The Orthodontic Plaque Index: An oral hygiene index for patients with multibracket appliances

Katrin Beberhold, DA\(^1\)
Anika Sachse-Kulp, DDS\(^{1,2}\)
Rainer Schwestka-Polly, DDS\(^1\)
Else Hornecker, DDS\(^3\)
Dirk Ziebolz, DDS\(^3\)

Adhesively bonded, fixed orthodontic appliances—so-called multibracket appliances—on buccal or lingual tooth surfaces can make oral hygiene difficult. This increases the risk of caries and gingivitis, and patients require closely monitored prophylactic care. Oral hygiene indices serve to assess the oral hygiene situation and evaluate oral health status. The currently available indices do not adequately meet the special requirements of patients with multibracket appliances, since they evaluate only the smooth surfaces and/or approximal spaces of the teeth in terms of plaque accumulation and signs of inflammation of the marginal gingiva. The Orthodontic Plaque Index (OPI) is a special index for patients with fixed orthodontic appliances. The OPI focuses on the tooth area in the immediate vicinity of the bracket, since additional and relatively inaccessible plaque niches arise at these sites. To record the OPI, the dentition is divided into sextants. Plaque scores (0 to 4) are assigned. The plaque accumulation on each tooth surface adjacent to the bracket base is evaluated (mesial, distal, occlusal/incisal, and cervical). In addition, signs of gingival inflammation are recorded. The highest score per sextant is entered into a sextant table. Increased risk of caries and gingivitis is assumed as of score 3. The OPI can be used for both buccal and lingual multibracket appliances. In patients with fixed orthodontic appliances, the OPI assesses oral hygiene in the bracket vicinity and thus provides differential findings. As a result, the OPI is recommended for clinical use. ORTHODONTICS (CHIC) 2012;13:94–99.

Key words: brackets, oral hygiene control, oral hygiene index, oral hygiene instruction, Orthodontic Plaque Index, orthodontics, prevention

Malocclusion is corrected over long periods of time using adhesively bonded, fixed orthodontic appliances on buccal or lingual tooth surfaces.\(^1\) During treatment with multiband-bracket appliances, the oral bacterial flora changes, which shifts the microbial balance.\(^2-4\) Compared with
patients who do not have multibracket appliances, increased plaque accumulation due to a greater number of plaque retention sites and debris niches is observed.\textsuperscript{5,6} Moreover, home oral hygiene with conventional and/or special oral hygiene aids is made more difficult or is possible only to a limited extent.\textsuperscript{7} Plaque accumulation around brackets and between brackets and gingiva is often accompanied by an increase in particularly cariogenic plaque flora. In turn, this is the chief cause of demineralization. Patients with fixed multibracket appliances have an increased risk of caries and gingivitis.\textsuperscript{2,8–12}

For patients undergoing such orthodontic treatment, daily oral hygiene presents a particular challenge. To minimize the increased risk of caries and gingivitis, patients should receive intensified individual prophylaxis during the entire course of orthodontic treatment. This entails regular oral hygiene check-ups with oral hygiene motivation and instruction. During the checkups, recording Plaque Indices (PIs) and inflammation indices serves to monitor home oral hygiene. To this end, a number of PIs have been described and are used in practice.\textsuperscript{13–15} The assessment of plaque accumulation is usually based on smooth surfaces or approximal spaces.\textsuperscript{15} In addition, inflammation indices to evaluate approximal/interpapillary inflammation of the marginal gingiva are also available.\textsuperscript{16–18}

However, these indices do not meet the demands of orthodontics. In patients with fixed orthodontic appliances, predilection sites for plaque accumulation are found surrounding the bracket. The assessment of oral hygiene in these cases is frequently performed with modifications of the indices mentioned above.\textsuperscript{7,19,20} It has become apparent, however, that for teeth bearing fixed orthodontic appliances, a different or expanded evaluation of plaque incidence and gingival status would be useful. The focus should be on the tooth surfaces adjacent to the bracket base as well as the approximal surfaces. Accordingly, a special hygiene index is required for daily use in orthodontic practices that can document changes in oral hygiene. To date, there are only a few PIs developed especially for patients with fixed orthodontic appliances—for instance, the Attin PI.\textsuperscript{21} This does not, however, evaluate the gingival situation.

To evaluate both plaque colonization of tooth surfaces bearing multibracket appliances and signs of inflammation of the neighboring marginal gingiva, as well as to evaluate oral hygiene and derive the treatment need, a new hygiene index was developed for these patients.
The Orthodontic Plaque Index (OPI) was developed to accommodate the special circumstances in the evaluation of oral hygiene during orthodontic treatment. With this index, the oral hygiene in addition to the caries and gingivitis risk of patients with fixed orthodontic appliances can be assessed. Not only is plaque accumulation recorded, but the adjacent marginal gingivae are also evaluated. Furthermore, the OPI enables an estimation of the patient's need for prophylaxis, so that the appropriate preventive measures can be taken. Problematic oral hygiene sites can be pinpointed, and the patient's motivation to perform regular oral hygiene can be increased. We see this as an opportunity to minimize the risk of demineralization and gingivitis.

The OPI visually documents the presence of plaque around the multibracket appliance by staining the teeth or surfaces with a plaque-disclosing solution (for instance, erythrosine). The evaluation includes only teeth or surfaces that bear an adhesively bonded bracket on the vestibular or oral (lingual/palatal) aspect. Teeth bearing orthodontic bands are not included. The evaluation of the adjacent marginal gingivae for inflammation is a crucial component of the OPI and helps determine further prophylaxis need.

In the clinical application of the OPI, the dentition is divided into sextants (Table 1, Fig 1) as it is for the Periodontal Screening Index (PSI), the successor of the Community Periodontal Index of Treatment Needs (CPITN). The status is indicated as a score from 0 to 4. The degree of plaque accumulation on each aspect of the bracket base (mesial, distal, occlusal/incisal, and cervical) and the condition of the adjacent marginal gingivae are assessed. Score 0 indicates an absence of plaque and inflammation. Scores 1 to 3 refer to the severity of plaque deposits in the bracket vicinity, and score 4 includes the inflammation status of the gingiva:

- 0: No plaque deposits on the tooth surfaces surrounding the bracket base
- 1: Plaque deposits on one tooth surface at the bracket base
- 2: Plaque deposits on two tooth surfaces at the bracket base
- 3: Plaque deposits on three tooth surfaces at the bracket base
- 4: Plaque deposits on four tooth surfaces at the bracket base and/or gingival inflammation indicators (plaque deposits near the gingiva do not necessarily have to be present)

Table 2 illustrates the scores with examples according to the criteria described.

### Table 1 Division of the dentition into sextants

<table>
<thead>
<tr>
<th>Sextant</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>First/S1</td>
<td>Maxillary molar and premolar area; first quadrant (17–14)*</td>
</tr>
<tr>
<td>Second/S2</td>
<td>Maxillary canine and incisor area; first/second quadrant (13–23)*</td>
</tr>
<tr>
<td>Third/S3</td>
<td>Maxillary premolar and molar area; second quadrant (24–27)*</td>
</tr>
<tr>
<td>Fourth/S4</td>
<td>Mandibular molar and premolar area; third quadrant (37–34)*</td>
</tr>
<tr>
<td>Fifth/S5</td>
<td>Mandibular canine and incisor area; third/fourth quadrant (33–43)*</td>
</tr>
<tr>
<td>Sixth/S6</td>
<td>Mandibular premolar and molar area; fourth quadrant (44–47)*</td>
</tr>
</tbody>
</table>

*FDI tooth-numbering system.
Fig 1  Division of the maxillary and mandibular dentition into sextants.

Table 2  OPI scores 0 to 4 with examples for evaluation

<table>
<thead>
<tr>
<th>OPI score</th>
<th>Example</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td><img src="image1.png" alt="Example Image" /></td>
<td>Brackets are plaque-free</td>
</tr>
<tr>
<td>1</td>
<td><img src="image2.png" alt="Example Image" /></td>
<td>Isolated plaque islands on one tooth surface at the bracket base</td>
</tr>
<tr>
<td>2</td>
<td><img src="image3.png" alt="Example Image" /></td>
<td>Plaque on two tooth surfaces at the bracket base</td>
</tr>
<tr>
<td>3</td>
<td><img src="image4.png" alt="Example Image" /></td>
<td>Plaque on three tooth surfaces at the bracket base</td>
</tr>
<tr>
<td>4</td>
<td><img src="image5.png" alt="Example Image" /></td>
<td>Plaque on all tooth surfaces at the bracket base</td>
</tr>
<tr>
<td></td>
<td></td>
<td>and/or gingival inflammation</td>
</tr>
</tbody>
</table>
The highest score found per sextant is entered into the sextant table. In addition, the highest score per sextant represents the score for the dentition. The highest score of all sextants determines the current oral hygiene situation and identifies the patient’s need for prophylactic treatment (Table 3). An increased risk of caries and gingivitis is assumed as of score 3.

The OPI can be used for both vestibular and lingual multibracket applications. Depending on bracket placement, the index takes into consideration only the vestibular or lingual/palatinal tooth surfaces. For this reason, the OPI is ideal for diagnostic application during the fixed treatment phase. Thanks to its practicality and ease of use, the OPI is a suitable aid for the evaluation of oral hygiene. With it, oral hygiene can be assessed and the prophylaxis need determined and handled accordingly.

**CONCLUSION**

The OPI makes it possible to record the current oral hygiene of patients during orthodontic treatment with multibracket appliances and serves to assess the risk of caries and gingivitis.

This index is easily applied in daily practice: scores 0 to 4 can be quickly determined, the documentation is concise, and the individual prophylaxis need is made apparent.

**ACKNOWLEDGMENT**

The authors are grateful to Mrs S. Robra for preparing the figures.

---

**Table 3  Graded assessment of oral hygiene and prophylaxis need**

<table>
<thead>
<tr>
<th>Score</th>
<th>Oral hygiene</th>
<th>Prophylaxis need</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Very good to good</td>
<td>• Remotivation</td>
</tr>
<tr>
<td>0 and 1</td>
<td>Mediocre</td>
<td>• Remotivation and oral hygiene instruction</td>
</tr>
<tr>
<td>2</td>
<td>Inadequate</td>
<td>• Remotivation and oral hygiene instruction</td>
</tr>
<tr>
<td>3 and 4</td>
<td></td>
<td>• Professional tooth cleaning</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Maintain recall interval</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Local fluoridation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• If necessary, in-office or home chlorhexidine treatment</td>
</tr>
</tbody>
</table>

... the OPI is ideal for diagnostic application during the fixed treatment phase.
REFERENCES