MÆDICA - a Journal of Clinical Medicine

ORIGINAL PAPER

The effect of the hygienic phase on the inflammation of gingiva – through the improvement of oral hygiene, evaluated by PBI Index

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BACKGROUND

The aim of the hygienic phase is to achieve optimal conditions for the prevention of dental caries and inflammation. If they already exist, the hygienic phase is still recommended in order to prevent their expansion and to establish optimal hygienic conditions for their treatment.

The main task is to maintain the equilibrium of the oral cavity ecology. If this equilibrium has already been broken, as it was demonstrated in the damage of the patient´s teeth, periodont or both, it is necessary to re-establish the disturbed ecology.

The cause of this disturbance within the oral cavity ecology may be based on the patient´s fault, as incorrect nutrition, insufficient hygiene and fluoridation, but also on the dentist´s fault, e.g. treating the patient without the observance of the prevention principles. The prevention principles have been taken into account in treatment planning during the hygienic phase. The whole hygienic phase, the patient's motivation and education should be based on the patient´s shortcomings in his teeth' care (1-4). According to Kulmer (1995), the hygienic phase should provide the changes in the individual prevention. The prevailing majority of authors (Rasch 1995, Boretti1995) include the hygienic phase into the first phase of periodontal treatment. The treatment of periodontitis has been divided in two phases: a hygienic phase followed by a surgical phase (5). As far back as the 1970's, many authors (Sandmeier 1973, Lindhe 1975, Nyman 1975) (6) presented considerable connection between the effectiveness of the surgical treatment and the effect of setting oral hygiene after the removal of the calculus, which appeared in spotlight only in the 80's and at

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the beginning of the 9th decade of the last century – 1999 (Morrisson 1980, Badersten 1984, 1998, Lindhe 1982, Nieminen 1995, Mombelli 1999) (6,7).

At the same time, in our dentists' awareness, the surgical treatment of periodontal conditions comes on the first place, while the teeth's treatment by fillings, crowns, or implants come secondly. **The importance of oral hygiene is taken into consideration only much later, together with the application of prevention in everyday dental practice. As to the presence of bacteria in dental plaque, it has been taken into account as the primary cause of teeth damage and gingival condition, and therefore the causal treatment should be considered as first-rate.** We should not regard oral hygiene as a duty before the surgical treatment, but as a necessary activity, on the quality of which depends the health status of the oral cavity, and the result of the whole dental and periodontal treatment. After the introduction of the hygienic phase in a patient's planned treatment, the improvement of the periodontal status is often so striking that the surgical treatment appears as unnecessary (outstanding diminution of periodontal sacks – Rateischak 1989 (8), remineralization of the superficial defects), and the teeth treatment by means of fillings also seems unnecessary. (Buttner, Kovalova 2004).

The aim of the study

The aim of this study was to find out the contribution of oral hygiene improvement on the gingival status. Patient instruction and deposits removal resulted in a decrease of the inflammation, evaluated by means of the PBI index. In the evaluation process, we compared the value of PBI in the first, second and third visit during the hygienic (initial) phase and recall.

Patients and methods

The study group consisted of 256 patients (126 men), aged 18-6. Only patients who took part in the whole hygienic phase and recall were taken into account.

All investigated patients were healthy, did not use any medicines, women did not use hormonal contraception. The patients were included randomly in the study group, after having been referred to our dental office for preventive or curative treatment.

Dental status was evaluated clinically and by means of bite x-rays. Oral hygiene was assessed by means of PBI index, treatment needs by CPITN index, x-rays presence of gingival recesses. In every patient's general anamnesis, a dental anamnesis was taken. The number of teeth was 14 to 32, no removable prosthetic appliances were present.

During the first visit, after dental examination, we informed the patients about the structure of our work and the treatment plan. Following visits were performed at 14 days intervals. After the end of the hygienic phase, recall was scheduled 6 months after the last visit in the hygienic phase. After one year from the beginning of the study bite X-rays were taken and the number of new caries was assessed.

Number of visits ranged from 3 to 6.

Gender: the patients were divided into two groups – men and women.

Age: age was recorded according to WHO standardization. Patients were 18 to 60 years old, divided into three groups:

I group: 18 – 29 years
II group: 30 – 44 years
III group: 45 – 60 years

Categorization of patients:

According to input examination results, the patients were divided into the following categories (after LUTZ, modified):

The first group – common patients (BP) had maximum three fillings (or three carries, or three extracted teeth, without SM, LB tests), and they did not have periodontitis.

The second group – cariologic patients (KAR) had more than three fillings (or more than three caries, or more than three extracted teeth, without SM, LB tests), healthy periodontium or gingivitis.

The third group – periodontal patients (PAR) had maximum three fillings (or maximum three caries, or maximum three extracted teeth, without SM, LB tests), and they had periodontitis.

The fourth group – cario-periodontal patients (KAR-PAR) had more than three fillings, (more than three caries, or more than three extracted teeth, without SM, LB tests), and they had periodontitis.

For caries risk patients motivation and re-motivation were also performed on the basis of diet history, and diet protocol was examined.

Periodontal status

PBI gingival index, periodontal index stated by means of periodontal sound (WHO type) (9), oral hygiene – gingival status by PBI index (after Muhleman 1977), preliminary detected depth of periodontal pockets, periodontal treatment needs by CPITH index (after Ainam 1982) were recorded. Maximal rate in each sextant was recorded (10). Presence of gingival recesses was recorded (8).

Oral hygiene status by PBI index

- input index in the first examination
- 1. control in the hygienic phase (after 10 – 14 days)
- 2. control in the hygienic phase (after 14 days)
- 3. control in the hygienic phase, if necessary (after 14 days)
- recall at six months after the end of the hygienic phase

CPITN

- input examination by WHO sound
- control at the end of the hygienic phase (one to three months after the first visit)
- recall in six months after the end of the hygienic phase

All examinations were done by the same dentist, data was recorded in special blanks.

The course of treatment was the following:

According to the examination results, during the first visit we achieved motivation by the colour (Motivations atlas – Kovalova 2005) (11) and X-ray. Patient instruction was done by means of interdental spiral brush (GABA). The size of the brush was estimated according to the size of interdental spaces. If the interdental spaces were impassable, we removed calculus by means of ultra-sound. We did not recommend the patients any antiphlogistic rinse. During the following visits demotivation was done according to the PBI index.

Supragingival plaque and calculus were removed by EMS ultra-sound. In the first phase of cleaning we used rounded end piece. After removing the heavy deposits we achieved the end-cleaning by spike end piece. Cleaning was always finished with Gracey´s curette. We used Gracey 5-6 for front teeth, Gr 9-10 for vestibular and oral surfaces of lateral teeth, Gr. 11-12 for mesial and Gr. 13-14 for distal surfaces of lateral teeth. The curettes were manufactured Deppeler. During treatment we did not use any lavage of periodontal pockets.

Moderate overhanging fillings were adjusted with Prophin knuckle with diamond end piece. In striking overhangings, we recommended their reconstruction. We instructed the patients for cleaning overhangings by use of the interdental brush. Large, uncleanable overhangings were removed and teeth were treated by temporary fillings. Amalgam fillings were polished by a surfacer and rubber ends. During the closing visits, we polished teeth with a fluoridated tooth-paste – Nupro (Dentsplay) – in a rubber cup. The instruction and re-instruction was always done after removing the deposits and before polishing and flouridation.

The differences between the PBI index value in the first, second and third visit and in recall were evaluated. The values were compared in relation with patients' age, gender and type .

Results

Table 1 shows a striking difference between PBI index values in particular types of patients and striking regress of PBI index values in the respective visits. The decrease of values between the first and second visit was mostly expressed in all patients, as it raised to one half. The difference between patients in connection with age, however, was not striking. Types of patients: B – common patient, K – cariologic, P – periodontologic, K-P – cario-periodontologic.

In table 2 we can see striking difference between the PBI index values in particular types of patients and striking decrease of PBI index values in the respective visits. There has been a great decrease of values between the first and second visit in all patients, almost to a half. The difference between patients in connection with age was not expressive. Types of patients: B – common patient, K – cariologic, P – periodontologic, K-P cario-periodontologic.

Tested congruence of arithmetic means of PBI index in particular visits on various types of patients

Table 3 shows the statistical significance of PBI index values.

When comparing the results, the statistical significance between the first and second visit was the most striking. Also, the difference between PBI values between particular types of patients and between men and women was

Visit		first			second			third			recall		
Group	N	AA	DD	SD	AA	DD	SD	AA	DD	SD	AA	DD	SD
B1	11	1,958	0,278	0,527	1,231	0,190	0,436	0,845	0,148	0,384	0,856	0,037	0,192
B2	11	1,978	0,688	0,829	1,282	0,511	0,715	0,710	0,294	0,543	0,929	0,241	0,491
B3	10	2,544	0,849	0,921	1,533	0,691	0,831	0,998	0,331	0,575	1,319	0,625	0,790
NB	**32**	**2,160**	**0,605**	**0,759**	**1,349**	**0,646**	**0,661**	**0,851**	**0,258**	**0,501**	**1,035**	**0,301**	**0,491**
K1	13	1,736	0,161	0,401	1,026	0,140	0,374	0,717	0,177	0,421	0,868	0,232	0,481
K2	10	1,771	0,434	0,659	1,170	0,374	0,612	0,851	0,215	0,463	0,832	0,771	0,267
K3	10	2,412	0,486	0,697	1,404	0,241	0,491	0,942	0,639	0,791	1,123	0,507	0,712
NK	**33**	**1,973**	**0,360**	**0,586**	**1,200**	**0,525**	**0,492**	**0,837**	**0,344**	**0,561**	**0,941**	**0,270**	**0,487**
P1	6	2,313	0,756	0,870	1,393	0,379	0,616	0,913	0,148	0,384	0,893	0,134	0,366
P2	11	2,883	1,078	1,038	1,594	0,325	0,570	0,895	0,164	0,405	0,948	0,373	0,611
P3	12	3,313	0,469	0,685	2,206	0,218	0,467	1,379	0,230	0,480	1,582	0,379	0,616
NP	**29**	**2,836**	**0,768**	**0,864**	**1,731**	**0,308**	**0,551**	**1,063**	**0,181**	**0,423**	**1,141**	**0,295**	**0,531**
K-P1	11	2,489	0,927	0,963	1,384	0,287	0,536	1,055	0,166	0,408	0,981	0,117	0,342
K-P2	10	2,987	0,543	0,737	1,700	0,393	0,627	1,098	0,247	0,497	1,125	0,230	0,480
K-P3	11	2,682	0,848	0,921	1,705	0,463	0,680	1,279	0,183	0,427	1,280	0,451	0,672
NK-P	**32**	**2,719**	**0,773**	**0,874**	**1,596**	**0,381**	**0,614**	**1,144**	**0,199**	**0,444**	**1,129**	**0,266**	**0,498**
N	**126**	**2,422**	**0,626**	**0,771**	**1,469**	**0,351**	**0,580**	**0,974**	**0,245**	**0,482**	**1,061**	**0,283**	**0,502**

TABLE 1. PBI index – men

Basic map: (AA – arithmetic average, DD – data dispersion, SD – standard deviation) as per type of patients (B, K, P, K-P), age group 1(18-29 years), 2(30-44), 3(45-60), sequence Visits (first, second, third, recall), number of patients in the group – N

visit			first		second			third			recall		
Group	N	AA	DD	SD	AA	DD	SD	AA	DD	SD	AA	DD	SD
	12	1,705	0,979	0,989	0,840	0,185	0,430	0,641	0,140	0,375	0,613	0,151	0,388
	10	1,413	0,801	0,895	0,744	0,216	0,465	0,640	0,132	0,363	0,570	0,095	0,308
	11	1,953	0,810	0,900	1,494	0,854	0,924	1,089	0,595	0,771	1,151	0,536	0,732
	33	**1,690**	**0,863**	**0,928**	**1,026**	**0,418**	**0,606**	**0,790**	**0,289**	**0,503**	**0,778**	**0,260**	**0,476**
	12	1,793	0,368	0,606	1,060	0,302	0,550	0,817	0,201	0,448	0,753	0,086	0,294
	11	2,376	1,105	1,051	1,500	0,382	0,618	1,108	0,170	0,413	1,112	0,266	0,515
	11	1,935	0,653	0,808	0,995	0,157	0,396	0,763	0,291	0,539	0,887	0,238	0,488
	34	**2,035**	**0,709**	**0,822**	**1,185**	**0,280**	**0,521**	**0,896**	**0,221**	**0,467**	**0,917**	**0,197**	**0,432**
	6	2,740	0,524	0,724	1,690	0,507	0,712	1,050	0,278	0,527	0,883	0,197	0,444
	12	2,570	1,016	1,008	1,384	0,544	0,738	0,945	0,269	0,518	0,903	0,168	0,409
	12	2,818	0,593	0,770	1,636	0,490	0,700	0,958	0,318	0,564	1,005	0,340	0,583
	30	**2,709**	**0,711**	**0,834**	**1,570**	**0,514**	**0,717**	**0,984**	**0,288**	**0,536**	**0,930**	**0,235**	**0,479**
	10	2,581	0,801	0,895	1,716	0,426	0,653	1,243	0,370	0,608	0,965	0,085	0,291
	11	2,721	0,841	0,917	1,711	0,426	0,652	1,345	0,270	0,520	1,287	0,258	0,508
	12	2,919	0,737	0,859	1,653	0,511	0,715	1,168	0,124	0,352	1,042	0,319	0,565
	33	**2,740**	**0,793**	**0,890**	**1,693**	**0,454**	**0,673**	**1,252**	**0,255**	**0,494**	**1,098**	**0,220**	**0,454**
	130	2,294	0,769	0,869A	1,368	0,417	0,629	0,981	0,263	0,500	0,931	0,228	0,460

Table 2. PBI index – women

Basic map: (AA – arithmetic average, DD – data dispersion, SD – standard deviation) as per type of patients (B, K, P, K-P), age group 1 (18-19 years), 2 (30-44), 3(45-60), sequence visits (first, second, third, recall) number of patients in the group – N

		common patient		cariologic		periodontologic		cario-periodontologic	
		M	W	M	W	M	W	M	W
F	**Age 18-29**	**18,366**	**8,703**	**12,980**	**11,418**	**7,483**	**11,283**	**14,281**	**11,922**
	1. visit-2. visit	**5,941**	**4,116**	**5,365**	4,498	2,389	2,929	**5,987**	**2,966**
	2. visit-3. visit	1,669	0,218	1,018	0,495	0,650	1,088	0,531	0,887
	3. visit-recall	0,001	0,004	0,244	0,034	0,001	0,074	0,027	0,306
Fkrit		**2,839**	**2,816**	**2,798**	**2,816**	**3,098**	**3,098**	**2,839**	**2,866**
F	**Age 30-44**	**7,809**	**4,829**	**7,026**	**6,587**	**19,395**	**14,534**	**22,137**	**10,794**
	1. visit-2. visit	2,051	2,399	2,201	2,364	**6,282**	**5,635**	**7,813**	**4,168**
	2. visit-3. visit	1,383	0,058	0,620	0,473	1,843	0,773	1,710	0,546
	3. visit-recall	0,203	0,026	0,002	0,000	0,011	0,007	0,003	0,014
Fkrit		**2,839**	**2,866**	**2,866**	**2,839**	**2,839**	**2,816**	**2,866**	**2,839**
F	**Age 45-60**	**7,143**	**4,829**	**9,189**	**9,365**	**28,009**	**20,677**	**9,900**	**20,848**
	1. visit-2. visit	2,731	2,399	**3,616**	**4,820**	7,567	6,418	3,596	7,586
	2. visit-3. visit	0,765	0,058	0,760	0,293	4,216	2,110	0,686	1,108
	3. visit-recall	0,275	0,026	0,117	0,084	0,253	0,010	0,000	0,076
Fkrit		**2,866**	**2,866**	**2,866**	**2,839**	**2,816**	**2,816**	**2,839**	**2,816**

TABLE 3. Tested congrunece of aritmetic means of PBI index in particular visits in variuos types of patients
Basic map: M-men, W-women

statistically significant. PBI values were not significantly correlated to age.

DISCUSSION

Basic preventive activities, which we include into the patient's treatment plan, contain caries prevention as well as prevention of inflammation. Caries prevention is focused on prevention of occurrence of new, secondary an recurrent caries (Javorka 1999, Riethe 1994).

Evaluation of periodontal treatment efficiency was assessed by observing the changes regarding gingival inflammation, depth of periodontal pockets and regression of microbial cover (Døízhal 1999).

Rateitschak et al (8) formulated the question about the limits and benefits of the hygienic phase. They stated that, after a successful hygienic phase, no additional treatment on patients with gingivitis was necessary. According to Baderstein, the results of a hygienic phase are very good on patients with incipient periodontitis on one-root teeth.

In their three-years study, Westfelt et al. (1998) compared a group of patients in hygienic phase and recall, treated by supragingival scaling with instructing to a group treated by complete scaling with instructing. They came to the conclusion that an incomplete oral hygiene is much less effective as far as the state of periodont is concerned.

In a two-years longitudinal study, Lembariti et al. (1998) observed the decrease of PBI index in a group of patients with repeated instructing, comparing them to a group of patients with instructing and scaling. The decrease of PBI index was 20% lower in the second group.

In our study we evaluated the effectiveness of inflammatory process decreasing in gingiva by means of PBI index after solitary motivation and patients' instructing on the cleaning of interdental space with an interdental brush. During the following visits we professionally removed the plaque and calculus deposits from the surface of teeth crown and root. The PBI index decreased significantly between the first and the second visit. The difference between the second and third visit was less significant.

During the 6 months interval between the third visit and recall, a worsening appeared in the condition of some patients. The increase of PBI values indicates a decrease of patients´ interest towards oral hygiene. Therefore, for risk patients in which a worsening of the oral condition leads to serious damage caused by continuous inflammatory process, follow-up visits must be planned at shorter intervals.

CONCLUSION

The authors followed up 256 patients aged 18 – 60 years, completing the whole hygienic phase and recall. The values of PBI index were evaluated.

On the first visit, motivation and instruction were done by means of the interdental brush. During the following visits, plaque and calculus deposits were removed, places of plaque retention were cleaned, overhanging fillings were removed or re-done, plaque retention places on the teeth crowns were removed, endodontic treatment was started, roots were extracted. If endodontic treatment and/or extraction were necessary because of teeth softness, they were done during the first visit.

By the above mentioned actions, all retention of pathogenic microorganisms, causing inflammation and caries was removed. As a result, those actions were followed by the decrease of those indexes indicating the presence of inflammation and of newly appearing caries. The improvement and total conversion of oral hygiene habits for many patients appeared to be a very effective method of prevention and patients' "treatment". Therefore, authors recommend that the hygienic phase should be declared as an integrant component of the treatment plan for every patient.

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