Does oral health counseling effectively improve oral hygiene of orthodontic patients?

**ABSTRACT**

**Aim** The aim of this study was to compare the effectiveness of oral health counseling sessions with traditional oral hygiene education in orthodontic patients with fixed appliances.

**Materials and methods** Study design: randomised control trial with experimental and control group. A group of 99 adolescents with fixed orthodontic appliances were randomly assigned to oral health counseling (experimental) or traditional health education (control) group. Subjects in the control group received verbal instructions and a demonstration of the modified Bass brushing technique on a model. The experimental group also received the verbal information with demonstration on the model and in addition a personalised 40-minutes counseling session on oral hygiene. Plaque Index (PI) and gingivitis (G) were recorded before, 1 and 6 months after the counseling session/traditional education.

**Results** Oral health counseling and traditional education improved the oral hygiene of orthodontic patients. PI values were significantly lower after 6 months compared to the baseline in both groups, but the prevalence of gingival inflammation remained significantly lower only in the experimental group.

**Conclusion** Oral health counseling increased plaque removal efficacy and control of gingival inflammation. The efficiency of counseling and traditional education was similar. Counseling is a promising approach that warrants further attention in a variety of dental contexts.

**Keywords** Dental education; Motivational interview; Oral health counseling; Oral hygiene; Orthodontic patients.

Introduction

Orthodontic treatment increases the risk of carious lesions and gingival inflammation, with consequent harm to the patient and a high risk of compromising treatment outcome Lucchese et al., 2001; Lucchese and Storti, 2011]. Caries risk is related to appliances which increase the number of sites where plaque can accumulate, as well as to changes in the bacterial flora and the age of the patient [Opsahl et al., 2010]. Gingival inflammation is also a common finding in orthodontic patients. The severity of gingival inflammation is in correlation with oral hygiene status because oral cleaning procedures are more difficult in presence of orthodontic appliances and their components [Baricevic et al., 2011].

Before starting orthodontic treatment, individual caries risk should be determined, and according to its results adequate preventive measures should be applied [Todd et al., 1999; Madléna et al., 2000; Benson et al., 2005]. Patients need to be educated how to maintain proper oral hygiene in order to prevent negative side effects of orthodontic appliances [Türkkahraman et al., 2005]. Authors reported that oral hygiene motivation methods used in dental education can affect the outcome of treatment. Educational methods are generally classified as verbal [Huber et al., 1972; Boyd, 1983; Yeung et al., 1989], written [McGlynn et al., 1987] or visual-based [Lees and Rock, 2000]. A demonstration of the brushing technique with a model, supported by verbal instructions, illustrations catalogue or instructional video, followed by supervised application by the patient, seems to be the most effective method for patients to adopt any brushing technique [Addy et al., 1999; Renton-Harper et al., 1999; Yetkin et al., 2007]. In recent years, there have been attempts to integrate cognitive behavioural techniques with interventions targeting cleaning behaviour by forming action plans for when, where and how to perform daily self-care [Jönsson et al., 2006; Schüz et al., 2006; Sniehotta et al., 2007]. Individual brushing recommendations should be targeted to individual goals and problems. One of the cognitive–behavioural techniques applied to dental education
interventions is motivational interviewing (MI), a brief counseling approach that provides strategies to move patients from inaction to action. Aim of counseling is to identify what maintains behaviours, including the ambivalence about modifying inadequate daily self-care routine, and to encourage and support people in adopting improved oral hygiene regime [Bundy, 2004]. Four principles guide the implementation of MI:

- expression of empathy: the counselor understands the individual’s feelings without judging;
- exploring ambivalence: through open-ended questions, the counselor facilitates the individual’s formulation of arguments for and against changing daily oral cleaning habits;
- rolling with the resistance: the counselor focuses on creating a new perspective for the importance of behavioural change;
- supporting self-efficacy: the counselor facilitates development of the individual’s confidence to cope with obstacles and succeed in changing oral hygiene related habits [Ismail et al., 2011].

Process avoids scolding, warning or exhorting patient to change. Instead, the dentist provides the advice and emphasises a patient’s choice, discovers and uses discrepancies that the patient identifies between his or her current behaviour and desired goals. The dentist encourages the patient to choose what he/she feels able to do and helps the patient to evaluate good and bad consequences of that behaviour [Rollnick et al., 1992].

The aim of this study was to describe and evaluate an individually-tailored educational method based on MI counseling for oral hygiene self-care in patients with fixed orthodontic appliances. More specifically, this study aims to describe the effects of MI counseling on dental plaque control and gingival health, and to compare them with the outcomes of traditional dental education regarding oral hygiene.

Material and methods

This study was conducted in the dental clinic at the Department of Paediatric and Preventive dentistry, Faculty of Stomatology Pancevo, Serbia. The study conformed to the Declaration of Helsinki. The Ethics Committee of the Faculty approved the study. The purpose of this study was explained to all of the patients and their parents, who signed an informed consent form.

Subjects

A total of 104 patients (53 males and 51 females, 13-14 years old) referred for treatment with fixed orthodontic appliances to the Department of Orthodontics, participated in this study scheduled between February 2011 and August 2011. Patients with systemic or chronic diseases were excluded from this study. We conducted a randomised clinical trial composed of two groups. The patients were randomly assigned to either the experimental or the control group.

Control group

In the control group, patients received a prophylactic treatment (use of plaque disclosure agents, prophylactic plaque removal and topical application of fluoride varnish), combined with traditional chair-side education. The dentists demonstrated the modified Bass brushing technique with a model, and provided verbal instructions. After the demonstration, the adolescent practiced brushing under dentist’s supervision.

Experimental group

The children in the experimental group received the same prophylactic treatment, verbal instructions and the demonstration of the brushing technique with a model, followed by supervised self-application. In addition, they received one 40-minute session with elements of Motivational Interviewing (MI) counseling to increase compliance and motivation for brushing.

MI protocol

Two trained dentists (ML and EA) performed counseling according to the written MI protocol. The counseling sessions were audio recorded in order to ensure that the MI protocol was being delivered consistently. At the beginning of counseling, the dentists stated the purpose of counseling and self-management and provided information on the aetiology of gingival inflammation. The dentists discussed with the adolescents their brushing habits and possible reasons that might affect cleaning behaviours (i.e. early rising or going to the bed late at night and being too sleepy to brush, forgetting to clean the teeth, fatigue, lack of time, personal relevance of having clean teeth, parental control). The adolescents assessed their need for change in oral hygiene habits (frequency of tooth brushing and cleaning around the brackets and in the interdental spaces). The dentists gave advice on how to improve the hygiene, concerning the patient’s need for improving oral cleanliness. Positive behaviours were encouraged, problems identified and possible solutions offered. The plan and schedule for brushing, interdental cleaning and use of fluoride rinses was suggested in accordance to the individual preferences. The dentists discussed the options and encouraged the patients to talk. The dentists helped them to set the individual long-term goals related to the oral health (i.e. the elimination of gingival bleeding, improvement of breath freshness). The dentists used strategies that reinforce the process of habits modification, which included problems in performing regular and thorough brushing, adolescents’ feelings and personal importance of teeth and oral health.
Clinical examination
Prior to the beginning of the study, two calibrated examiners recorded the prevalence of gingival inflammation (a percentage of subjects with localised or generalised gingivitis) and the Plaque Index (PI) according to Silness & Löe. Follow-ups were conducted after one- and six-month period. We recorded the Plaque Index and the presence of gingival inflammation in the experimental and the control group.

Statistical analysis
We used ANOVA for repeated measures and Paired Samples T-test to compare the mean values of Plaque Index (PI), and Fisher’s Exact Test to compare the prevalence of gingival inflammation at different times of measurement. In all tests, p value less than 0.05 was considered to be statistically significant. We performed the statistical analysis using the SPSS statistical software (SPSS for Windows, release 17.0, SPSS, Chicago, IL).

Results
The response rate was 95.2% (99 patients, 49 males and 50 females), so eventually the experimental group consisted of 48 patients (26 female and 22 male) and the control group of 51 (24 female and 27 male).

Both MI counseling and traditional dental education resulted in significant reduction of dental plaque. Figure 1 illustrates the changes of Plaque Index from baseline (PI 0) to one- (PI 1) and six-month (PI 2) follow-up in the experimental and the control group. According to the results of ANOVA for repeated measurements, no significant differences in PI values between the groups were observed at the baseline (p=0.582), after one (p=0.056) and six months (p=0.625). We used a Paired Samples T- test to compare the values of the Plaque Index within the groups at different times of measurement (Table 1). In both groups, PI values were significantly lower at the follow-ups compared to the baseline, although there was an increase of PI values from one- to the six-month follow-up period.

At the baseline, 66.7% of subjects had gingivitis, its prevalence significantly decreased after one month in both groups (Fig. 2, 3). After six months, prevalence of gingival inflammation increased in both groups, but not significantly compared to the previous value. Compared to the baseline measurement (G2 vs. G0),

### Table 1: Comparison of the Plaque Index values at the baseline (PI0), one- (PI1) and six-month (PI2) follow-up in the experimental and control group.

<table>
<thead>
<tr>
<th>PI0 - PI1</th>
<th>Mean</th>
<th>SD</th>
<th>SE</th>
<th>Lower</th>
<th>Upper</th>
<th>t</th>
<th>df</th>
<th>p</th>
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<tbody>
<tr>
<td>EXPERIMENTAL GROUP</td>
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<tr>
<td>PI0 - PI1</td>
<td>0.496</td>
<td>0.393</td>
<td>0.057</td>
<td>0.382</td>
<td>0.610</td>
<td>8.74</td>
<td>47</td>
<td>&lt;0.001</td>
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<tr>
<td>PI0 - PI2</td>
<td>0.251</td>
<td>0.333</td>
<td>0.048</td>
<td>0.155</td>
<td>0.348</td>
<td>5.23</td>
<td>47</td>
<td>&lt;0.001</td>
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<tr>
<td>PI1 - PI2</td>
<td>-0.245</td>
<td>0.306</td>
<td>0.044</td>
<td>-0.334</td>
<td>-0.156</td>
<td>-5.55</td>
<td>47</td>
<td>&lt;0.001</td>
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<tr>
<td>CONTROL GROUP</td>
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<tr>
<td>PI0 - PI1</td>
<td>0.300</td>
<td>0.337</td>
<td>0.047</td>
<td>0.205</td>
<td>0.395</td>
<td>6.34</td>
<td>50</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>PI0 - PI2</td>
<td>0.173</td>
<td>0.364</td>
<td>0.051</td>
<td>0.071</td>
<td>0.275</td>
<td>3.39</td>
<td>50</td>
<td>0.001</td>
</tr>
<tr>
<td>PI1 - PI2</td>
<td>-0.127</td>
<td>0.355</td>
<td>0.050</td>
<td>-0.227</td>
<td>-0.027</td>
<td>-2.54</td>
<td>50</td>
<td>0.014</td>
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</table>
the value of gingivitis remained significantly lower only in the experimental group (p = 0.012). Between the groups, no statistically significant differences in the prevalence of gingival inflammation were observed at the baseline (p=0.286), one- (p=0.831) and six-month follow-up (p=0.689).

**Discussion**

The presence of the fixed orthodontic appliances encourages the growth and retention of dental plaque, which results in localised gingivitis [van Gastel et al., 2007]. Therefore, it is very important to ensure a continuous control over the plaque accumulation. However, literature findings suggest that the educational interventions have positive, but temporary effect on plaque accumulation [Kayl and Locker, 1996; Ivanovic and Lekic, 1996]. In our study, both MI counseling and the traditional education improved the plaque removal efficacy among the patients. While our primary intention was to test an alternative educational method, we were also interested to determine if it was possible for orthodontists and/or paedodontists to apply this method in their practices; this was confirmed in the present study.

We believe that MI counseling is a suitable method for increasing the motivation and commitment for improving oral hygiene behaviour, since the regular check-ups during the orthodontic treatment, usually scheduled once in a month, provide the opportunity to reinforce the process of habit improvement. Still, single MI counseling session in our study did not ensure significantly greater long-time improvement in oral hygiene compared to the traditional education, although PI values and prevalence of gingival inflammation in the experimental group were lower than those in the control group at the follow-ups. The increase of mean PI values after six months in both groups, implicates that constant effort in oral health education must be directed towards the motivation of the patients, and that the behavioural change in some patients should be reinforced with additional short counseling sessions during the regular check-ups [Weinstein et al., 2006].
Although the prevalence of gingivitis was similar between the groups six months after the education, the percentage of adolescents with gingivitis in the experimental group remained significantly lower compared to the baseline, while in the control group it reached values similar to the initial ones. This suggested that patients in the experimental group were more consistent in oral hygiene. Still, this result must be interpreted with caution, because initial prevalence of gingivitis was greater (but not statistically different) in the experimental than in the control group. Our results were consistent with findings of other authors, who reported that a short-term preventative programme induced a transient improvement of gingival health but only during the instructional period [Ivanovic and Lekic, 1996]. The maintenance of improved gingival health over longer periods requires prolonged, repeated instructions [Emler et al., 1980].

Similar efficacy of a single MI counseling session and a traditionally approached oral hygiene education in our study could be a result of numerous factors. First, motivational counseling was provided to all the participants in the experimental group regardless of their baseline motivation, which could have resulted in mixed effects as a function of initial readiness to change the brushing habits [Martino et al., 2008]. Second, MI in other contexts relies heavily on personal analysis of the pros and cons of the misbehaviour. In contrast to misbehaviours such as substance abuse, which have clear negative effects, the oral hygiene may be less relevant, particularly for children and adolescents who are undergoing physical, emotional and social changes. Third, the patients in both groups were probably highly motivated to improve their brushing habits since they were at the beginning of orthodontic treatment. Decline in motivation could be expected over time, and the application of MI counseling might contribute to long-term compliance with regard to preventive recommendations [Weinstein et al., 2006].

The sample in this study was relatively small and all the patients came from similar local environment, the results, therefore, could not be generalised.

Motivation from the orthodontist for oral health programmes, as well as the feedback, should be offered with kindness, objectivity, and respect, as it can influence the outcome of a programme [Clark, 1976]. Health professionals tend to elicit information from children but to exclude them in the communication of decision-making and treatment [Kasila et al., 2006]. Developing child-centered approach and increasing shared decision-making might lead to a shift in the child-dentist relationship from being asymmetrical and controlled by dentist towards a more equalitarian one.

The MI counseling helps dealing with the resistance and avoids telling the patients what to do, which can be very important for the patients of specific ages, like schoolchildren and adolescents. The implementation of counseling practices in orthodontic patients usually occurs in the context of difficult and critical period of development. Motivational interviewing technique avoids prescriptive character of traditional dental education [Rollnick et al., 1992], and helps in the reduction of the children’s resistance to change behaviours that increase the risk of developing the oral disease.

The main challenge for future research is not only to find the effective ways to educate individuals how to adopt new skills and behaviours, but also to achieve long-term results regarding maintenance of good oral health. The theoretical framework of counseling may broaden counselors’ awareness of readiness for change and foster child-centered and more efficient approach to counseling and contribute to adapting appropriate counseling strategies in the context of child’s and adolescent’s oral hygiene history and life situation [Kasila et al., 2006].

**Conclusion**

Increase of motivation among orthodontic patients regarding sustainable oral hygiene regime might result in better oral health outcomes and prevent complications [Bardal et al., 2011]. However, the best way to educate and motivate the patients in terms of oral hygiene can’t be easily identified. According to our findings, the MI counseling effectively improved plaque control and gingival health of children, but the results were similar to those provided by traditional dental education. Further research of oral hygiene counseling is required, as there is an evident need for improving and developing oral health education to meet the personal needs of patients.

**References**

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