Attrition, occlusion, (dys)function, and intervention: a systematic review

Arie van ’t Spijker
Cees M. Kreulen
Nico H. J. Creugers

Authors’ affiliation:
A. van ’t Spijker, C. M. Kreulen, N. H. J. Creugers,
Department of Oral Function and Prosthetic Dentistry, College of Dental Science, Radboud University Nijmegen Medical Centre, Nijmegen, The Netherlands

Correspondence to:
Nico H. J. Creugers DDS, PhD
Department Oral Function and Prosthetic Dentistry, Dentistry 309
Radboud University Nijmegen Medical Centre
PO Box 9101
6500 HB Nijmegen
The Netherlands
Tel.: +31 24 3614004
Fax: +31 24 3614373
e-mail: n.creugers@dent.umcn.nl

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Abstract

Objectives: Attrition and occlusal factors and masticatory function or dysfunction are thought to be related. This study aims to systematically review the literature on this topic with the emphasis to find evidence for occlusion-based treatment protocols for attrition.

Materials and methods: Literature was searched using PubMed (1980 to 2/2006) and the Cochrane Library of Clinical Trials with the keywords ‘tooth’ and ‘wear’. Five steps were followed. Exclusion was based on the following: (1) reviews, case-reports, studies on non-human tooth material, and studies not published in English and (2) historical or forensic studies. Included were (3) in vivo studies. Next, studies on (4) occlusal factors, function or dysfunction [temporomandibular disorders (TMD), bruxism], or intervention, and (5) attrition were included. Two investigators independently assessed the abstracts; measure of agreement was calculated using Cohen’s $\kappa$; disagreement was resolved by discussion. Full-text articles were obtained and correlation between outcomes on occlusal factors, (dys)function, treatment, and attrition were retrieved. References in the papers included in the final analysis were cross-matched with the original list of references to add references that met the inclusion criteria.

Results: The search procedure revealed 1289 references on tooth wear. The numbers of included studies after each step were (1) 345 ($\kappa = 0.8$), (2) 287 ($\kappa = 0.87$), (3) 174 ($\kappa = 0.99$), (4) 81 ($\kappa = 0.71$), and (5) 27 ($\kappa = 0.68$). Hand searches through the reference lists revealed six additional papers to be included. Analysis of the 33 included papers failed to find sound evidence for recommending a certain occlusion-based treatment protocol above another in the management of attrition.

Conclusion: Some studies reported correlations between attrition and anterior spatial relationships. No studies were found suggesting that absent posterior support necessarily leads to increased attrition, though one study found that fewer number of teeth resulted in higher tooth wear index (on the remaining teeth). Attrition seems to be co-existent with self-reported bruxism. Reports on attrition and TMD signs and symptoms provide little understanding of the relationship between the two.

Extensive tooth wear is considered a potential threat to functional dentition. The management of tooth wear, especially from attrition, is becoming a subject of increasing interest in the prosthodontic literature, both from a preventive [how to stop the progress of tooth substance loss (TSL)] and from a restorative point of view [how to replace the lost tooth substance and to restore function].

By definition, attritional wear is the loss of tooth tissue due to friction between
opposing teeth and is thus related to dental occlusion. In a classical paper on attrition, Berry & Poole (1976) considered TSL to be a normal ageing process, in which deposition of secondary dentine, alveolar growth, muscle adaptation, and attrition are all part of a compensation mechanism. They stated that ‘if this concept is right, then attrition, whatever its extent, can never be excessive’ [Berry & Poole 1976]. However, loss of tooth tissue usually affects the dental occlusion and it is still disputed whether a changing occlusion could be ignored in the management of dental problems such as ‘extensive’ attrition or temporomandibular disorders (TMD).

The role of occlusion as a key factor in the treatment of mutilated dentitions is less disputed. Although almost completely empiric-based, occlusal concepts are willingly used in both conservative dentistry and prostho-dontics to compass the restorative process of broken down or worn teeth and dentitions. The scientific evidence of the use of occlusal concepts and the knowledge regarding the role of occlusal factors in [the management of] tooth wear is fragmented and ambiguous, as is the relationship between [management of] tooth wear and [dys]function.

In the management of tooth wear, the prosthodontist has to make decisions regarding the need for treatment, treatment procedures, materials’ choice, and occlusal concepts. With regard to treatment need it has been advised that tooth wear should be diagnosed early and treated timely ‘to prevent the tooth from wear beyond a point of acceptable restoration’ [Dawson 2007]. In contrast, careful monitoring has been advised above early treatment because the progress of tooth wear might fluctuate [Seligman & Pullinger 1995; Smith & Robb 1996]. Regarding treatment procedures and materials’ choice, a wide variation of options has been proposed in the dental literature, most of it in textbooks, case reports, or clinically oriented reviews. Besides the traditional prosthodontic restorations used in oral rehabilitation, direct and indirect composite restorations [Briggs et al. 1994; Yip et al. 2003], bonded cast metal restorations [Watson 1997; Chana et al. 2000], implant-supported removable partial dentures [Briggs & Bishop 1997], orthodontic treatment [Evans 1997], and [protective] splints [McIntyre 2000] have been proposed. Yet, no evidence is available for choosing one of these treatment options above another.

The purpose of the present study was to systematically assess relationships, if any, between attrition and occlusal factors and oral (dys)function in terms of management of attrition. More specifically, the aims were [1] to find and assess evidence from the literature for patients with attrition and TMD regarding choice of intervention, [2] to map evidence addressing occlusion-based protocols and occlusal factors in the management of attrition, and [3] to find evidence for defining a certain threshold, at which interventions are indicated in subjects with attrition.

The null-hypothesis was the literature provides no sound evidence justifying the qualification of certain occlusion-based interventions above others in the management of attrition.

Material and methods

This systematic review is characterized by four major elements: literature search, inclusion/exclusion of papers, extraction and grouping of study outcomes, and outcome analysis.

Literature search

The literature was searched using PubMed with limitation of publication year from 1980 up to February 2006 as well as the Cochrane Library of Clinical Trials. Key words used in the literature search were: ‘tooth’ in combination with ‘wear’.

Inclusion/exclusion of papers

From this dataset, references were selected with ‘wear of human tooth tissue’ as the study subject. Two independent readers (A. V. S., N. H. J. C.) selected references to be included on the basis of abstracts. The search was not limited to randomized-controlled trials (RCTs). Excluded were reviews, case reports, comments, and references in which wear other had meanings than loss of tooth tissue. References to non-English articles were also excluded. If abstracts were not available in PubMed, original published articles were obtained. Observer agreement was analysed and disagreements were resolved by discussion.

Assessment of study outcomes and statistical analysis

For all steps, Cohen’s κ coefficient was used as a measure of agreement between the two reviewers. Study outcomes were to be pooled, but only a qualitative assessment was achievable. Correlations between parameters and outcome [attrition] were retrieved.

Results

The PubMed search resulted in a list of 1289 references. A total of 345 references
were entered in the tooth wear dataset containing studies addressing wear of human tooth tissue. Search of the Cochrane Library of Clinical Trials did not reveal further relevant papers. The complete selection procedure resulted in the inclusion of 27 articles [Fig. 1]. Observer agreements ranged from 0.68 ± 0.08 (fair) to 0.99 ± 0.01 (very good). Hand search through the reference lists revealed six additional papers to be included, all of them dealing with functional parameters and attrition [Droukas et al. 1984; De Laat et al. 1986; Seligman et al. 1988; Runge et al. 1989; Ekfeldt et al. 1990; Pintado et al. 1997]. Finally, 11 articles reporting data on attrition and occlusal parameters, 21 articles with data on attrition and functional parameters, and four articles evaluating intervention or treatment effects were subjected to further analysis. Three studies [Egermark-Eriksson et al. 1987; Ekfeldt et al. 1990; Carlsson et al. 2003] dealt with both occlusal and functional parameters and were therefore included in both sub-sets. Another two studies [Bauer et al. 1997; Witter et al. 2001] addressed research questions related to occlusal parameters in dental situations resulting from active dental treatments. For practical reasons, these studies were allocated to the occlusal parameters group only. No papers were identified investigating threshold values of TSL, at which interventions are indicated in subjects with attrition.

The studies selected for the category occlusal parameters showed large heterogeneity in study design, sample composition, research question, and measurement method (Table 1). As a result, pooling of outcome data was not possible. Only few correlations between attrition and occlusal parameters were reported. No correlation between anterior attrition and absent posterior teeth was reported, only some statistical correlations were found for specific sub-samples (Smith & Robb 1996; Witter et al. 2001). However, differences were small and considered clinically irrelevant. One study found a correlation between reduced number of teeth and increased tooth wear on the remaining teeth [Ekfeldt et al. 1990] Associations between attrition and anterior [spatial] relationships were reported in several studies, although some of them appear to be contradicting (Table 1).

The studies investigating functional parameters in relation to attrition also showed large heterogeneity, making meaningful aggregation of outcome data impossible (Table 2). Kim et al. (2001) was the only report addressing ‘normal’ function. All other reports in this category dealt with TMD or bruxism and as such they were considered addressing dysfunction. A few trends could be distinguished. Seven studies reported positive correlations between attrition and self-reported bruxism. Two studies including self-reported bruxism reported no such correlation. Another study reported no significant correlation between attrition and clinically diagnosed bruxism.

Nine studies reported relationships between attrition and clinically diagnosed TMD, of which three demonstrated positive correlations and one reported a negative correlation. Four studies reported no such correlations. Another study presented...
<table>
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<tr>
<th>References</th>
<th>Study design</th>
<th>Subject selection</th>
<th>Anticipated risk factor</th>
<th>Number of subjects</th>
<th>% female (controls)</th>
<th>Age group</th>
<th>Tooth wear scale (levels)</th>
<th>Correlations between tooth wear and occlusal factors</th>
<th>Remarks</th>
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<tr>
<td>Carlson et al. (2003)**</td>
<td>L Population-based</td>
<td>Bruxism, oral parafunctions</td>
<td>320</td>
<td>52</td>
<td>YA</td>
<td>I</td>
<td>5</td>
<td>†</td>
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<td>Witter et al. (2001)</td>
<td>L Dental school patients</td>
<td>Shortened dental arch</td>
<td>74 (72)</td>
<td>60 (51)</td>
<td>A</td>
<td>I</td>
<td>4</td>
<td>†</td>
<td>0</td>
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<td>Bauer et al. (1997)</td>
<td>C Orthodontically treated</td>
<td>Anterior guidance for anterior wear</td>
<td>85</td>
<td>38</td>
<td>YA + A</td>
<td>I + II</td>
<td>4</td>
<td>†</td>
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<td>Smith &amp; Robb (1996)</td>
<td>C Population-based</td>
<td>Absent posterior teeth</td>
<td>1007</td>
<td>?</td>
<td>YA + A + E</td>
<td>I</td>
<td>5</td>
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<tr>
<td>Seligman &amp; Pullinger (1995)</td>
<td>C Dental school patients + private practice patients</td>
<td>Canine attrition</td>
<td>148</td>
<td>32</td>
<td>YA + A</td>
<td>II</td>
<td>5</td>
<td>†</td>
<td>†</td>
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<td>Abdullah et al. (1994)</td>
<td>C Dental students</td>
<td>Excursive contact schemes</td>
<td>64</td>
<td>47</td>
<td>YA</td>
<td>I + II</td>
<td>4</td>
<td>†</td>
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<tr>
<td>Johansson et al. (1994)</td>
<td>C Dental students</td>
<td>Excursive contact schemes</td>
<td>80</td>
<td>44</td>
<td>YA</td>
<td>I + II</td>
<td>4</td>
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<td>†</td>
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<tr>
<td>Silness et al. (1993)</td>
<td>L Dental school patients</td>
<td>Vertical overbite and horizontal overjet</td>
<td>51</td>
<td>45</td>
<td>O + YA</td>
<td>II</td>
<td>3</td>
<td>+1</td>
<td>†</td>
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<tr>
<td>Crothers &amp; Sandham (1993)</td>
<td>C Referrals wear clinic</td>
<td>Vertical dimensional responses</td>
<td>35 (40)</td>
<td>23 (55)</td>
<td>YA + A</td>
<td>III mm</td>
<td>†</td>
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<td>Ekfeldt et al. (1990)</td>
<td>C Population-based</td>
<td>Number of teeth</td>
<td>87 (133)</td>
<td>?</td>
<td>YA + A + E</td>
<td>IV</td>
<td>4</td>
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positive correlations for some sub-samples of TMD, but not for others. Five studies in this category were based on self-reported TMD symptoms. Of these, two reported a positive correlation between attrition and TMD pain; one reported no such correlation in their results. One study reported a relationship between attrition and temporomandibular joint (TMJ) clicking and another reported no correlation between attrition and symptoms of TMD.

From the intervention/treatment studies (Table 3), only one had a prospective study design reporting less attrition in subjects (young children) wearing bites plates compared with subjects who did not wear these devices (Hachmann et al. 1999). This finding was affirmed by Carlsson et al. (1985) who followed subjects with severe attrition and found splint treatment in these subjects to slow down the rate of tooth wear. Two studies were retrospective analyses reporting on relationships between tooth wear and treatment history. Orthodontic treatment history was not associated with attrition (Dahl et al. 1989), whereas extensive restorative treatment and treatments including extraction of teeth seemed to increase the risk for tooth wear (Dettmar & Shaw 1987). No studies were found addressing interventions at certain threshold values of attrition. One of the included papers (Smith & Robb 1996) mentioned threshold values, but only in relation with the prevalence of tooth wear.

Discussion

The papers included in this review demonstrated that research on tooth wear is a complex undertaking. It appeared that it is difficult to quantify the amount of TSL in a practical way for larger groups of subjects; hence, there is no consensus on how to measure tooth wear clinically. The studies included made use of tooth wear scales ranging from two to eight levels. Very few studies actually measured wear. Relating attrition to other dental factors appeared to be even more complex. The measurement methods determining occlusal factors as well as the diagnosis of functional and dysfunctional ‘use’ of the dentition as described in the studies showed extensive variation. For example, some studies used anamnestic criteria while others used research diagnostic criteria (RDC/TMD) to diagnose TMD. In other cases, the used measurement methods were not validated. Moreover, it seems to be impossible to isolate specific anticipated risk factors from others, which hinders proper investigation of the multifactorial phenomenon of TSL.

The literature on attrition does not provide clear evidence for the efficacy of particular occlusal designs in the management of attrition. No intervention studies addressing this topic were found. Some support was found in cross-sectional studies, indicating that anterior (spatial) relationships and attrition were related. As could be expected, anterior guidance, which is partially determined by vertical overbite and horizontal overjet, seems to reduce the risk for posterior attrition, but increases the risk for anterior attrition. Clinically, canine protection is advocated to ensure anterior guidance with the purpose of diminishing posterior TSL. In this review, one study addressed this variable, demonstrating an association between canine wear and posterior wear (Seligman & Pullinger 1995). It has to be emphasized that this was the case for unrestored teeth and was therefore not directly applicable for restored teeth. Based on the literature though, a treatment strategy to create canine guidance thus remains unproven. The literature provides no data regarding the amount of lost tooth tissue due to attrition for different occlusal schemes. Whether the occurrence of anterior TSL is more or less a threat to the dentition or its function than posterior TSL remains a subjective issue.

The articles addressing the relationship between attrition and the level of posterior support found that decreased support does not lead to more wear. Hence, there is no justification for tooth replacement to prevent TSL in the remaining dentition. Nevertheless, the multi-factorial aetiology of TSL is a too complicated a factor to draw such conclusions.

Most studies identifying relationships between attrition and functional or dysfunctional parameters, addressed the question whether these parameters could be the cause for attrition. Bruxism was identified as an associative factor in dental attrition in most of the studies. However, as all of these associations were based on self-reported bruxism, they are lacking a sound
<table>
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<tr>
<th>References</th>
<th>Study design</th>
<th>Subject selection</th>
<th>Study population</th>
<th>Number of subjects</th>
<th>% female (controls)</th>
<th>Age-group</th>
<th>Tooth wear scale (levels)</th>
<th>Tooth wear measurement</th>
<th>TMD/bruxism diagnosis</th>
<th>Correlation with TMD/bruxism</th>
<th>r/OR values</th>
<th>Level of significance</th>
<th>Remarks</th>
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</thead>
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<td>Hirsch et al. (2004)</td>
<td>C Population-based</td>
<td>TMD</td>
<td>1011</td>
<td>52</td>
<td>Ch + O</td>
<td>I</td>
<td>3</td>
<td>S</td>
<td>0</td>
<td>No correlation between anterior tooth wear and TMD pain</td>
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<tr>
<td>Baba et al. (2004)</td>
<td>C Bruxers and matched controls</td>
<td>Bruxism activity</td>
<td>8 (8)</td>
<td>50</td>
<td>YA</td>
<td>II</td>
<td>8</td>
<td>D</td>
<td>0</td>
<td>No significant relationship between tooth wear and current bruxism</td>
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<td>320</td>
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<td>S</td>
<td>+1</td>
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<td>OR 12.5</td>
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<td>Pergamalian et al. (2003)</td>
<td>C TMD diagnosed subjects</td>
<td>History of self-reported bruxism</td>
<td>84</td>
<td>84</td>
<td>YA</td>
<td>II</td>
<td>4</td>
<td>D</td>
<td>0</td>
<td>No correlation between tooth wear and TMD pain, Tooth wear not correlated with reported bruxism</td>
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<td>Carlsson et al. (2002)</td>
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<td>TMD signs and symptoms at young age</td>
<td>320</td>
<td>52</td>
<td>YA</td>
<td>I</td>
<td>5</td>
<td>S</td>
<td>+1</td>
<td>***</td>
<td>OR 4.3</td>
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<td>John et al. (2002)</td>
<td>C Dental school patients with diagnosed TMD and controls</td>
<td>TMD</td>
<td>154 (120)</td>
<td>75 (63)</td>
<td>O, YA, A, E</td>
<td>II</td>
<td>6</td>
<td>D</td>
<td>0</td>
<td>Anterior tooth wear not significantly associated with TMD</td>
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<td>Kim et al. (2001)</td>
<td>C Dental students</td>
<td>Chewing pattern (grinding vs. chopping)</td>
<td>15 (15)</td>
<td>33 (33)</td>
<td>YA</td>
<td>I + II</td>
<td>4</td>
<td></td>
<td></td>
<td>*</td>
<td>Grinding type more posterior tooth wear than chewing type, no difference for anterior tooth wear</td>
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<td>Pintado et al. (1997)</td>
<td>L Dental students</td>
<td>Gender, TMD diagnosed</td>
<td>18 ?</td>
<td>YA</td>
<td>II</td>
<td>mm/mm³</td>
<td>S</td>
<td>+1</td>
<td>Δ = 0.05 mm³ per time period than non-bruxers</td>
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<td>84</td>
<td>45</td>
<td>YA</td>
<td>I</td>
<td>5</td>
<td>S</td>
<td>+1</td>
<td>+</td>
<td>Tooth wear correlated with subjective reports of nocturnal tooth clenching, Degree of tooth wear correlated with TMJ pain on palpation and subjective difficulties in mouth opening</td>
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<td>Pullinger &amp; Seligman (1993)</td>
<td>C Dental school patients + private practice patients</td>
<td>TMD subgroups</td>
<td>270 (148)</td>
<td>89 (32)</td>
<td>YA + A</td>
<td>II</td>
<td>5</td>
<td>D</td>
<td>Various</td>
<td>Various</td>
<td>Occlusal etiology role for attrition in TMD subjects remains questioned</td>
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<td>Goho &amp; Jones (1991)</td>
<td>C School children</td>
<td>Wear facets in primary teeth</td>
<td>50 (50)</td>
<td>?</td>
<td>Ch</td>
<td>I</td>
<td>3</td>
<td>D</td>
<td>0</td>
<td>No correlation between wear facets and clinical signs of TMD</td>
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<td>Author(s)</td>
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<td>Steele et al. (1991)</td>
<td>C</td>
<td>Referrals pain clinic and controls</td>
<td>Migraine patients</td>
<td>72 (31)</td>
<td>I + II</td>
<td>D</td>
<td>Migraine group not significant more wear than control group</td>
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<td>Ekfeldt et al. (1990)</td>
<td>C</td>
<td>Population-based</td>
<td>Bruxism</td>
<td>87 (133)</td>
<td>IV</td>
<td>S + 1</td>
<td>Higher prevalence of bruxism in subjects with tooth wear compared with subjects without</td>
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<td>Runge et al. (1989)</td>
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<td>Orthodontic patients</td>
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<td>226</td>
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<td>D</td>
<td>Association between reciprocal clicking and moderate to severe dental wear</td>
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<td>Seligman et al. (1988)</td>
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<td>Dental students</td>
<td>TMD symptoms</td>
<td>222</td>
<td>II</td>
<td>D + 1</td>
<td>Dental attrition not associated with TMJ clicking. In male: attrition of canines and premolars associated with reported bruxism</td>
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<td>Szentpetery et al. (1987)</td>
<td>C</td>
<td>Population-based</td>
<td>TMD</td>
<td>600</td>
<td>I</td>
<td>S + 1</td>
<td>Correlation between excessive tooth wear and dysfunction signs and between excessive tooth wear and reported bruxism</td>
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<td>Roberto et al. (1987)</td>
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<td>Occlusal factors for arthrogenic TMD</td>
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<td>I</td>
<td>D</td>
<td>No difference between tooth wear in arthrogenic TMD diagnosed subjects and subjects without arthrogenic TMD</td>
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<td>Eggermark-Eriksson et al. (1987)*</td>
<td>L</td>
<td>Population-based</td>
<td>Occlusal factors/TMD/bruxism</td>
<td>240</td>
<td>I</td>
<td>S + 1</td>
<td>Tooth wear correlated with reported bruxism for ages 11 and 15 years. No correlation between tooth wear and TMD</td>
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<td>De Laat et al. (1986)*</td>
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<td>Dental students</td>
<td>Occlusal parameters for TMD</td>
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<td>I + II</td>
<td>S + 1</td>
<td>More dental wear in subjects with reported bruxism. Dental wear correlated with muscle pain. Correlation between excessive wear and dysfunction symptoms</td>
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<td>Lieberman et al. (1985)</td>
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<td>Dysfunction symptoms</td>
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<td>I</td>
<td>D + 1</td>
<td>Negative correlation between attrition of premolars and clinical dysfunction index. No correlation between attrition and reported bruxism</td>
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<tr>
<td>Droukas et al. (1984)</td>
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<td>Negative correlation between attrition of premolars and clinical dysfunction index. No correlation between attrition and reported bruxism</td>
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</tbody>
</table>

*Reports based on same (original) samples.

Report: Not described, unknown, unspecified; study design: L, longitudinal; C, cross-sectional; S, self-reported; D, clinical diagnosis.

Age-groups: Ch, children (<11 years); O, adolescents (12-18 years); YA, young adults (19-30 years); A, adults (31-64 years); E, elderly (≥ 65 years).

+, positive correlation; 0, no correlation; –, negative correlation; tooth wear measurement: I, clinical examination; II, cast examination.

*P<0.05; **P<0.01; ***P<0.001.

TSL, tooth substance loss; TMD, temporomandibular disorders; TMJ, temporomandibular joint.
The information on bruxism attained from the subjects might not be reliable, because many individuals are not aware of their parafunctions [Magnusson et al. 1985]. One study concluded that attrition was not increased in subjects with diagnosed bruxism [Baba et al. 2004], but due to the small sample size and the short experimental period covered, this study might have been insufficient for this conclusion.

With regard to possible associations between attrition and TMD signs and symptoms, synthesis of study outcomes is even more difficult. As time goes by, TMD symptoms may vary. TSL on the other hand has a cumulative character: lesions do not heal but will stay constant even if some of the aetiological factors disappear. Comparing TMD patients with non-patients in studies on TSL is therefore less accurate than often assumed. Moreover, the ‘degree of dysfunction’ is often not measured, in contrast to the ‘degree of TSL’. It is therefore very difficult (if not impossible) to combine data from different studies using subjective and objective TMD-criteria with data from studies using different tooth-wear scales (varying from two to eight levels) in an attempt to calculate relative risks for TSL in case of TMD.

Elements of the healthy dentition have been described as absence of pathology, sufficient oral function, variability in forms and function, and the ability to adapt to changing function or environment (Mohl et al. 1988; Ash & Ramfjord 1995). If attrition is hypothesized as a mechanism to adapt to changing function or environment, it might explain the weak correlation between attrition and TMD; lack of ability to adapt is claimed to cause TMD. However, the two selected studies that investigated attrition as possible cause for dysfunction are ambiguous in this respect. In one study, wear facets in primary teeth did not predict clinical signs of TMD (Goho & Jones 1991). In contrast, the other study (Carlsson et al. 2002, 2003) pointed out that attrition at young age predicts TMJ clicks and night grinding 20 years later.

Unfortunately, we found only one intervention study relevant to our topic. This study (Hachman et al. 1999) reported on the effect of a non-restorative therapy [bite-plate] to reduce attrition. The two included retrospective studies [Dettmar & Shaw

<table>
<thead>
<tr>
<th>Study design</th>
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<tr>
<td>Intervention study on occlusal splint therapy</td>
<td>L Selected cases</td>
<td>Oclusal splints</td>
<td>O</td>
<td>YA II + A 1-1+ II III</td>
<td>18</td>
<td>50</td>
<td>Study design: L longitudinal; C cross-sectional.</td>
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<tr>
<td>Effect of orthodontic treatment on tooth wear</td>
<td>C Orthodontically treated</td>
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<td>II</td>
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van ‘t Spijker et al. Attrition, occlusion, (dys)function and intervention
1987; Dahl et al. 1989) cannot be considered intervention studies. They did not compare the true effects of one treatment to another, but merely looked at TSL as a side effect of variable treatments in the past.

It is possible that another search strategy, e.g., using the keyword ‘bruxism’ in combination with ‘intervention’ or ‘treatment’, would have revealed more intervention studies. However, most probably TSL would not have been included as a research variable in those studies designs.

Nevertheless, some remarks can be made regarding our search strategy. The additional hand search on the basis of the full text articles revealed that six relevant papers had to be included instead of their exclusion on the basis of abstracts and titles. Three of them [Selgman et al. 1988; Ekfeldt et al. 1990; Pintado et al. 1997] were actually included in the original PubMed list of 1289, but did not meet later selection criteria. The other three [Droukas et al. 1984; De Laat et al. 1986; Runge et al. 1989] were not excavated by PubMed due to the absence of logic keywords. The heterogeneity in terminology used by investigators emphasizes the need for standardization of study and reporting protocols. It also emphasizes the importance of additional hand searches in systematic reviews.

Conclusions

This systematic review failed to find sound evidence for the recommendation of one occlusion-based treatment protocol above another in the management of attrition. The null-hypothesis is therefore accepted.

Some correlations were found between attrition and anterior spatial relationships, however not in the context of intervention. Absent posterior support did not necessarily lead to increased attrition of the remaining teeth, whereas a reduced number of teeth may lead to increased wear of the remaining teeth. Correlations between attrition and other occlusal parameters were not reported. Attrition seems co-existent with self-reported bruxism. Reports on attrition and TMD signs and symptoms provide little understanding of the relationship between the two. No papers were found that reported threshold values of attrition that indicate whether intervention might be beneficial for a patient.

References

Included articles


Ekfeldt, A., Huguson, A., Bergendal, T. & Helkimo, M. (1990) An individual tooth wear index and an occlusion-based treatment protocol above another in the management of attrition. The null-hypothesis is therefore accepted. Some correlations were found between attrition and anterior spatial relationships, however not in the context of intervention. Absent posterior support did not necessarily lead to increased attrition of the remaining teeth, whereas a reduced number of teeth may lead to increased wear of the remaining teeth. Correlations between attrition and other occlusal parameters were not reported. Attrition seems co-existent with self-reported bruxism. Reports on attrition and TMD signs and symptoms provide little understanding of the relationship between the two. No papers were found that reported threshold values of attrition that indicate whether intervention might be beneficial for a patient.

References

Included articles


Articles excluded after step 5:


Additional articles


