Missing Teeth and Prosthodontic Replacement in an Institutionalized Dentate Population of 60 Years and Older in Qingdao, China

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Purpose: The aim of this study was to investigate missing teeth and prosthodontic replacements in an institutionalized elderly population in China, and to assess dental functionality before and after the prosthodontic replacements based on a hierarchical dental functional classification (HDFC) system. Materials and Methods: A sample of 512 participants (9% aged 60–69 years; 29% aged 70–79 years; 62% aged ≥ 80 years) living in eight nursing homes in Qingdao were categorized by the HDFC with and without tooth replacements. A functional dentition in the HDFC meets all the following criteria: ≥ 10 natural teeth in each jaw; a complete anterior region; 3 or 4 posterior occluding pairs (POPs) in the premolar regions; and ≥ 1 POP bilaterally in the molar region. Participants with tooth replacements were reclassified. The score for effectiveness of replacements were as follows: 4 for ≥ 10 teeth in each jaw; 3 for a complete anterior region; 2 for 3 or 4 POPs in premolar regions; and 1 for ≥ 1 molar POP bilaterally. Results: Twenty percent of the participants had functional dentitions, but 42% met none of the functional criteria. In the branch ‘< 10 teeth in each jaw’ the mean number of teeth present was 26.3 ± 2.9, and the mean number of POPs was 6.2 ± 2.0. In the branch ‘< 10 teeth in each jaw,’ there were 13.4 ± 5.5 teeth and 11.1 ± 1.5 POPs. Of the 384 participants with natural teeth in each jaw, 44% had no replacements and 56% had fixed dental prostheses (FDPs), partial removable dental prostheses (PRDPs), or both. FDPs usually replaced 1 or 2 teeth, and PRDPs 3 or more teeth. On the basis of natural teeth plus artificial teeth (214 participants with replacements), 46% had functional dentitions while 18% met none of the functional criteria. In the promoted participants, the mean number of teeth added by FDPs was 3.6 ± 2.5, and for PRDPs it was 11.9 ± 6.5. FDPs had a significantly higher mean promotion value per tooth added than PRDPs. Conclusion: Approximately half the tooth replacements effectively met all criteria for a functional dentition. Int J Prosthodont 2016;29:389–398. doi: 10.11607/ijp.4822

With approximately 165 million people aged 60 years and older, China has the largest population in the world of people in this age group. It is estimated that this population will increase to 400 million people by 2050.1 The increasing number of older people poses tremendous societal challenges with respect to health care needs and utilization. Although the majority of these individuals are still embedded in the traditional Chinese culture and receive care from family members, a nationwide shift can be observed from traditional care to institutionalized care.2 Currently, approximately 1.5% of older people in China live in care homes and apartments for older people, but this percentage is expected to increase in the coming years.3

In a previous article, the present authors reported on the dental status of a population of older people living in care homes. It was found that the vast majority of dentate people had caries (up to 90% for those aged 80 years and older) and one or more missing teeth (up to 98% for people aged 70 years and older).4 The mean number of teeth present resulted in high percentages of dentitions comprising fewer than 20 teeth: 28 at 60 years to 88 at 90 years of age. However, a large number of people had tooth replacements. When both natural and artificial teeth are counted in this population, the percentages of people with fewer

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Table 1  Levels and Criteria for Dichotomization in the Step-by-Step Branching Hierarchy Used in the Hierarchical Dental Functional Classification System (HDFC)

<table>
<thead>
<tr>
<th>Level</th>
<th>Meeting criterion</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Dentition level</td>
<td>≥ 1 tooth present in each jaw</td>
</tr>
<tr>
<td>II Jaw level</td>
<td>≥ 10 teeth in both maxilla and mandible</td>
</tr>
<tr>
<td>III Anterior level</td>
<td>All 12 anterior teeth present</td>
</tr>
<tr>
<td>IV Premolar level</td>
<td>3 or 4 occluding pairs of premolars</td>
</tr>
<tr>
<td>V Molar level</td>
<td>≥ 1 occluding pairs of molars at both left and right sides of the dentition</td>
</tr>
<tr>
<td></td>
<td>Edentulous jaw(s)</td>
</tr>
<tr>
<td></td>
<td>&lt; 10 teeth in maxilla or mandible</td>
</tr>
<tr>
<td></td>
<td>&lt; 12 anterior teeth</td>
</tr>
<tr>
<td></td>
<td>≥ 2 occluding pairs of premolars</td>
</tr>
<tr>
<td></td>
<td>No occluding pairs of molars at left or right side of the dentition</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Dichotomy</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 1 tooth vs no teeth</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥ 10 teeth vs &lt; 10 teeth</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complete vs incomplete</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sufficient vs impaired</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Edentulous jaw(s)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

than 20 teeth was considerably lower: 4 at 60 years and 16 at 90 years of age.

Tooth replacements are intended to restore reduced dentitions and enhance oral function. To assess oral functionality, a systematic review provided circumstantial evidence that in addition to the number of teeth, tooth type, tooth location, and number of occluding pairs determine oral function. Based on this review, a hierarchical dental functional classification system (HDFC) was developed that classifies dentitions according to these variables. This system has been validated for the Chinese population with respect to chewing ability and can be used to quantify the effectiveness of tooth replacement at population level.

In the present study, the aim was to assess the degree of tooth replacements in a group of elderly care home residents and to analyze the effectiveness of these replacements by applying HDFC.

**Materials and Methods**

**Participants**

The present study was conducted in Qingdao City, located at the east coast of Shandong Province, Eastern China. A purposive sample of eight elderly care homes (ranging from 33 to 359 residents; total number of residents = 1,226) in different districts in Qingdao City was selected on the basis of accessibility and convenience. Information on the purpose and procedures of the study was provided to the management of the care homes and their residents. The aim was to include a total of 500 participants.

All residents were visited room by room and invited to participate. A total of 512 people (42% of the total population of the visited elderly homes) capable of communication and with no life-threatening conditions agreed to participate. The number of participants per care home ranged from 7 (21% of the residents of that particular care home) to 171 (86%); 66% were women. The study was carried out in compliance with the Helsinki Declaration. Prior to the start of the study, the ethics committee of the Affiliated Hospital of Medical College, Qingdao University, approved the study protocol.

**Clinical Data**

According to the study protocol, verbal informed consent was obtained from each participant before entering the study. Two calibrated dentists trained by an experienced researcher performed an oral examination following the procedures and diagnostic criteria recommended by the World Health Organization. In the present study, of all variables recorded only the presence of teeth (including third molars), tooth type, number and location of posterior occluding pairs (POPs), and tooth replacements were considered. Interobserver agreement among the experienced researcher and the two observers on these variables was good (all kappas ≥ 0.8). Retained roots were considered nonfunctional and candidates for replacement, and therefore considered missing teeth. Replaced teeth were recorded as missing teeth replaced by fixed dental prostheses (FDPs) or partial removable dental prostheses (PRDPs).

Participant dentitions were classified using the HDFC system. The criteria in this dichotomized five-level branching hierarchy system are based on number and type of the present natural teeth and number of POPs and have been described previously; however, for convenience they are presented in Table 1.

**Data Analysis**

Participants being edentulous in one or both jaws were excluded from the analyses. Next, two steps were undertaken. The first step was to classify the dentitions considering natural teeth only. For each level in the branching hierarchy, percentages of participants meeting and not meeting the classification criteria were calculated. Mean numbers of natural teeth and POPs were calculated for three age groups (60–69 years, 70–79 years, and ≥ 80 years). Intraclass
correlation coefficients (ICCs) were calculated as a measure of the homogeneity of the groups after dichotomization at each level with respect to teeth (ICC-t) and number of POPs (ICC-p).

In the second step, tooth replacements were considered. For all categories in the HDFC, the mean number of teeth replaced by FDPs and PRDPs, respectively, were calculated per age group and added to the mean number of natural teeth. The mean number of POPs added by FDPs (F-POPs) and PRDP (R-POPs) were also calculated per age group for each category in the classification system. If, on the basis of teeth added by FDP or PRDP, a subject could be reclassified to a category reflecting higher functionality (ie, from not meeting the level-specific criterion to meeting the particular criterion), this was considered a promotion.

A promotion was considered an indicator for prosthodontic effectiveness in terms of added value in the HDFC system. The value 1 was given for a promotion to category ‘sufficient molar region’; value 2 for a promotion to category ‘sufficient premolar region;’ 3 for promotion to ‘complete anterior region;’ and 4 for promotion to category ‘≥10 teeth in each jaw.’ When subjects were reclassified to more than one level higher in the HDFC system, the values were summed (eg, for a promotion from category ‘insufficient molar region’ to ‘sufficient molar region’ [value = 1 point] and to ‘sufficient premolar region’ [value = 2 points] by restoring an impaired molar region and an impaired premolar region with tooth replacements, the values were summed for a total score of 3 points). Two-sided r test was used to determine the statistical significance of comparisons of the promotion values of FDPs and PRDPs.

Details of the HDFC system and functional promotions were provided in a previous report.7

### Results

Of the total sample included in the study (n = 512), 75% (n = 384) of the participants were dentate in both jaws; 25% (n = 128) were edentulous in one or both jaws, with 58 participants (11%) completely edentulous. More than half (62%) of the participants were aged 80 years or older (Table 2).

#### Natural Teeth Present and POPs

The classification of participants who were dentate in both jaws according to HDFC resulted in varying homogeneity within the groups with respect to number of natural teeth and POPs present (Fig 1). The highest ICCs, indicating good group homogeneity, were found at level II (≥10 teeth in each jaw): 0.807 ± 0.014 for the number of teeth (ICC-t) and 0.801 ± 0.022 for number of POPs (ICC-p). The lowest homogeneities were found for the level III (anterior region complete) in the branch ‘≥10 teeth in each jaw’ (ICC-t = 0.184 ± 0.070; ICC-p = 0.000 ± 0.250).

Only 20% of the participants dentate in each jaw met all criteria for a sufficient functional dentition (meeting all cut-offs up to level V) and 42% met none of the criteria. Of participants dentate in both jaws, 47% had at least 10 teeth in each jaw; of these, 62% (29% of all participants dentate in both jaws) had an intact anterior region (Fig 1). Overall in the ‘≥10 teeth in each jaw’ branch, the mean number of teeth was 26.3 ± 2.9 and the mean number of POPs was 6.2 ± 2.0. In the branch ‘<10 teeth in each jaw,’ these figures were 13.4 ± 5.5 and 1.1 ± 1.5, respectively.

Participants aged 60 to 69 years meeting the criteria ‘≥10 teeth in each jaw’ had a mean of 27.3 ± 2.7 teeth present and 6.7 ± 1.8 POPs. For the age group 80 years and older, these numbers were 25.8 ± 2.9 and 5.9 ± 2.0, respectively. In the branch ‘<10 teeth in each jaw,’ participants in the age group of 60 to 69 had a mean number of 13.8 ± 3.4 teeth present and 0.7 ± 0.8 POPs. For the age group of 80 years and over these numbers were slightly different (12.4 ± 5.5 and 0.8 ± 1.2). In Fig 1, categories with relatively low prevalence (in the ‘≥10 teeth’ branch the categories not meeting the criteria, and in the ‘<10 teeth branch’ the categories that met the criteria) were not further dichotomized to the next level.

#### Tooth Replacements

Of all participants with ≥1 tooth in each jaw (level I), 214 (56%) had 1 or more teeth replaced by a FDP, a PRDP, or both; 31% had a FDP (n = 120) and 36% (n = 140) had a PRDP (Table 3). The majority of participants with FDPs (n = 70) had a FDP that added 1 or 2 teeth. Most participants with PRDPs had 3 or more teeth added; 91 participants (65%) had PRDPs that added 7 or more teeth.

Figure 2 presents mean numbers of teeth and POPs based on natural teeth only and on natural teeth plus tooth replacements, according to HDFC category and age group. Of the participants, 46% met all criteria for a sufficient functional dentition and 18% met none of the criteria. The figure demonstrates low numbers of

### Table 2: Sex and Age of Participants

<table>
<thead>
<tr>
<th>Age (y)</th>
<th>60–69</th>
<th>70–79</th>
<th>&gt; 80</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men (n,%)</td>
<td>16 (34)</td>
<td>45 (30)</td>
<td>113 (36)</td>
<td>174 (34)</td>
</tr>
<tr>
<td>Women (n,%)</td>
<td>31 (66)</td>
<td>105 (70)</td>
<td>202 (64)</td>
<td>338 (66)</td>
</tr>
<tr>
<td>Total</td>
<td>47 (9)</td>
<td>150 (29)</td>
<td>315 (62)</td>
<td>512 (100)</td>
</tr>
</tbody>
</table>
Prosthodontic Replacement in an Institutionalized Dentate Population

<table>
<thead>
<tr>
<th>Category</th>
<th>Yes (%)</th>
<th>No (%)</th>
<th>ICC-t</th>
<th>ICC-p</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 1 tooth in each jaw</td>
<td>47%</td>
<td>53%</td>
<td>0.807 (0.014)</td>
<td>0.801 (0.022)</td>
</tr>
<tr>
<td>≥ 10 teeth in each jaw</td>
<td>29%</td>
<td>71%</td>
<td>0.184 (0.070)</td>
<td></td>
</tr>
<tr>
<td>Anterior region complete</td>
<td>24%</td>
<td>76%</td>
<td>0.411 (0.111)</td>
<td></td>
</tr>
<tr>
<td>Premolar region sufficient</td>
<td>20%</td>
<td>80%</td>
<td>0.673 (0.059)</td>
<td></td>
</tr>
<tr>
<td>Molar region sufficient</td>
<td>20%</td>
<td>80%</td>
<td>0.782 (0.037)</td>
<td></td>
</tr>
</tbody>
</table>

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The average number of teeth added in this branch was 1.1 ± 1.9: 55% (0.6 ± 1.1) by FDP and 45% (0.5 ± 1.6) by PRDP. In the ‘< 10 teeth in each jaw’ branch, 8.2 ± 7.8 teeth were added: 86% (7.1 ± 7.8) by PRPD and 14% (1.1 ± 2.1) by FDP. In this branch, the highest number of teeth added (8.9 ± 8.1) was found in the category ‘molar region insufficient.’
Table 3  Participants with Partial Dental Prostheses According to Number of Teeth Added

<table>
<thead>
<tr>
<th>Teeth added (n)</th>
<th>Participants with FDP, PRDP, or both (n[%])</th>
<th>Participants with FDP (n[%])</th>
<th>Participants with PRDP (n[%])</th>
</tr>
</thead>
<tbody>
<tr>
<td>1–2</td>
<td>59 (28)</td>
<td>70 (58)</td>
<td>20 (14)</td>
</tr>
<tr>
<td>3–6</td>
<td>55 (26)</td>
<td>47 (39)</td>
<td>29 (21)</td>
</tr>
<tr>
<td>≥ 7</td>
<td>92 (46)</td>
<td>3 (2)</td>
<td>91 (65)</td>
</tr>
<tr>
<td>Total</td>
<td>214 (100)</td>
<td>120 (100)</td>
<td>140 (100)</td>
</tr>
</tbody>
</table>
Fig 2  Mean number of natural and artificial teeth and natural and artificial posterior occluding pairs per age group according to the HDFC system. SDs T: Standard deviations number of teeth; SDs P: Standard deviations number of posterior occluding pairs.
Mean number of natural posterior occluding pairs (N-POPs)
Mean number of natural + FDP posterior occluding pairs (N-POPs + F-POPs)
Mean number of natural + FDP + RDP posterior occluding pairs (N-POPs + F-POPs + R-POPs)

SDs T: 0.89 – 6.03
SDs P: 1.14 – 2.88

SDs T: 1.92 – 8.21
SDs P: 0.82 – 3.55

SDs T: 0.84 – 4.44
SDs P: 0.89 – 1.41

SDs T: 1.93 – 8.28
SDs P: 0.82 – 3.55

SDs T: 2.17 – 5.17
SDs P: 1.37 – 3.03

SDs T: 1.92 – 8.21
SDs P: 0.82 – 3.55

SDs T: 1.78 – 8.51
SDs P: 0.75 – 3.55

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Effectiveness by Promotions in the HDFC

Of participants having tooth replacement (FPD, PRPD, or both), 76% (163 subjects) were promoted to a higher level in the HDFC system. Of participants with FDPs, 46% were promoted; of those having PRDPs, 83% were promoted to a higher level in the HDFC system (Table 4). The mean number of teeth added in the promoted participants was 10.3 ± 6.9. In participants promoted by means of FDP the mean number of teeth added was 3.6 ± 2.5; participants promoted by means of PRDP had 11.9 ± 6.5 teeth added. Teeth added by PRDP resulted in promotions at all levels of the HDFC (ranging from 48% by PRDP replacing anterior teeth to 60% by PRDP replacing premolar teeth). Participants with FDPs predominately were promoted as a result of teeth added in the anterior and premolar regions (27% and 20%, respectively). The largest difference between FDP and PRDP promotions can be seen in the molar region. In this region, FDPs resulted in promotions in 8% of eligible participants, compared with 61% for PRDPs.

The mean promotion value was significantly higher (P < .001) for participants with teeth added by PRDP (mean promotion: 5.8 ± 3.7) compared with participants having FDP (mean promotion: 1.8 ± 2.5). The mean promotion value for all participants (with and without promotion) per tooth added by means of FDP was 0.7 ± 1.0; for PRDP this value was 0.6 ± 0.6. However, this difference was not significant (P = .840). Considering only participants with promotions, the mean promotion value per tooth added was significantly higher for participants with FDPs than for those with PRDPs (1.4 ± 1.1 and 0.8 ± 0.5, respectively; P < .001).

Discussion

Sample

This study investigated the dental functional status with and without prosthodontic replacement of missing teeth among a purposive sample of institutionalized older people living in eight nursing homes in Qingdao, Shandong Province, China. To date, detailed information on the prosthetic situation of institutionalized elders in China is lacking. Although a purposive sample was used for this study, the authors consider the outcomes valuable information for authorities responsible for oral health care and its utilization. Differences in care home sizes and participation rates for each nursing home might have caused biases. However, to the authors’ knowledge there were no systematic differences between the small and large care homes, such as participation rates, population compositions, or care facilities.
HDFC

The importance of tooth replacement in Chinese elders has been illustrated in a previous report. In that study, investigating the dental status of the same sample as the present study, it was found that the percentage of dentate older people having at least 20 natural teeth varied from 70% at the age of 60 to 12% at the age of 90. Tooth replacement increased these percentages to 96% and 84%, respectively. The present study elaborates the extent of missing teeth and applied tooth replacements, and the effects in terms of oral functionality. The assessment of oral functionality as used in this study is based on the systematic review of Gottfredsen and Walls, of which the main conclusions—assigning different functional characteristics to different tooth types—are reflected in HDFC. As in previous studies in adult general populations, homogeneities after dichotomization of the groups of institutionalized elders in the present study were moderate to good. This indicates that HDFC can be used not only for the general population, but also to classify dentitions of institutionalized older adults.

Tooth Replacements

Comparison of the findings of the present study among institutionalized older people in Qingdao City with the epidemiologic findings among the general population aged 40 years and older in urban and rural areas in Qingdao District shows some interesting differences. The prevalence of complete edentulousness in the present study was 11%, while in the general population aged 40 years and over it was 4%. Among the institutionalized elders, 25% were edentulous in one or both jaws, compared with 8% in the general population. The percentage of people (dentate in each jaw) with fewer than 10 teeth in each jaw also was substantially higher at 53% versus 17% in the general population. These comparisons indicate a factor of approximately 3 with respect to the prevalence of reduced dentitions and edentulousness in institutionalized elders compared with the general population aged 40 years and older in this area. Compared with studies of institutionalized elders in other countries, the prevalence of complete edentulousness in the present study is strikingly lower (eg, 43% in Norway, 50% in Italy, 34% in Spain, and 46% in Poland).

As a result of tooth replacements the percentage of participants having at least 10 teeth in each jaw increased from 47 to 76 and the percentage of participants meeting all functional criteria increased from 20 to 46 (Figs 1 and 2). This 26% increase in participants meeting all criteria resulted from tooth replacements in 56% of the dentate participants. This means that approximately half of the tooth replacements were effective for meeting all criteria for a functional dentition.

Given the high number of teeth present among the participants with at least 10 teeth in each jaw, only a few teeth were replaced in this branch. In contrast with the general population, a relatively low percentage of missing teeth (55%) were replaced by FDPs versus 82% in the general population. It is unclear whether this difference is due to a cohort effect or whether this points at previously failed FDPs that were replaced subsequently by PRDPs. In the branch ‘< 10 teeth in each jaw,’ 86% of missing teeth were replaced by PRDPs, which is more than in the general population (66%). In the present sample, the distribution of the number of replaced teeth per FDP was similar compared to that in the general population, whereas the distribution of the number of replaced teeth per PRDP pointed at higher numbers of replaced teeth than in the general population.

In the ‘< 10 teeth in each jaw’ branch, on the basis of number of natural teeth (on average just slightly more than 13) and natural POPs (on average just slightly more than 1) most dentitions can be considered functionally impaired. PRDPs in this branch added 3.1 to 3.7 POPs, restoring the dentitions to 3.8 to 4.7 POPs. These numbers are similar to what has been found for the general population aged 60 years and older. This similarity indicates an equal utilization level of prosthodontic care for community-dwelling and institutionalized older people in the Qingdao area. However, PRDPs in the institutionalized population comprised an average of approximately 7 artificial teeth to restore up to this number of POPs, while in the community-dwelling elders PRDPs comprised an average of 4.5 artificial teeth to achieve this. As for the general population, tooth replacements in the ‘> 10 teeth in each jaw’ branch in this sample had almost no effect on the number of POPs.

In the present study, 76% of the participants were promoted as result of tooth replacement, which indicates effective prosthodontic tooth replacement. This percentage is higher than that found for the general population (60%). Although the percentages of promotions by PRDP did not differ substantially, PRDPs in the institutionalized elders had more artificial teeth (11.9 ± 6.5) than in the general population (8.6 ± 5.7). Mean numbers of teeth replaced by FDPs are more or less similar (3.6 ± 2.5 compared with 3.5 ± 2.4, respectively). In the general population, the highest percentage of promotions (77%) were found for promotion to the functional level ‘≥ 10 teeth in each jaw,’ whereas in the institutionalized populations the highest percentage (51%) was observed in promotions to the functional levels ‘≥ 10 teeth in each jaw’ and ‘sufficient premolar region.’ In both the general...
and institutionalized populations, promotion values for PRDPs were higher than for FDPs, but per tooth added values were higher for FDPs.

Conclusions

Compared with a general population of adults in the Qingdao area, the prevalence of edentulousness and reduced dentitions among institutionalized elders was approximately three times higher. However, the present study demonstrated a high percentage of institutionalized elders with tooth replacements that enhanced oral functionality. Approximately half of these tooth replacements met all criteria for a functional dentition. Similarities in the application of tooth replacements indicate an equal utilization level of prosthodontic care for institutionalized elders and community-dwelling elders.

References


Literature Abstract

**Dental Surface Texture Characterization Based on Erosive Tooth Wear Processes**

This in vitro study investigated the differential diagnosis of erosion, erosion-abrasion, and abrasion lesions on enamel and root dentin based on their surface textures using methods originally developed for dental microwear analysis. A group of 32 flattened and polished enamel and root dentin specimens and 32 natural enamel and root dentin surfaces were each subjected to one of four different in vitro protocols to simulate four lesion types (erosion, abrasion, erosion-abrasion and sound [no lesion = control]) (n = 8). These specimens were analyzed to determine the dentinal microwear parameters using area-scale fractal complexity (Asfc), exact proportion (Asfc), scale of maximum complexity (Smc), average surface roughness (Sa), and textural fill volume (Tfv). The effects of substrate and lesion type were evaluated using two-way analyses of variance and Fisher protected least significant differences tests (α = .05). Classification trees were constructed to verify the strength of potential associations of the parameters tested. For flattened and polished enamel and dentin specimens, Asfc, Sa and Tfv were not able to differentiate erosion and erosion-abrasion lesions from the control. Only Asfc could differentiate erosion from erosion-abrasion enamel lesions (all P < .05). The association parameters correctly classified 84% and 94% of the lesions in enamel and dentin, respectively. For the natural enamel and dentin specimens, Asfc was able to differentiate erosion and erosion-abrasion lesions from the control. Epslr was able to differentiate erosion from erosion-abrasion (all P < .05). The association parameters correctly classified 81% and 91% of the lesions in enamel and dentin, respectively. The authors concluded that dental microwear analysis and the association of the tested parameters show great potential in differentiating lesions for enamel and dentin surfaces.