



### RESEARCH ARTICLE

#### THE EFFECT OF ORAL HYGIENE PROGRAM ON MAINTENANCE OF GINGIVAL HEALTH DURING FIXED ORTHODONTIC THERAPY.

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#### Abstract

**Aim:** To evaluate the effectiveness of different instructional methods of oral hygiene programs in maintenance of gingival health during fixed orthodontic therapy.

**Materials And Methods:** A total of 60 orthodontic patients were included in this study. The patients were divided into three groups according to oral hygiene instructions (n = 20) as follows: first control group received written instructions. Second group received video instructions. Third group received one to one verbal instructions by hygienist. The periodontal parameters (modified gingival index, bonded bracket index and hyperplastic index) were recorded at the baseline and every two months consequently for six months. The level of salivary interleukin 1 $\beta$  was measured between baseline and after 6 months.

**Results:** During the observed period, a statistically significant change in modified gingival index and bonded bracket index was noticed in both video group and one to one verbal instructions, while both did not show significant change in hyperplastic index. The written instructions showed no statistical significant change in all parameters. One to one verbal instructions and video instructions showed a reduction on the level of salivary interleukin 1 $\beta$  significantly, while written instructions did not show significant change on the level of salivary interleukin 1 $\beta$ .

**Conclusion:** The oral hygiene instructions by visual demonstrations gave an improvement in oral hygiene more then written instructions.

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#### Introduction:-

Maintaining good oral hygiene is very important for patients with fixed orthodontic appliances.<sup>1</sup> Orthodontic appliances consist of brackets, wires and bands, which make the cleaning of teeth more difficult. As a result, it is common for plaque to accumulate around the base of the bracket.<sup>21</sup>

This retained plaque represents a considerable clinical risk that demineralization of the enamel may occur, resulting in white spot lesions and caries. Several studies indicate an increasing incident of carious lesion on the facial and lingual aspect of the teeth (Lundstrom and Krasse 1987, Qgaard 1989). The development of gingivitis and hyperplastic gingiva also could be seen as a problem during orthodontic treatment with fixed appliances.<sup>55</sup>

For this reason, oral hygiene is a challenge for both practitioner and patient (Truchot, 1991). The orthodontist should give more consideration to the oral hygiene of their patients and spend time to explain how to maintain good oral

hygiene during orthodontic treatment. The orthodontist and his staff should pay attention in motivating of patients to become concerned about their oral health during orthodontic treatment (Clark J.R. 1976).<sup>45,46,67</sup>

The uses of mouthwashes are effective in reducing plaque accumulation, gingival inflammation and enamel demineralization in orthodontic patients. While the use of mouthwash must not be considered by patients an alternative to brushing and interdental cleaning (Brightman *et al*, 1991) The bacterial flora of the mouth increase with the presence of fixed orthodontic appliance. Many studies report that changes in the dental flora occur after starting the orthodontic treatment (Bloom and Brown 1964, Perinetti *et al* 2004, Sallum *et al* 2004).<sup>100,121</sup>

### Metrialsand methods:-

Sixty patients undergoing fixed orthodontic therapy at the graduate orthodontic clinics at Riyadh Colleges of Dentistry and Pharmacy participated in this study. The ages of the patients varied between 13 and 30 years from both genders and all had metal Edgewise brackets appliances 'Roth System'. All procedures were explained to the patients and/ or their guardians. Each individual signed an informed consent form. The approval was obtained from the committee of research. The inclusion criteria for patient selection were as follow:

1. Patients age group from 13–30 years. Sex discrimination was not made in the study.
2. Patients undergoing fixed orthodontic treatment with brackets on all teeth and bands on molars.
3. Healthy patients with no systemic diseases.
4. No pregnancy at the time of measurements.
5. Similar socioeconomic levels.
6. No alveolar bone loss visible on X-rays.
7. No medication known to cause gingival enlargement, including phenytoin, cyclosporine, nifedipine, verapamil, diltiazem, felodipine, or nitredipine.
8. Nonsmokers

The patients were divided randomly into 3 groups in which each group was given a package of toothbrush, super floss, oral interdental brush and toothpaste. The group assignment was as follows:

Group 1: 20 patients (control group) had oral hygiene instructions written in paper by the Orthodontist that was given to them to take home (Appendix A).

Group 2: 20 patients were given the oral hygiene instructions through video 2.20 minutes long, which they took home on a compact disk.

Group 3: 20 patients had one to one verbal hygiene program, which aimed to show the patient -on an orthodontic model- how to brush the teeth and clean interdental space by dental floss and interdental brush.

The oral hygiene written instructions that were given to group 1 included the technique of how to use the toothbrush (modified Bass technique), dental floss and interdental brush with explanation pictures. Group 2 received a video animation of the same oral hygiene of written instructions. For group 1 and 2, the patient's oral hygiene was checked during routine appointments every four weeks and, if necessary, the orthodontist asked the patient to go over the instructions again. The 3rd group was registered with one hygienist that gave oral hygiene instructions on plastic models of the dental arches fitted with upper and lower fixed appliances. The hygienist had read the written instructions and watched the videos that were given to groups 1 and 2. The Bass technique of tooth brushing, interdental brushing and flossing were demonstrated by the hygienist and practiced by the patient. The patients were monitored while using the brushes and the techniques were corrected when necessary.

This was been done until the hygienist was satisfied that the patient demonstrated a good practice of oral hygiene. Also considering different levels of manual dexterity of patients and their previous tooth brushing skills, some of them had to be given more time for practice until they learned how to use mechanical devices properly for oral hygiene maintenance. The patients were requested to bring along their cleaning kits at every visit to assess and correct their technique. The patient's oral hygiene was checked during routine appointments every 4th or 5th week and, if necessary, instructions were repeated. The hygienist and the orthodontist asked the patients about their impressions in terms of tooth brushing techniques and potential difficulties during brushing.

We paid particular attention to cleaning instruction of areas where patients had not cleaned well. All groups were told not to use any other oral agents, including oral irrigators or antimicrobial mouth rinses. The indices were measured at four times intervals, where the first time before the hygiene programs “baseline” (T1) then after every two months consecutively for six months (T2, T3 and T4). Interleukin 1 $\beta$  test was done on salivary samples at baseline (T1) and after 6 months (T4) time intervals two dental interns participated in our study, one of them was registered as hygienist; the other one was registered as blinded examiner. Before the study, the single blinded examiner underwent calibration training on five patients for modified gingival index, bonded bracket index and hyperplastic index.

During the first visit, following removal of archwires, scaling was performed. Two weeks later, baseline measurements were obtained. The modified gingival index (Lobene et al 1986), bonded bracket index (Kilicoglu et al 1997) and hyperplastic index (Angelopoulos and Goaz 1972) indices were measured at baseline and after 2 months consequently for 6 months by the single-blinded examiner. The immunologic factors (IL-1 $\beta$ ) related to orthodontic treatment-induced gingival enlargement were evaluated through these three groups by ELISA test; saliva samples were collected at baseline (T1) and after 6 months (T4). Results of these 3 groups have been compared by the aid of a statistical computer program (SPSS, version 16).

#### **Specimen collection for human IL-1 $\beta$ :**

For evaluation of the immunological factor (IL-1 $\beta$ ), the patients were asked not to eat at least one hour before the appointment, and then asked to rinse their mouth 10 minutes before sample collection. Patients may collect whole saliva by tilting the head forward, allowing the saliva to pool on the floor of the mouth, and then passing the saliva into a large polypropylene vial. This large polypropylene vial facilitated the collection of saliva from the patients. Then the saliva was transferred to smaller polypropylene vial. After saliva was collected from the patients, the samples were stored in a refrigerator 4°C for a maximum 3 days. The samples were then taken to King Faisal Specialist Hospital to be placed in a deep freezer at -77°C and stored. After collection of all samples, steps to detect IL-1 $\beta$  level for each patient was followed according to the manufacture instructions (Salimetrics salivary IL-1 $\beta$  ELISA kit); (Appendix B).

#### **Indices:**

##### **Modified Gingival Index (MGI) by Lobene et al. (1986)**

1. Absence of inflammation
2. Mild inflammation or with slight changes in color and texture but not in all portions of gingival marginal or papillary.
3. Mild inflammation, such as the preceding criteria, in all portions of gingival marginal or papillary.
4. Moderate, bright surface inflammation, erythema, edema and/or hypertrophy of gingival marginal or papillary.
5. Severe inflammation: erythema, edema and/or marginal gingival hypertrophy of the unit or spontaneous bleeding, papillary, congestion or ulceration.

##### **Bonded Bracket Index (BBI) visually by Kilicoglu et al. (1997)**

1. No microbial plaque on the bracket or tooth surface.
2. Microbial plaque only on the bracket.
3. Microbial plaque on the bracket and tooth surface, but no spreading towards the gingiva.
4. Microbial plaque on the bracket and tooth surface, spreading toward the papilla.
5. Microbial plaque on the bracket and tooth surface. Part of the gingiva is covered with plaque.
6. Microbial plaque on the bracket and tooth surface. Gingiva is totally covered with plaque.

The decision to visually detect plaque compared to the use of disclosing solution was made to avoid over diagnosis of plaque. Only naked eye evaluation was used.

##### **Hyperplastic index (HI) by Angelopoulos and Goaz (1972)**

1. No gingival overgrowth.
2. Mild overgrowth, blunting of the marginal gingiva;
3. Moderate overgrowth, extending to the middle of the tooth crown.
4. Severe overgrowth, covering two thirds of the tooth crown or affecting the whole of the attached gingival.

### Results:-

Complete data were obtained from the 60 study patients included in the 3 groups. The indices were done at four times intervals, where the first time before the hygiene programs “baseline” (T1) then after two months (T2), after four months (T3) and after 6 months (T4). Interleukin 1 $\beta$  test was done on salivary samples at (T1) and (T4) time intervals.

A Hygiene program by written instructions:

The mean values of modified gingival index, bonded bracket index and hyperplastic index are shown in (table 1).

**Table 1:-**The mean and standard deviation (SD) of all indices in multiple time intervals among group 1 (hygiene written instructions).

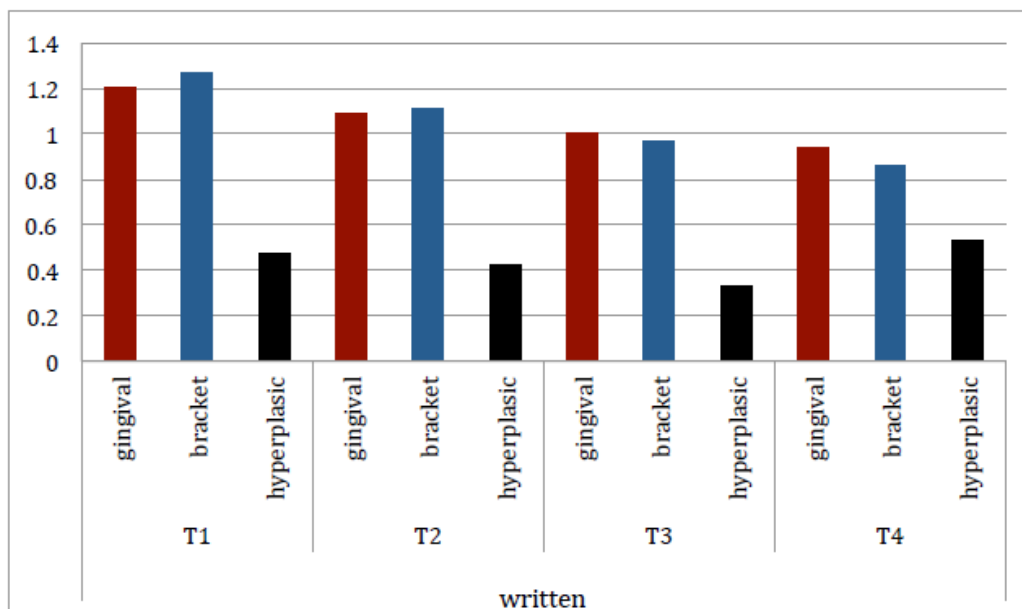
Group	Type	Time	N	Mean	SE
Written instruction	Modified Gingival Index	T1	20	1.205	.116
		T2	20	1.090	.094
		T3	20	1.007	.093
		T4	20	.940	.101
	Bonded Bracket Index	T1	20	1.270	.125
		T2	20	1.108	.130
		T3	20	.968	.117
		T4	20	.863	.125
	Hyperplastic Index	T1	20	.575	.068
		T2	20	.527	.063
		T3	20	.545	.069
		T4	20	.530	.070

### Group Type Time N Mean

The modified gingival index, bonded bracket index and hyperplastic index showed no significant difference between time intervals T1, T2, T3 and T4, which indicates no change in gingival condition and plaque accumulation (table 2, figure 1).

**Table 2:-**all types of indices in different time intervals among group 1 (hygiene written instructions).

Time intervals	T1 - T2	T1 - T3	T1 - T4	T2 - T3	T2 - T4	T3 - T4
Sig.	.971	.723	.451	.990	.870	.997
Modified gingival index						
Time intervals	T1 - T2	T1 - T3	T1 - T4	T2 - T3	T2 - T4	T3 - T4
Sig.	.941	.419	.152	.966	.705	.991
Bonded bracket index						
Time intervals	T1 - T2	T1 - T3	T1 - T4	T2 - T3	T2 - T4	T3 - T4
Sig.	.997	1.000	.998	1.000	1.000	1.000
Hyperplastic index						



**Fig 1:-**all indices in different time intervals among group 1 (written hygiene instructions).

#### Hygiene program by video instructions:

For the video group, the mean value of modified gingival index, bonded bracket index and hyperplastic index are shown in table 3.

**Table 3:-**The mean and standard deviation of all indices in multiple time intervals among group 2 (video instructions).

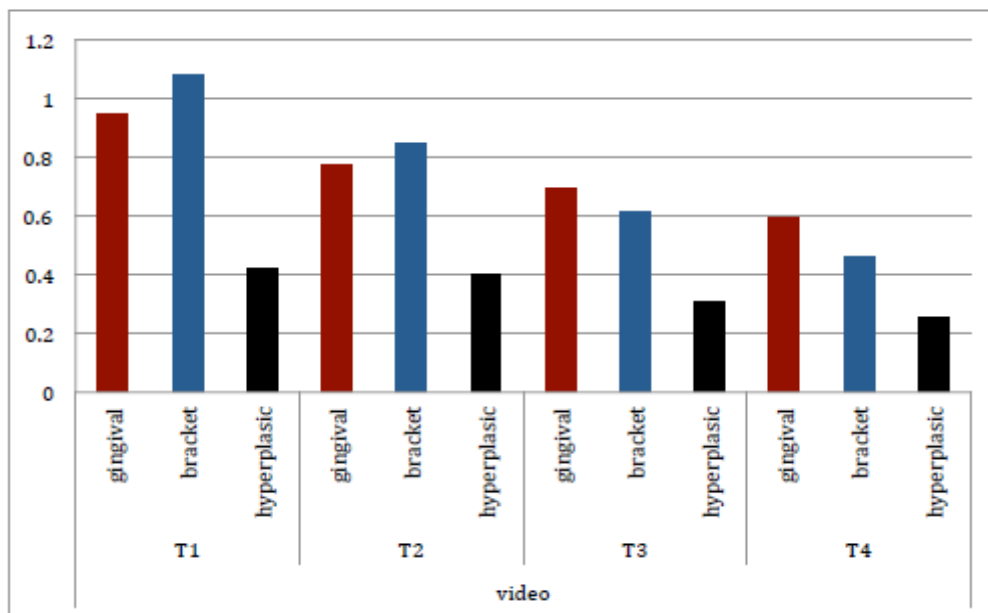
Group	Type	Time	N	Mean	SE
Video instruction	Modified Gingival Index	T1	20	.949	.092
		T2	20	.773	.071
		T3	20	.693	.066
		T4	20	.592	.073
	Bonded Bracket Index	T1	20	1.082	.087
		T2	20	.845	.091
		T3	20	.613	.084
		T4	20	.458	.083
	Hyperplastic Index	T1	20	.373	.057
		T2	20	.341	.055
		T3	20	.330	.060
		T4	20	.252	.050

Modified gingival index showed that there was no significant difference between T1 and T2, T1 and T3, T2 and T3 and T4 while there was significant difference between T1 and T4 ( $P < 0.027$ ). For the bonded bracket index there was no significant difference between T1 and T2 while there was a significant difference between T1 and T3 ( $P$

<0.03), and T1 and T4 ( $P > 0.000$ ). There was no significant difference between T2 and T3, T3 and T4 but there was a significant difference between T2 and T4 ( $P > 0.02$ ). For the hyperplastic index there was no significant difference between T1, T2, T3 and T4 (Table 4, figure 2).

**Table 4:-all types of indices in different time intervals among group 2 (video instructions).**

Time intervals	T1 – T2	T1 – T3	T1 – T4	T2 – T3	T2 – T4	T3 – T4
Sig.	.600	.175	.027	.960	.411	.899
Modified gingival index						
Time intervals	T1 – T2	T1 – T3	T1 – T4	T2 – T3	T2 – T4	T3 – T4
Sig.	.350	.003	.000	.351	.020	.739
Bonded bracket index						
Time intervals	T1 – T2	T1 – T3	T1 – T4	T2 – T3	T2 – T4	T3 – T4
Sig.	.999	.997	.540	1.000	.813	.905
Hyperplastic index						



**Fig 2: Indices in different time intervals among group 2 (video instructions).**

### Group 3: one to one verbal hygiene program

The mean values of modified gingival index, bonded bracket index and hyperplastic index are shown in table 5.

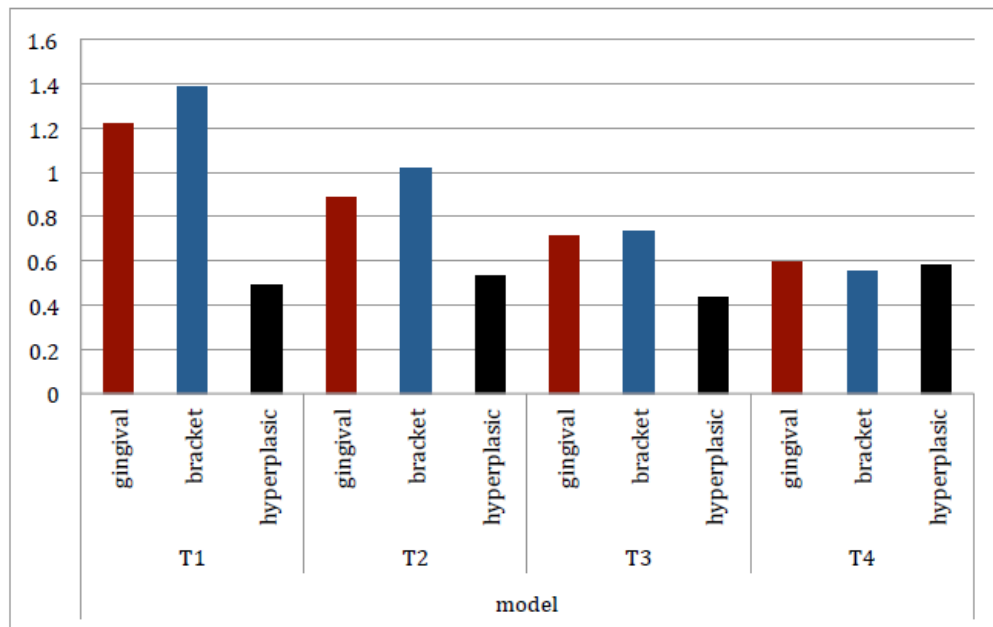
**Table 5:-**The mean and standard deviation of all indices in multiple time intervals among group 3 (one to one verbal instructions).

Group	Type	time	N	Mean	SE
One to one verbal hygiene program	Modified Gingival Index	T1	20	1.22	.111
		T2	20	.889	.099
		T3	20	.712	.091
		T4	20	.595	.083
	Bonded Bracket Index	T1	20	1.390	.134
		T2	20	1.016	.110
		T3	20	.737	.080
		T4	20	.556	.090
	Hyperplastic Index	T1	20	.494	.064
		T2	20	.458	.064
		T3	20	.372	.058
		T4	20	.319	.052

Modified gingival index showed no significant difference between T1 and T2, while there was significant difference between T1 and T3 ( $P < 0.007$ ), and between T1 and T4 ( $P < 0.000$ ). There was no significant difference between T2 and T3, as well as T2 and T4. There was no significant difference between T3 and T4. For the bonded bracket index there was no significant difference between T1 and T2, T2 and T3, and T3 and T4, while there was a significant difference between T1 and T3 ( $P < 0.001$ ), T1 and T4 ( $P < 0.000$ ), and T2 and T4 ( $P < 0.016$ ). For the hyperplastic index there was no significant different between T1, T2, T3 and T4 (table 6, figure 3).

**Table 6:-**all types of indices in different time intervals among group 3 (one to one verbal instructions)

Time intervals	T1 – T2	T1 – T3	T1 – T4	T2 – T3	T2 – T4	T3 – T4
Sig.	.174	.007	.000	.739	.167	.925
Modified gingival index						
Time intervals	T1 – T2	T1 – T3	T1 – T4	T2 – T3	T2 – T4	T3 – T4
Sig.	.210	.001	.000	.263	.016	.602
Bonded bracket index						
Time intervals	T1 – T2	T1 – T3	T1 – T4	T2 – T3	T2 – T4	T3 – T4
Sig.	.999	.678	.230	.913	.484	.985
Hyperplastic index						



**Fig 3:-**all indices in different time intervals among group 3 (one to one verbal instructions).

#### Salivary interleukin 1 $\beta$ levels:

Salivary interleukin 1 $\beta$  level mean value at T1 and T4 shown for each group in (table 7). The result showed that there is a moderate correlation between interleukin 1 $\beta$  and modified gingival index, bonded bracket index and hyperplastic index (Pearson correlation 0.63-0.75).

**Table 7:-**The mean and standard deviation for Salivary interleukin 1 $\beta$  level at T1 and T4.

Group			Mean	N	SE
One to one verbal instructions	Pair 1	T1	23.154	20	2.949
		T4	15.711	20	2.743
Video instructions	Pair 1	T1	17.369	20	2.284
		T4	13.683	20	2.774
Written instructions	Pair 1	T1	24.271	20	3.438
		T4	22.509	20	2.390

**Table 8: A)** correlation between indices and Salivary interleukin 1 $\beta$  level in T1, **B)** correlation between indices and Salivary interleukin 1 $\beta$  level in T4.

Baseline (T1)	MGI	BBI	HI	After 6 months (T4)	MGI	BBI	HI
IL-1 $\beta$ (Pearson Correlation)	.746**	.634**	.693**	IL-1 $\beta$ (Pearson Correlation)	.713**	.644**	.712**
MGI (Pearson Correlation)	-	.853**	.903**	MGI (Pearson Correlation)	-	.905**	.910**
BBI (Pearson Correlation)	.853**	-	.789**	BBI (Pearson Correlation)	.905**	-	.856**



**The correlation of Salivary interleukin 1 $\beta$  level between indices:**

The repeated measurement test on table 8 showed a strong relation between modified gingival index, bonded bracket index and hyperplastic index (Pearson correlation > 0.75)(table 8).

**The comparison between groups according to indices:**

In modified gingival index there was no significant difference between one to one verbal instructions and video instructions, while there was a significant difference between model instructions and written instructions ( $P < 0.02$ ), also there was a significant difference between video instructions and written instructions ( $P < 0.000$ ) (table 10). For the bonded bracket index there was no significant difference between one to one verbal, video and paper instructions, while there was significant difference between video and written instructions ( $P < 0.01$ ) (table 10) For the hyperplastic index there was no significant difference between one to one verbal instructions and video instructions, while there was significant difference between oral hygiene and paper instructions ( $P < 0.011$ ), and video and written instructions ( $P < 0.00$ ) (table 10). Therefore, model hygiene instructions program and hygiene program by video instructions are recommended for orthodontic patients. There was a significant decrease in the level of interleukin 1 $\beta$  in both one to one verbal instructions and video instructions ( $P < 0.05$ ), while there was no significant decrease on written instructions ( $P > .05$ ) (table 9).

**Table 9:-**Salivary interleukin 1 $\beta$  among the studied groups at T1 and T4.

Group			Mean	Std. Error Mean	Sig. (2-tailed)
One to one verbal instructions	Pair 1	T1 - T4	7.443	1.369	.000
Video instructions	Pair 1	T1 - T4	3.694	1.821	.047
Written instructions	Pair 1	T1 - T4	1.762	3.340	.093

**Table 10:-**The significant different between each group according to indices.

Type	(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.
Modified Gingival Index	verbal	video	.103	.067	.344
		written	-.205*	.074	.020
	video	written	-.308*	.065	.000
Bonded Bracket Index	verbal	video	.175	.080	.090
		written	-.127	.089	.400
	video	written	-.302*	.080	.001
Hyperplastic Index	verbal	video	.086	.041	.110
		written	-.133*	.045	.011
	video	written	-.220*	.043	.000
*. The mean difference is significant $P < 0.05$ level.					

## Discussion:-

Maintaining good oral hygiene is particularly challenges for patients with fixed orthodontic appliances. The development of white spot lesions, gingivitis and hyperplastic gingiva is also a well-recognized problems during orthodontic treatment with fixed appliances (Truchot 1991, Welbury and Carter 1993).<sup>11,14,16,18</sup>

Giving orthodontic patients proper instructions on gingival health maintenance to orthodontic patients play vital role in getting good orthodontic result with stable periodontal health. The present study showed that modified gingival index, bonded bracket index, hyperplastic index and interleukin 1 $\beta$  values were reduced significantly in video group and in the one to one verbal hygiene programs. This implies that these programs have a positive effect on reducing gingival inflammation and plaque accumulation in patients undergoing orthodontic treatment.<sup>27,49,100</sup>

It is noted that all subjects who were in the video and one to one verbal hygiene programs had improved their modified gingival index and bonded bracket index at their orthodontic treatment period, although between time intervals differences were not statistically significant. It is assumed that the frequent visits to the orthodontist and the regular reminders that the patients received regarding their oral care had a positive effect on the level of plaque control by the patients. In addition to the effect shown by tooth cleaning aids, recognition of the importance of oral hygiene by the patients themselves play an important role in successful treatment. Establishing concepts of oral health conditions in patients, and maintaining a good relationship between the orthodontist and his patient can help and support the performance of a planned oral hygiene program.<sup>34,35,67</sup>

It is the responsibility of the orthodontist to involve patients in a systematic program of preventing caries and periodontal disease, by focusing on the removal of plaque and elimination of cariogenic and periodontopathic microorganisms (Clark 1976, Smiech-Słomkowska and Jablonska-Zrobek 2007). Our data supporting this. At first visit for patients in all programs, some of them had mild to moderate gingival inflammation and plaque accumulation, which improved later on by the oral hygiene programs. This is in agreement with Boyd et al (1985) who found that even in patients with periodontal disease before orthodontic treatment, the periodontal health condition would be the same as any regular patients if they paid attention to oral hygiene care and if they follow oral hygiene instructions at regular times during orthodontic treatment.<sup>54,56,58,121</sup>

The one to one verbal instructions which done by the hygienist using a model showed an effective method in improving the oral hygiene which goes with the previous studies (Clark J.R. 1976, Huber et al 1987, Zuhail et al 2007) who found that oral hygiene instructions by demonstration was more effective in improving patient education. The present study showed that written instructions for orthodontic patients appear to be the least effective way to control oral hygiene for orthodontic patients. This is in agreement with Self et al (1983) who made a study on twenty-nine adult asthmatic patients from an allergy clinic. They were divided into three groups, each receiving a different form of instruction: an information sheet, personal instructions or a videotape presentation. The result showed no significant difference in the scores between the groups instructed in person and by videotape, but both were significantly better than patients who got written instructions. The video presentation gave a convenient and clear demonstration of the opportunity for the comfortable self-learning.<sup>111,119,120,123</sup>

From previous studies by Machen and Johnson (1974) and Fields and Pinkham (1976), the video instructions showed an effective method for the attitude of patients toward dental treatment. The main advantage of a video over other instructional methods is that it can be used repeatedly at no additional cost, this was a suggestion made by McCulloch et al. (1983) who successfully developed a videotape for teaching dietary control to insulin dependent diabetics.<sup>14</sup> Modified gingival index in the group of one to one verbal hygiene program showed an incremental improvement between time intervals. There was no statistical significant difference between baseline (T1) and second time interval (T2), while there is a significant different between (T1) and third time interval (T3) and also fourth time interval (T4).<sup>43</sup>This could means that there was gradual improvement of patient hygiene during the program. Modified gingival index in the group of video instructions showed an incremental improvement between time intervals.<sup>89</sup>There was no significant difference between baseline (T1) and T2 and T3, but there is significant difference between baseline and T4.

This means that there was gradual improvement of patient hygiene during the program. Modified gingival index in the group of written instructions showed no statistical significant difference between each time interval.<sup>80,85</sup> This was supported by other studies (Self et al, 1983) and (Lees and Rock, 2000) who evaluated the influence of different instructional types on patients, their result showed that written instructions had less effect on patients than other

instructional methods. However, McGlynn et al (1987) did a study on written instructions for self-managing of oral hygiene in orthodontic patients and found that there was a significant improvement in oral hygiene due to self-motivation.<sup>60</sup> It was noticed for all the study groups in the current study that modified gingival index and bonded bracket index, had no significant difference between T3 and T4.

This may be a result of saturation of learning by the patient, so no longer they can have a benefit from the program. Bonded bracket index in the one to one verbal hygiene instructions group and the video instructions group showed no statistically significant difference between baseline and T2, while there was a significant difference between baseline and T3 and T4, and significant difference between T2 and T4. The one to one verbal hygiene instructions and video instructions played the same role for the bonded bracket index during orthodontic treatment. This is in agreement with Lees and Rock (2000) who showed that one to one instructions and video instructions both improve the plaque removal especially between gingiva and bracket area, twice more than that by written instructions group.<sup>71,72,73,75</sup>

There was no improvement in hyperplastic index for the group of one to one verbal, video and written instructions between time intervals. Therefore, more attention should be paid to gingival enlargement caused by orthodontic treatment. However, there was a study done by Zachrisson (1976) who found that GE most often resolves within weeks after debanding.<sup>76,77</sup>

Improvement of oral hygiene was observed for both video instructions group and the one to one verbal instructions group by the hygienist. The changes reach the level of statistical significance in both modified gingival index and bonded bracket index.<sup>99</sup>

Whereas the group who had written instructions did not show statically significant improvement in all parameters. This is in accordance with the result by Self et al (1983). While Lees and Rock (2000), found no significant difference between all these types of instructions. There was a moderate correlation between interleukin 1 $\beta$  values and the parameters used in the study (table 8).<sup>22,26,54,76</sup>

The Interleukin 1 $\beta$  is a cytokine that is produced by various cell types including macrophages, fibroblasts, and neutrophils. It mediates soft tissue destruction through the stimulation of prostaglandin production, and the induction of collagenase and other proteases. The inflammatory responses mediated by Interleukin 1 $\beta$  play an important role in periodontal tissue destruction (Stashenko et al, 1991)<sup>1,2,23,25</sup>

## Conclusions:-

1. Visual demonstrations either by one to one verbal instructions or video instructions improved oral hygiene more than written instructions.
2. There was no different effect on oral hygiene between video instructions and one to
3. one verbal hygiene instructions.
4. None of the hygiene programs showed improvement in hyperplastic index.
5. There was a reduction in the level of interleukin 1 $\beta$  in both one to one verbal instructions and video instructions while written instructions did not show significant improvement.

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