups after the patients have been dismissed. Duration of the retention period tends to be permanent in almost all of the surveyed countries, and information about retention type and duration, as well as responsibility for retention follow-up, should be an integral part of the pretreatment plan.

Almost all orthodontists (95.2%) considered the original malocclusion to be the most important factor when selecting the type of retainer. Despite similar
reports from other surveys,\textsuperscript{10} research findings on the relationship between pretreatment malocclusion and posttreatment stability and relapse are contradictory. Some studies report more relapse in patients with severe malocclusion,\textsuperscript{26} while others fail to find any significant correlation between pretreatment factors and stability.\textsuperscript{27,28} This controversy, together with recent reports that show no significant differences between various types of retainers,\textsuperscript{6,7,20} suggest that relapse and stability after orthodontic treatment are not significantly associated with either the original malocclusion or the type of retainer used.

Renkema et al\textsuperscript{11} report that almost 90% of the surveyed orthodontists in the Netherlands consider that practice guidelines for retention procedures should be developed. In contrast, Norwegian orthodontists seem to be more reluctant, with fewer than 50% considering retention guidelines advantageous. Some regard guidelines as a useful common tool that will justify their retention choice. Others find common guidelines too rigid and limiting, given that all cases are different and thus require a different retention approach. None of the other surveys evaluated the possibility of developing common retention guidelines.

Significantly more female than male orthodontists preferred having retention guidelines and used a combination of maxillary fixed and removable retainers. This is in contrast to other reports that find more men than women using fixed retainers\textsuperscript{13} or find no sex differences.\textsuperscript{12} As no other variables were sex dependent, it is difficult to explain why more women use this retention protocol, let alone define a trend that could be explained by sex.

This survey is one of the five surveys conducted worldwide on this topic. The results provide experience-based information about the most commonly used orthodontic retention protocols in Norway and provide the ability to compare these protocols with those used in other countries. More importantly, such surveys provide data for randomized controlled trials that can test the validity of the current retention protocols and give evidence-based information about retention guidelines.

CONCLUSIONS

The most commonly used retention appliances in Norway are fixed retainers in the mandible and a combination of a fixed and a removable retainer in the maxilla. Retainers in the mandible are kept much longer than in the maxilla, most often more than 5 years. Half of the orthodontists, predominantly women, desire common retention guidelines. The choice of retention devices is similar to those reported in the other surveys. There are, however, disparities related to duration of retention, follow-up regimens, and the perceived need for common retention guidelines.
REFERENCES